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Notes on the contents of this volume

The thirty-ninth annual meeting of the Berkeley Linguistics Society consisted of a general session along with:

- a special session on Space and Directionality
- a parasession on the Languages of Southeast Asia
- a parasession on Human Prehistory and Linguistics

The parassessions are presented here folded into the general session.

The following authors or author pairs also gave talks at the conference that do not appear as papers in this volume: Matthew Adams, Wichaya Bovonwiwat, Will Chang, Virginia Dawson, Mark Donohue and Cathryn Donohue, Yu-Yin Hsu, Elsi Kaiser and David Cheng-Huan Li, Lan Kim, Linda Konnerth, Chieu Nguyen, Tatiana Nikitina, Şeyda Özçalışkan and Susan Goldin-Meadow, Rui Rothe-Neves and Hellen Valentin, David Sawicki, and Harold Torrence and Khady Tamba.

Jürgen Bohnemeyer, Marc Brunelle, and Russell Gray gave invited talks that do not appear as contributions in this volume.

Foreword

The editors are pleased to present the proceedings of BLS 39, which took place in February 2013. We wish to thank our conference speakers and proceedings contributors for their considerable patience.

GENERAL SESSION

The Definite Marker in Arabic: Morphological realization of the syntactic head D or a [DEF] feature*

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1 Introduction

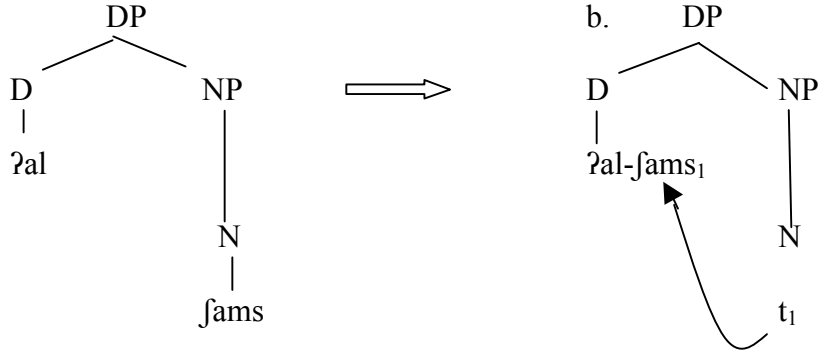
In Arabic, the definite marker can render a noun phrase (NP) definite and it appears as a proclitic on adjectives that modify a definite NP (a phenomenon known as definiteness agreement). Arabic also has a complex adjectival construction known as Construct State Adjective (CSA) that also exhibits the definiteness agreement property. Moreover, in cardinal number constructions in Standard Arabic, the definite marker appears as a proclitic on both the numeral and the enumerated noun (another case for definiteness agreement). This CSA construction and cardinal number constructions are interesting in that definiteness agreement is optional as opposed to the canonical cases of noun-adjective constructions (with post nominal adjectives) where definiteness agreement is obligatory. This paper argues that, given these facts about definiteness agreement, it is more plausible to treat the definite marker whish appears on nominal heads as the realization of the syntactic D head while the definite marker appearing on adjectival and nominal complements as a [DEF] feature added at PF. This analysis extends and builds on Kramer's (2010) analysis of definiteness in Amharic. In this section, I introduce the basic analyses of these facts. Then in section two, I review the approaches that have been entertained to explain the

* I would like to thank the audience of BLS 39 for their helpful comments on the earlier version of this paper presented during the conference. Thanks are also due to Steven Franks and Yoshi Kitagawa for their helpful comments on earlier versions of this paper.

realization of the definite markers. In section three, I argue in favor of Kramer's analysis for analyzing the realization of the definite marker in Arabic and build on it by adding a [DEF] deletion process that can explain the complex patterns for the distribution of the definite marker in the Arabic noun phrase. And in section 4 I conclude.

The standard analysis of the Semitic DP (e.g., Fassi Fehri 1993) has the determiner located at its left periphery which selects an NP complement (Abney's 1987 analysis). The determiner, however, generally shows up as a prefix on the head of the NP. The determiner and the head of the NP are one prosodic word. When the determiner shows up as a prefix on a noun that has a coronal sound word initially, the lateral sound in the determiner [ʔal] assimilates to the coronal sound as in [ʔaʃ-ʃams] 'the sun'. This word level phonological process has been explain by N-D movement suggesting that the word formation process that merges the determiner with the head of the NP is syntactic incorporation, i.e. the noun moves to the head of the DP and incorporates with the determiner (Benmamoun (1992, 2000b), Fassi-Fehri (1989, 1993, 1999), Mohammad (1988), Ouhalla (1991)). The trees in examples (1) illustrate this.

(1) a. b.



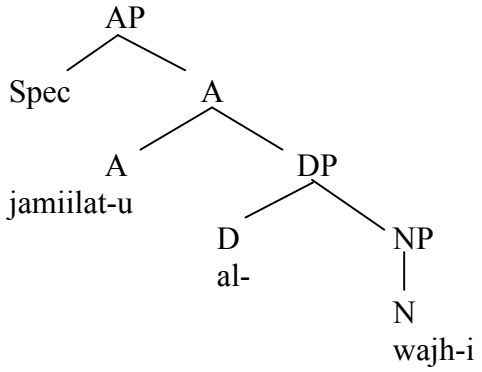
Shlonsky (2004) criticizes this incorporation analysis. He points out that incorporating the noun with the determiner should result in the wrong word order, i.e. the noun will left adjoin to the determiner since incorporation is left adjunction. Therefore, we need to introduce another mechanism into the syntax in order to get the right word order under the incorporation analysis. This extra mechanism is to allow heads to right adjoin in incorporation. Following the spirit of the minimalist program, Shlonsky argues against incorporation to explain the merger between the determiner and the head noun of the NP. Instead, he adopts Siloni's (2001) postsyntactic analysis of this phenomenon. Siloni proposes that the determiner merges with the noun after spell out at the PF side by prosodic licensing. Specifically, Siloni argues that the determiner merges with the noun at the prosodic level when prosodic structure is built. She proposes that prosodically weak words are function words that attach to prosodic words. The determiner attaches to the noun because it is prosodically weak. Siloni basically proposes this

to explain why the determiner cannot show up on the construct state heads in Hebrew.

Some adjectives precede the head of the DP and others follow it. The prenominal adjectives have been analyzed as heads in an AP that dominates the DP. The heads assign genitive case to the NP (Shlonsky 2004), as in (2) and the illustration in (3).

(2) jamiilat-u al-wajh-i
beautiful-$_{NOM}$ the-face-$_{GEN}$
'beautiful of face'

(3)

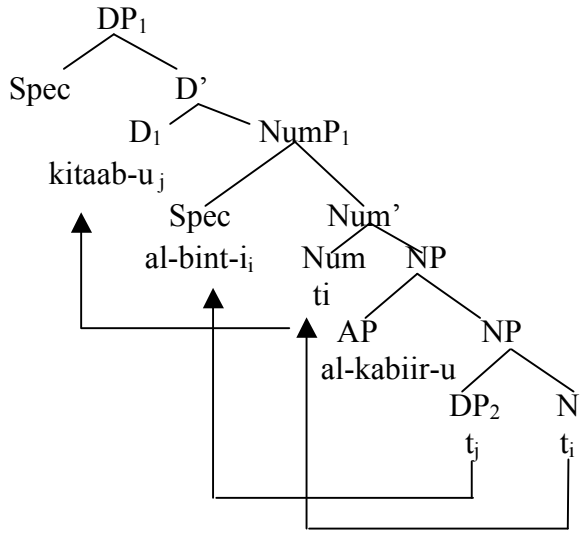


The post-nominal adjectives have been analyzed as specifiers in Spec-NP and the head of the NP moves higher to a NumP and incorporates with Num^0. In the possessive/genitive construction (Construct State Nominal (CSN))[1] as in e.g. (4) below, on the contrary, the head noun has been argued to move to the head of the DP because the determiner never appears as a prefix on the head of the NP as in e.g. (4) below where the CSN head noun *kitaab-u* 'book-$_{NOM}$' cannot carry the determiner. The complementary distribution between the determiner and the head of the genitive construction has been viewed as a competition between these two heads illustrated in e.g. (4) to occupy the same head position of the DP (Ritter 1991, Fassi-Fehri 1993, Borer 1996 and others). Accordingly, Construct State Nominal (CSN) is often analyzed as follows. First, a **head** noun is merged with a DP and assigns genitive case to this DP. In (4) below, for example, the head noun *kitaab-u* 'book-$_{NOM}$' first merges with the genitive DP2 *al-bint-i* 'the-girl-$_{GEN}$' at the bottom of the tree in (5).

[1] The term construct state refers to the weak state of the head of the genitive construction. The head is morphologically weak in Modern Standard Arabic and phonologically weak/reduced in Hebrew and some Arabic dialects. Morphologically, the head lacks the morpheme –n when it is indefinite. Indefinite nouns have this –n suffix but not when they are used as heads of the genitive construction.

(4) (*al-)kitaab-u al-bint-i *(al-)kabiir-u
(*the)book-$_{NOM}$ the-girl-$_{GEN}$ the-large-$_{NOM}$
'the big book of the girl'

(5)



The NP which is composed of the noun *kitaab-u* and the genitive DP2 then merges with the adjective *al-kabiir-u* 'the-large-$_{NOM}$' which modifies the head noun *kitaab-u*. The head noun *kitaab-u* then moves to NumP to pick up the number morpheme. The genitive DP2 moves to Spec NumP to check its gentitve case and the head noun *kitaab-u* inherits definiteness from the definite DP2 in turn. The head *kitaab-u* then moves to the D1 head of the highest DP and turns the whole possessive construction into a definite DP. Although the head *kitaab-u* morphologically lacks the definite article, it is claimed to be definite because it is ungrammatical to delete the definite article which appears on the adjective *al-kabiir*. Adjectives must carry the article whenever the noun they modify is definite. This is known as definiteness concord in Semitic. The adjective also shows agreement in *phi* features with the noun it modifies.

In addition to CSN, there is another 'Construct State (CS)' construction generally referred to as Construct State Adjective (CSA).[2] This construction involves an adjectival **head** that merges with a DP and assigns genitive case to this DP (**'the internal DP'**), as in the examples from Modern Standard Arabic (MSA) in (6). In example (6), the adjective and its internal DP function as an attributive modifier for the N in a higher DP (**'the external DP'**). The adjective head agrees with the noun in the external DP in *phi* features. CSA does not have a definite interpretation and it is used as an attributive modifier for the noun in the external DP. It is the adjective that shows concord and the internal DP always

[2] Although adjectives agree with the nouns they modify in definiteness, the adjective in CSA lacks the indefinite morpheme –n. This is similar to what happens to the head noun in CSN.

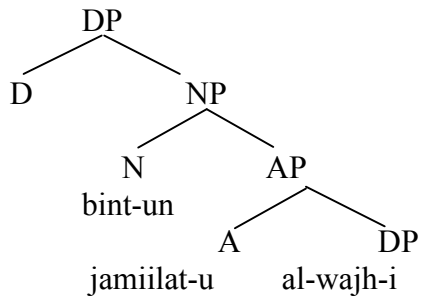
carries the definite article regardless of the definiteness value of the external DP, as in (6).

(6) a. [$_{DP}$ bint-un [$_{AP}$[$_{A}$ (*al-)jamilat-u] [$_{DP}$ ***(al-)**wajh-i]]]
girl(FS)-NOM (*the-)beautiful(3FS)-NOM ***(the-)**look(MS)-GEN
'A good looking girl'

b. [$_{DP}$ al-bint-u [$_{AP}$[$_{A}$ *(al-)jamilat-u] [$_{DP}$ ***(al-)**wajh-i]]]
the-girl(FS)-NOM *(the-)beautiful(3FS)-NOM ***(the-)**look(MS)- GEN
'The good looking girl'

The following tree in (7) represents the CSA in example (6):

(7)



2 Theoretical Background and Previous Analyses

Under the DP hypothesis (Abney 1987), the definite article is assumed to be base-generated under the syntactic head D (Ouhalla 2004). A second approach treats it as a morphosyntactic feature [DEF] generated on the lexical host (noun or adjective) through a definiteness agreement with (abstract) D (Fassi Fehri 1999; Shlonsky 2004; den Dikken 2007). The first is problematic in languages that exhibit definiteness agreement on adjectives like Arabic (e.g. (8)). There is no explanation for how the adjective can carry the definite marker since the AP does not have a D head. Moreover, this agreement process is sometimes optional as in Amharic multiple adjectives (e.g. (9)). The second approach is also problematic in cases of multiple instances of the definite marker (e.g. (9)). An extra mechanism like (multiple Agree) is needed and even with this it is not possible to explain the optionality of agreement. It is also not possible to explain the absence of the marker from nouns modified by adjectives in Amharic since the presence of the marker is expected, given that the noun is specified for [DEF]. The third approach is a hybrid analysis (Kramer 2010) for the Amharic DP where the determiner of the noun phrase is the realization of the D head (which has a [DEF] feature) which undergoes local dislocation at PF, while the definiteness agreement marker carried by the adjective is the realization of a [DEF] feature added at PF (a distributed morphology analysis).

(8) [DP al-bint-u [AP [A *(al-)jamil-at-u]
DEF-girl-NOM *(DEF-)beautiful-FS –NOM
'The beautiful girl'

(9) tillik'-u t'ik'ur(-u) bet
big-$_{DEF}$ black(-$_{DEF}$) house
'the big black house'

For Arabic, the second approach has been assumed. The definite marker has been considered as the realization of [DEF] features on nouns and adjectives (Shlonsky 2004, Fassi Fehri 1999). The noun, which has a [DEF] feature, enters into a Spec-Head relationship to license the [uDEF] feature of the adjective (as well as the phi features). This movement explains how adjectives are post-nominal. Further movement of the noun to D (head-to-head movement = incorporation) to render the whole DP definite and this explains the fact that the definite marker is a clitic. However, there are at least 4 reasons that make this analysis disfavored. First, Arabic allows multiple instances of the definite marker (e.g. (8)) and this requires multiple Agree. Second, cardinal number constructions in Standard Arabic have optional definiteness agreement on the enumerated noun (e.g. (10), (11) and (12)). Moreover, a certain type of adjectives (construct state adjectives=CSA) in Jordanian Arabic allows optional definiteness agreement on these adjective (e.g. (13) and (14)). The optionality cannot be explained under the second approach. Third, the internal noun 'baal' in (4b) cannot enter into an Agree process to value its [uDEF] feature since this noun is not in a c-command relation with the external noun 'el-zalam' with which is agrees. This problem can only be solved by introducing an extra mechanism like 'feature sharing' as in Danon (2008). Fourth, the outcome of incorporating the noun with the syntactic head D creates the wrong word order [N*D] since heads left-adjoin to heads they incorporate with.

(10) **al**-xamsat-u ʔawlaad-i
DEF-five-$_{NOM}$ boys-$_{GEN}$
'the five boys'

(11) al-xamsat-u al-ʔawlaad-i
DEF-five-NOM DEF-boys-GEN
'the five boys'

(12) xamsat-u **al**-ʔawlaad-i
five-$_{NOM}$ **DEF**-boys-$_{GEN}$
'the five boys'

(13) [$_{DP}$ **el**-zalam [$_{AP}$ [$_{A}$ **el**-tawiil [$_{NP}$ baal]]]]
DEF-man-$_{NOM}$ **DEF**-long patience
'the patient man'

(14) ?[DP el-zalam [AP [A tawiil [NP el-baal]]]]
DEF-man-NOM long DEF-patience
'the patient man'

(15) [$_{DP}$ **el**-zalam [$_{AP}$ [$_{A}$ **el**-tawiil [$_{NP}$ **el**-baal]]]]
DEF-man-$_{NOM}$ **DEF**-long **DEF**-patience
'the patient man'

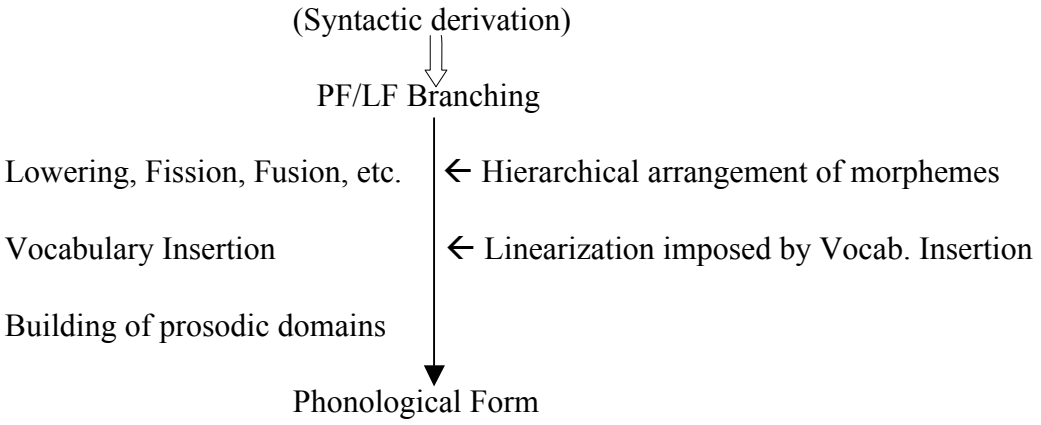
I argue in favor of the third approach. I propose a post-syntactic Agr-Insertion rule that is obligatory for adjectival modifiers, and this explains the presence of the definite marker in examples (8) and (15) on the adjectives 'beautiful' and 'long' respectively. But this Agr-Insertion rule is optional for nominal complements, and this explains how the nominal complements 'boys' and 'patience' carry the definite marker optionally (see contrast between (10) and (11) and between (13) and (15)). I also propose an 'impoverishment' process that optionally deletes the [DEF] feature of the adjectival and nominal head that assigns genitive case to its complement. These heads are the numeral 'five' and the adjective 'long' in examples (12) and (14). This process applies at PF. I show that this explains all the facts of definiteness marking in the CSA and cardinal number constructions in the Arabic examples above. I show that this analysis can avoid the 3 problems mentioned above. We avoid the extra mechanism called feature sharing Agree proposed by Danon (2008) to explain the CSA internal noun valuation of its [uDEF]. We also eliminate optionality of definiteness agreement in CSA and Cardinal number phrases from syntax and move it to PF since optionality is not desirable in the minimalist program. Moreover, it avoids the presence of uninterpretable features in syntax. This simplifies the syntax proper since there is no need to value these features and no need to delete/erase them. Finally, it accounts for the fact that the article is a proclitic without the need to stipulate right incorporation. In my analysis the definite marker simply locally dislocates with the noun at PF in the sense of Embick and Noyer (2001).

3 Proposal: third approach for Arabic

I propose a Distributed Morphology analysis for the realization of the definite marker in Arabic. The definite marker is the realization of the syntactic D head when it appears on NP/CardP heads. But it is a dissociated morpheme inserted at PF (post-syntactic) when it appears on adjectival modifiers (AP heads). Marantz (1992), Halle & Marantz (1993) and Halle (1997) analyze subject-verb agreement in terms of the post-syntactic adjunction of an [Agr] morpheme to T (cf. Embick

(1997) for a detailed discussion of the insertion of dissociated morphemes, and cf. Fuß (2004) for an analysis of complementizer agreement in Germanic in terms of dissociated [Agr] morphemes). Kramer (2010) develops an analysis of definiteness agreement in Amharic as a dissociated Agr-morpheme. (16) shows the order of operations on the PF branch (articulated by Embick and Noyer 2001):

(16) Order of operations on the PF branch.



I propose a post-syntactic Agr-Insertion rule (as in (17)) that is obligatory for adjectival modifiers, and this explains the presence of the definite marker on adjectival modifiers whether single word adjectives (e.g.(19)) or adjectives that take nominal complements (e.g.(20)). This is also consistent with the norm for adjectival modifiers to have agreement in definiteness and phi features. This Agr-Insertion takes place at PF and a dissociated Agr node is inserted to the left of the A node. The [DEF] feature of the closest c-commanding D head is then copied into the Agr node, as in (18) which is illustrated by the trees in example (21).

(17) Agr-Insertion (Obligatory)

A ⟶ [A Agr]

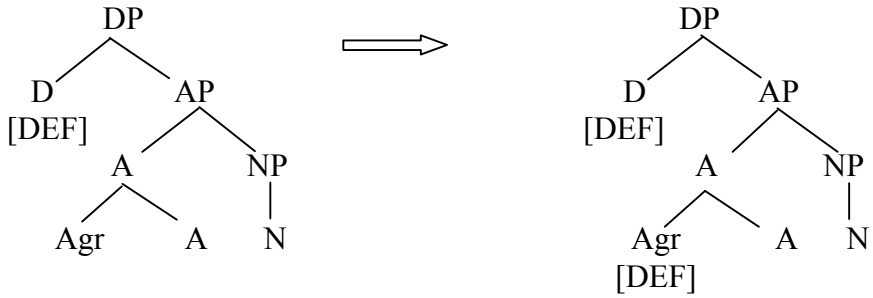
(18) Feature Copying

The [DEF] feature on the closest c-commanding D is copied into the Agr node attached to A.

(19) [$_{DP}$ **al**-bint-u [$_{AP}$ [$_{A}$ *(**al**-)jamil-at-u]
DEF-girl-**NOM** *(**DEF**-)beautiful-**FS –NOM**
'the beautiful girl'

(20) [$_{DP}$ **el**-zalam [$_{AP}$ [$_{A}$ **el**-tawiil [$_{NP}$ baal]]]]
DEF-man-NOM **DEF**-long patience
'the patient man'

(21) a. AGR Insertion b. Feature Copying:



But the Agr-Insertion rule is optional (as in (22)) for nominal complements agreeing with their heads. As with the previous example, the [DEF] feature of the closest c-commanding head is copied into the Agr-node. But here it is that c-commanding head is the D in example (24) and the A in example (25). This explains how in examples (24) and (25) the nominal complements 'boys' and 'patience' carry the definite marker optionally. Example (26) illustrates the optionality of DEF in Nominal complements of numeral phrases, and example (27) shows the optionality of DEF in nominal complements of CSA.

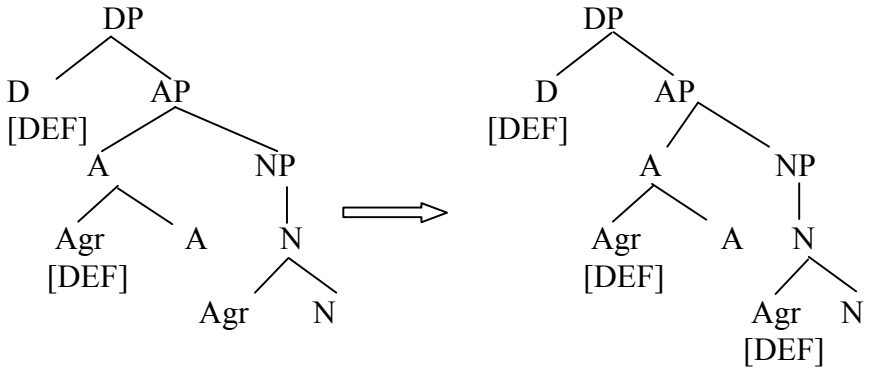
(22) Agr-Insertion (Optional)
N ⟶ [N Agr]

(23) Feature Copying
The [DEF] feature on the closest c-commanding D/A is copied into the Agr node attached to N.

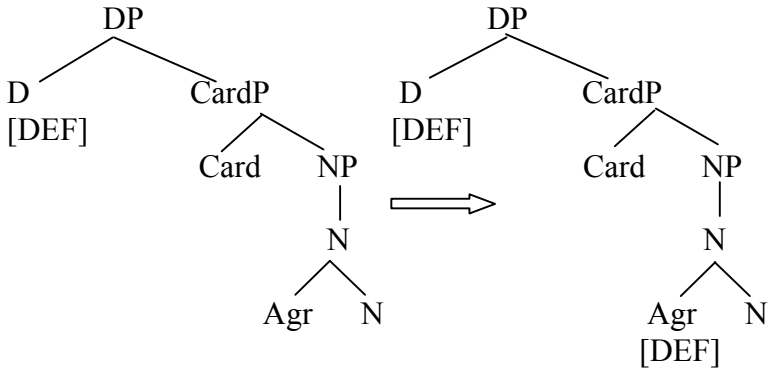
(24) **al**- xamsat-u **(al)-**ʔawlaad-i
DEF-five-NOM (**DEF**)-boys-GEN
'the five boys'

(25) [$_{DP}$ **el**-zalam [$_{AP}$ [$_{A}$ **el**-tawiil [$_{NP}$ **(el)**-baal]]]]
DEF-man-NOM **DEF**-long (**DEF**)-patience
'the patient man'

(26) a. AGR Insertion b. Feature Copying:



(27) a. AGR Insertion b. Feature Copying



Now for (12) and (14) where the [DEF] of the heads D and A is absent, I propose an impoverishment process in the Distributed Morphology (DM)sense. In DM, impoverishment involves the deletion of certain morphosytactic features from morphemes in certain morphological environments (See Embick 2007 on impoverishment in Standard Arabic case system). This deletion process applies at PF and guarantees blocking of Vocabulary Insertion for the deleted morphemes. This process optionally deletes the [DEF] feature of the syntactic head that assigns genitive case to its nominal complement. These heads are the numeral 'five' and the adjective 'long' in examples (12) and (14). So DEF deletion can be stated via an Impoverishment rule in (28):

(28) Impoverishment Rule
DEF → Ø / ------ [adjective]+DEF+[noun]+gen.case
DEF → Ø / ------ [cardinal]+DEF+[noun]+gen.case

It is important to discuss one more CSA example that challenges my analysis and sheds more light on the complex distribution of the definite marker in this construction. Consider example (29) where the nominal complement *el-baal* optionally carries the definite marker despite the fact that the CSA construction has an indefinite interpretation.

(29) [$_{DP}$ zalam [$_{AP}$ [$_{A}$ tawiil [$_{NP}$ **(el)**-baal]]]]
man-$_{NOM}$ long **DEF**-patience
'a patient man'

In this case, one might reasonably conclude that the definite marker carried by the same noun in example (14) is not an instance definiteness agreement. However, I would like to maintain that in example (14) the nominal complement carries [DEF] as an agreement morpheme, but in example (29) the nominal complement carries the generic marker as a marker for nouns which have generic reference. In other words, the marker in example (29) not the realization of a [DEF] feature, but it is merely a generic article homophonous with the definite marker. Consider example (30) where the complement of the verb is a noun that has generic reference and indeed the generic article is optional in Jordanian Arabic.

(30) Ali byudrus (al-)ʔadab
Ali studies (the-)literature
'Ali is studying literature'

Now if the analysis of the article in example (29) as a generic article (rather than an agreement article) is on the right track, one can make the prediction that this article cannot reflect the required definiteness agreement that post-nominal adjectives modifying a definite noun phrase exhibit. This prediction is borne out in Standard Arabic which does not allow the absence of the generic article from nouns which have a generic reference, as in example (31). Because the generic noun always carries the generic article in Standard Arabic, the CSA head has to carry the definite marker to show definiteness concord with the definite noun it modifies in example (32). In other words, the impoverishment process is blocked in example (32) because this example does not have the right environment for deleting the [DEF] morpheme of the CSA adjectival head.

(31) Ali yadrus *(al-)ʔadab
Ali studies *(the-)literature
'Ali is studying literature'

(32) [$_{DP}$ al-bint-u [$_{AP}$[$_{A}$ *(al-)jamilat-u] [$_{DP}$ ***(al-)**wajh-i]]]
the-girl(FS)-NOM *(the-)beautiful(3FS) -NOM ***(the-)**look(MS)-GEN
'The good looking girl'

One might ask why the impoverishment process takes place. One possibility is analogical change. Analogy is a process whereby one form of a language becomes more like another with which it is somehow associated (Campbell & Mixco 2007); Cardinal numbers (e.g., (33)) and adjectival heads of CSA (e.g., (34)) both select genitive nouns and check their genitive case.

(33) [$_{DP}$ bint-un [$_{AP}$[$_{A}$ **jamilat-u**] [$_{DP}$ *(al-)wajh-i]]]
girl(FS)-$_{NOM}$ beautiful-$_{NOM}$ *(the-)look-$_{GEN}$
'A good looking girl'

(34) **al-xamsat-u** (al)-ʔawlaad-i
$_{DEF}$-five-$_{NOM}$ $_{(DEF)}$-boys-$_{GEN}$
'the five boys'

Construct State heads also select genitive nouns, as in (35):

(35) **(*al-)kitaab-u** al-bint-i
(*the)book-$_{NOM}$ the-girl-$_{GEN}$
'the book of the girl'

4 Conclusion

This paper shows that the realization of the definite marker in the Arabic complex noun phrase cannot be explained under the analyses which treat the definite marker as merely the realization of the syntactic head D (the general assumption under the DP-hypothesis) or as a [DEF] feature generated on lexical host through Definiteness Agreement (DA) with (abstract) D (Fassi Fehri 1999). This paper argues in favor of a hybrid analysis (Kramer 2010) where NP determiners realize a [DEF] marked D head, while DA markers for adjectives realize a [DEF] feature added at PF.

Extending and building on Kramer's 2010 analysis, I proposed a post-syntactic Agr-Insertion rule that is obligatory for adjectival modifiers but optional for nominal complements. I also proposed an 'impoverishment' process that optionally deletes the dissociated [DEF] feature of the case assigning heads at the PF linear level. This explains all the facts of definiteness marking in Construct State Adjectives (CSA) and Cardinal Number (CN) constructions.

The analysis in this paper has the following advantages. First, we avoid the extra mechanism called feature sharing Agree proposed by Danon (2008) to explain the CSA internal noun valuation of its [uDEF]. Second, we also eliminate optionality of definiteness agreement in CSA and Cardinal number phrases from syntax and move it to PF since optionality is not desirable in the minimalist program. Third, it avoids the presence of uninterpretable features in syntax. This simplifies the syntax proper since there is no need to value these features and no need to delete/erase them. Fourth, it accounts for the fact that the article is a proclitic without the need to stipulate right incorporation. In my analysis the definite marker can simply locally dislocates with the noun at PF in the sense of Embick and Noyer (2001).

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A Frame-Semantic Approach to Verb-Verb Compound Verbs in Japanese: A Case Study of *V-toru*[*]

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This paper claims a semantic constraint on Japanese $[V1+V2]_V$ compound verbs[1] (henceforth JCVs), such as *osi-taosu* (push-topple) 'topple by pushing', is that V1 and V2 must constitute a coherent *semantic frame*. In order to support this claim, a corpus-based analysis of JCVs with V2 *tor(-u)* 'get/remove' was conducted in the framework of Frame Semantics (Fillmore 1982, 1985, Fillmore & Baker 2010, Goldberg 2010, inter alia). V2 *toru* is a polysemous word, which generally carries two meanings, 'get' (1a) and 'remove' (1b).[2]

(1) a. Jon-wa Biru-kara okane-o damasi-tot-ta
John-TOP Bill-from money-ACC cheat-get-PST
'John cheated Bill out of money.'

b. Jon-wa teeburu-no yogore-o huki-tot-ta
John-TOP table-GEN stain-ACC wipe-remove-PST
'John wiped out a stain on a table.'

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[1] Kageyama (1993) claims Japanese compound verbs can be classified into syntactic compounds and lexical compounds based on their syntactic properties and meaning relation of V1 and V2 (see also Kageyama 2009). The term JCVs used in this study refers to lexical compounds for convenience.

[2] The abbreviations used in this paper are as follows: ACC = accusative; GEN = genitive; HON = honorific; LOC = locative; PART = particle; PST = past; TOP = topic.

This paper asks the following three questions with regard to JCVs with V2 *toru*. First, what are the possible combinations of V1 and V2? Second, what is the semantic relation between the two verbs and how it is determined in a particular compound verb? Third, how is the meaning of V2 selected in a particular compound verb when V2 is polysemous? By examining a total of 65 JCVs with V2 *toru* found in an online database of JCVs, this study argues that there is a necessity to incorporate *encyclopedic knowledge* (see Taylor 1996) into the semantic structure when explaining the construction of meaning in JCVs.

This paper is organized as follows. Section 1 will describe the basic properties of JCVs as well as the problems of the semantic structures utilized by previous studies of JCVs. In Section 2, the framework of this study, Frame Semantics, will be introduced with a focus on the concepts of *semantic frame* and *frame elements*. In Section 3, JCVs with V2 *toru* will be analyzed on the basis of the data found in an online database of JCVs. Finally, Section 4 concludes my discussion.

1 Background

1.1 Basic Properties of Compound Verbs in Japanese

According to Lieber (1992), the least productive compounds in English are those that contain verbs. In contrast, compounds involving verbs are productive and widespread in Japanese (Kageyama 2009:512). For example, an online database of JCVs developed by a project of NINJAL (National Institute for Japanese Language and Linguistics) called "Web-based database of Japanese compound verbs" (http://csd.ninjal.ac.jp/comp/index.php) lists 3,757 JCVs.

A compound verb is a sequence of two verbs formed as one word. V1s in compounds take the Renyookei ('infinitive') form to be combined with V2. In JCVs, V1 and V2 constitute a single morphological word, which can be judged by their "lexical integrity" (see Kageyama 1989, Matsumoto 1996). V1 and V2 in JCVs cannot be separated by particles (**tobi-wa-agaru* 'jump-PART-go.up'), nor can V2 alone be put in an honorific form (**tobi-o-agari-ni-naru* 'jump-HON.go.up'). Additionally, passive and causative morphemes cannot be inserted between V1 and V2; they must be attached to the end of the whole compound. JCVs also possess "compound accent," which indicates that the compounds behave phonologically as a single word. These properties of JCVs distinguish themselves from other V-V sequences like Japanese V-te V complex verbs such as *hasit-te kuru* (run-TE come) 'come running' or serial verb constructions in other languages.

The combinatory possibilities of JCVs are constrained by "the principle of subject sharing," which requires that the most prominent participants (subjects) in the semantic structure of the two verbs be identical in the compound (Matsumoto 1998). Though this constraint captures an important insight into the formation of

JCVs, it is proposed as only a necessary, and not sufficient condition. Thus, Matsumoto (1998) claims that semantic constraints are also required alongside the principle of subject sharing, since the principle of subject sharing alone is too general and says too little. As Matsumoto (1998, 2011) states, JCVs permit only a restricted set of semantic relations between V1 and V2, as shown in (2).

(2) **Semantic relations of JCVs (Matsumoto 2011)**

a. **Coordination**: *naki-sakebu* (cry-scream) 'cry out'
b. **Means**: *osi-akeru* (push-open) 'open by pushing'
c. **Manner**: *korogari-otiru* (roll-fall) 'fall rolling'
d. **Cause**: *aruki-tukareru* (walk-get.tired) 'get tired from walking'
e. **Background**: *mi-nogasu* (see-let.escape) 'let escape one's notice'
f. **Theme event**: *arai-ageru* (wash-complete) 'wash up'

When two verbs with similar meanings are compounded, they form a "coordinate compound." "Means compounds" are those where V1 represents the means by which the causation of change represented by V2 is executed. In a "manner compound," V1 represents the manner in which the process denoted by V2 is performed. In other cases V1 represents the cause by which the process denoted by V2 comes to happen ("cause compounds"). There are also cases where V1 represents the "background" or the "theme event" of V2. Nevertheless, the problem of how we build these semantic relations remains unsolved. To put it another way, in the case of *huki-toru* (wipe-remove) 'remove by wiping', how is the means relationship is selected in this particular compound?

1.2 Previous Semantic Structures

Previous studies of JCVs, such as Kageyama (1996, 1999) and Yumoto (2005, 2008), were mainly conducted utilizing lexical conceptual structure (LCS). For example, *naki-otosu* (cry-persuade) 'persuade someone by crying' is represented in LCS as illustrated in (3) (Yumoto 2011:151).

However, the theory of LCS is deemed to be insufficient, since the semantic structure of LCS itself is too simple to capture the semantic features that determine the possible combinations of JCVs (cf. Yumoto 2011). For instance, the semantic structure of LCS cannot account for the possible patterns of [V1+*tirasu*]$_V$. V2 *tirasu* 'scatter' can be combined with a variety of V1s such as *maku* 'strew', *kuwu* 'eat', *nugu* 'undress', *keru* 'kick', *owu* 'chase', *huku* 'blow', etc. What is the shared semantic feature among these V1s? One possibility is that verbs can be compounded with *tirasu* if they are "verbs of scattering" which entail the result of something being scattered. For example, *maku* 'strew' entails the result of strewn objects being scattered. In this case, the LCS of "verbs of

scattering" can be represented by "[x ACT ON y] CAUSE [y BECOME [y BE [AT SCATTERED]]]."

(3) **Lexical Conceptual Structure**

naki-otosu (cry-persuade) 'persuade someone by crying':

$\underline{[[x_i]\ ACT_{CRY}]}$ +

$[[x'_i]$ ACT ON $[y'_j]]$ CAUSE $[[y'_j]$ BECOME [BE [AT PERSUADED]]]

$[[x_i]$ ACT ON $[y_j]]$ CAUSE $[[y_j]$ BECOME [BE [AT PERSUADED]]]

BY $\underline{[[x_i]\ ACT_{CRY}]}$

Nevertheless, it is unreasonable to say that V1s in other instances of $[V1\text{-}tirasu]_V$ must be "verbs of scattering." The events designated by *kuwu* 'eat', *nugu* 'undress', *keru* 'kick', *owu* 'chase', or *huku* 'blow', do not logically entail the result of being scattered. Scatteredness is merely one of the results that could happen. Furthermore, one needs to possess rich encyclopedic knowledge to produce or interpret these compounds. In the case of *kuwi-tirasu* (eat-scatter) 'scatter the food by eating', one needs to know that when eating something, the food may be scattered. Similarly, one needs to possess the background knowledge, that if you chase someone, they will run away, as in the case of *owi-tirasu* (chase-scatter) 'disperse persons by chasing them'.

Another structure is used by Lieber (2009), who has recently proposed a "skeleton/body model" to analyze Japanese compound verbs. The "skeleton" is comprised of only features that are of relevance to the syntax, while the "body" encodes various perceptual, cultural, and encyclopedic aspects of meaning. Basically, this model is based on various semantic features of the action expressed by the verb.

(4) **The skeleton/body model** (Lieber 2009: 102)

naki-sakebu (cry-scream) 'cry out'

naku 'cry'	*sakebu* 'scream'
[+dynamic ([$_i$])]	[+dynamic ([$_i$])]
<personal>	<personal>
<sound emission>	<sound emission>
{noise caused by pain, sorrow, etc.}	{noise – loud, piercing}

The lexical entries in (4) have three parts: skeleton enclosed in square brackets, body presented in angle brackets, and encyclopedic elements given between curly brackets. Lieber (2009) claims this model to be a finer-grained semantic structure than LCS. For example, in the compound *naki-sakebu* (cry-scream) 'cry out', both *naku* 'cry' and *sakebu* 'scream' have the semantic features of "dynamic" (the positive value corresponding to an event or process), "personal," and "sound emission." Thus, based on the similarity between V1 *naku* and V2 *sakebu*, they can be combined as a coordinate compound. Actually, this approach, based on the similarity between the semantic features of V1 and V2, works well in coordinate compounds. However, this account cannot deal with the formation of other semantic relations such as means compounds or cause compounds. The reason is that it is too difficult to try to find the same semantic features between V1 and V2 in means, cause, or manner compounds. For example, what is the shared semantic feature between V1 *erabu* 'choose' and V2 *toru* 'get' in *erabi-toru*? Maybe one can extract a very abstract semantic feature such as <agentive action>. However, this sort of abstract feature cannot be used to distinguish *erabi-toru* from other combinations such as **nade-toru* (stroke-get/remove). Even though the constituents of **nade-toru* also possess the same feature <agentive action>, they still cannot be combined as a compound verb.

Most importantly, neither of these previous semantic structures can solve the three basic questions in this paper. First, what are the possible combinations of V1 and V2? Second, what is the semantic relation between the two verbs? Third, what criteria does one use to interpret or determine the meaning of a polysemous V2? Previous semantic structures cannot explain these problems because they only contain the information of the action itself, and do not contain the "related events" of an action like typical results, purposes, means, etc.

Consequently, LCS or Lieber's model cannot account for why V1s like *kosuru* 'rub' can be combined with both V2 *toru* 'remove' and *tukeru* 'attach', which respectively carry the opposite meanings, as shown in (5).

(5) a. Taro-wa yogore-o burasi-de kosuri-tot-ta
Taro-TOP dirt-ACC brush-with rub-remove-PST
'Taro removed the dirt with a brush by rubbing.'

b. Taro-wa taoru-ni sekken-o kosuri-tuke-ta
Taro-TOP towel-LOC soap-ACC rub-attach-PST
'Taro applied soap to the towel by rubbing.'

In LCS, V1 *kosuru* cannot entail two opposite results (removing, attaching) at the same time. In Lieber's model, it is unclear whether a verb can possess two opposite semantic features at one time or not. In contrast to the previous semantic structures, this study employs a rich semantic structure called *semantic frame*,

which contains detailed knowledge of a verb's semantics *and* its related events.

2 Frame Semantics

The basic idea of Frame Semantics is that meanings are relativized to scenes or frames (Fillmore 1977:59). A frame is a set of concepts related in such a way that to understand any one of them, you have to understand the whole structure in which it fits (Fillmore 1982:111). Thus, to understand the word *hypotenuse*, one has to understand the whole structure, namely a right-angled triangle (Langacker 1987).

A number of studies in cognitive psychology support this sort of "situated conceptualization" (Barsalou 2003, Yeh & Barsalou 2006, Simons et al. 2008, inter alia). As Yeh & Barsalou (2006:349) claim, concepts are not abstracted out of situations but are situated instead. Feldman (2010:12) also states that concepts are never learned or activated in isolation – concepts we have are richly interrelated. Based on these sorts of related concepts in situation-based semantic structure, we can solve the problems of JCVs mentioned previously.

The approach adopted by Ryder (1994) to examine English noun-noun compounds is basically the same as the frame-semantic approach of this study.

> [W]e can say in order to establish a connection between component structures, it must be possible to establish a correspondence between a schema connected with each of the two structures, as in the two nouns in a noun-noun compound. (Ryder 1994:72)

According to Ryder, a person may construe noun-noun compounds differently based on different schemas that two nouns can share: *tiger-hunter* as a hunter of tigers (based on a shared event schema) or as a hunter who is fierce and voracious (based on shared feature schemas). Ryder uses the term *schema* to refer to the knowledge structure like *frame* or *script*.

In the same vein, Goldberg (2010:39) claims that the only constraint on the combination of events designated by a single verb is that the events must constitute a coherent *semantic frame*.[3] Although this constraint is proposed for single verbs, I claim it can be applied to compound verbs as well (see Chen 2012). In this study, a word sense's semantic frame is what the word "means" or "evokes" under a "background frame" (background situation), which means that the same word will carry different meanings under different background situations. For example, under the background frame Cause_harm, *beat* carries the meaning of 'hit someone to cause damage' as in *John beat Bob with a bat*. In contrast, under the background frame Cause_to_make_noise, *beat* means 'hit a percussion

[3] In addition, according to Goldberg (2010:41), the semantic frame of a verb is a generalized, possibly complex state or event that constitutes a "cultural unit" (cultural representation judging from cultural logic, see Enfield 2002).

instrument to make sound' as in *John beats a drum*. Background frames in this paper are set by referring to Berkeley FrameNet (Fillmore et al. 2003, http://framenet.icsi.edu). FrameNet is a lexical database of English developed by the International Computer Science Institute in Berkeley. FrameNet is based on a semantic network of predefined frames and their *frame elements*.

The frame elements (FEs) stand for those entities or properties which may or must be present in any instance of a given frame (Fillmore & Baker 2010). The frame elements of a verb's semantic frame in this study are the **Essential Event** expressed by the verb, the **Event Participants**, and the **Related Events**.

(6) Frame elements (FEs) of a verb's semantic frame

a. The **Essential Event** expressed by a verb

b. **Event Participants** which may or may not be realized as arguments

c. **Related Events**, such as means, purpose, reason, cause, manner, result, presupposition, co-occurring events, etc.

Table (7) represents the semantic frame of *kosuru* 'rub' under a background frame Removing.

(7) The semantic frame of *kosuru* under the background frame Removing

	kosuru 'rub' Background Frame: Removing
Essential Event	**An [Agent]$_{agt}$ applies pressure and friction to a [Patient]$_{pat}$ on a [Surface]**
Event Participants	**Agent$_{agt}$, Patient$_{pat}$, Surface,** Instrument
Related Events	Purpose (to remove the patient; etc.) Manner (repeatedly; roughly; etc.) Result (the patient removed from the surface; the agent got tired; etc.) Presupposition (the patient sticks to the surface; etc.)

In (7), FEs represented in **boldface** are the core FEs (profile, see Langacker 1987), whereas those FEs that are not in boldface are the peripheral FEs (base). "Essential Event" is represented in the order of "action chain" (Langacker 1991). Inside the square brackets are the entities of the essential events. Entities with subscripts "agt" or "pat" represent the proto-agent and proto-patient respectively (Dowty 1991), which could be utilized to explain the argument realization of JCVs. "Event Participants," which may or may not be realized as arguments, are

the semantic roles that participate in the event. When V1 and V2 are compounded, the event participants will be fused (see Goldberg 1995:50-51). The last section is the "Related Events", which includes the means of causation, the purpose and reason of an agentive action, the cause of a nonagentive action, the manner of a motion/action, the result and presupposition of an action, co-occurring events, etc. Related events are the "typical" means, results, etc., and they are not entailed by the verb (cf. "prototypical outcomes" in Boas 2003).

A semantic frame may change under a different background frame. Thus when the same verb *kosuru* 'rub' under a different background frame Attaching, its semantic frame will be different from the one in (7). For example, the purposes (to attach the patient; etc.) and the results (the patient attached to the surface; etc.) are different from those in the background frame Removing.

By virtue of the encyclopedic knowledge via the notion of semantic frame, each verb carries background information concerning the likely causes and results of the process or the manner/means by which the process may be executed. Consequently, the combinations of V1 and V2 can be restricted and predicted based on the information extractable from the semantic frame.

3 Analysis

In this section, I conduct a case study of compound verbs with V2 *toru* 'get/remove' in a frame-semantic approach. The data of this study is a total of 65 JCVs with V2 *toru* found in the "Web-based database of Japanese compound verbs." V1s compounded with V2 *toru* can be categorized into the following 3 groups based on the interpretation of V2, as judged by the example sentences given in the database.

(8) V1s compounded with V2 *toru* in three interpretations.

a. '**get**'
V1: *utu* 'hit', *semeru* 'attack', *tatakawu* 'fight', *katu* 'win', *ubawu* 'rob', *nusumu* 'steal', *kasumeru* 'filch', *odosu* 'threaten', *yusuru* 'extort', *sebiru* 'pester', *damasu* 'cheat', *kaziru* 'bite', *musaboru* 'covet', *suwu* 'suck', *karu* 'reap', *karu* 'hunt', *kanziru* 'feel', *kagu* 'smell', *kiku* 'listen', *miru* 'see', *yomu* 'read', *kaku* 'write', *manabu* 'learn', *hiku* 'pull', *kumu* 'draw', *tukamu* 'seize', *nuwu* 'sew', *neru* 'sleep', *noru* 'get on', *hakaru* 'measure', *mukaeru* 'meet', *mesu* 'call', *ukeru* 'receive', *utusu* 'copy', *erabu* 'choose', *kawu* 'buy'. (36 in total)

b. '**remove**'
V1: *huku* 'wipe', *nuguwu* 'wipe (tears or sweat)', *haku* 'sweep', *yaku* 'burn'. (4 in total)

c. '**get' or 'remove**'

V1: *kiru* 'cut', *kezuru* 'shave', *sogu* 'chip', *eguru* 'gouge out', *oru* 'break', *yaburu* 'tear', *tigiru* 'tear to pieces', *hagasu* 'tear off', *hagu* 'peel off', *nuku* 'pull out', *musiru* 'pluck', *mogu* 'wrench', *tumu* 'pick', *kosu* 'filter', *kosuru* 'rub', *siboru* 'squeeze', *sukuwu* 'scoop', *suru* 'graze', *daku* 'embrace', *nameru* 'lick', *horu* 'dig', *maku* 'roll', *kaku* 'scratch', *karamu* 'entwine', *utusu* 'move'. (25 in total)

The three basic problems in this paper can be solved by means of semantic frame. First, we can explain the possible combinations of V1 and V2 by the "semantic link(s)." When the semantic frames of V1 and V2 can establish semantic link(s) between each other, and there exists no inconsistency among all frame elements, V1 and V2 can constitute a coherent semantic frame of [V1+V2]v.[4] Take *nusumi-toru* (steal-get) 'get by stealing' as an example. Table (9) shows the semantic frames of V1 *nusumu* 'steal' and V2 *toru* 'get'.

(9) Semantic links between V1 *nusumu* 'steal' and V2 *toru* 'get'[5]

	V1 *nusumu* 'steal' Background Frame: Theft	V2 *toru* 'get' Background Frame: Getting
Essential Event	**A [Perpetrator]$_{agt}$ takes [Goods]$_{pat}$ from a [Victim]/[Source]**	**A [Recipient]$_{agt}$ starts off without the [Theme]$_{pat}$ in their possession, and then comes to possess it**
Event Participants	**Perpetrator$_{agt}$, Goods$_{pat}$, Victim/Source,** Instrument	**Recipient$_{agt}$, Theme$_{pat}$,** Source
Related Events	Purpose (to get the goods; etc.) Means (by sneaking into; etc.) Manner (swiftly; etc.) Result (the perpetrator gets the goods; caught by police; etc.)	Purpose (to possess the theme; etc.) Means (by stealing; by robbing etc.) Manner (swiftly; etc.) Result (the recipient obtains the theme; etc.)

In (9), the background frame of *toru* is Getting, thus *toru* will be interpreted as 'get'. In this case, one of the related events of V2 *toru*, "Means," contains the information of "by stealing." This information can build a semantic link with the

[4] To constitute a coherent semantic frame, the semantic links must be restricted to the particular semantic relations as (2) shows. For example, even if V1 *toru* 'get' and V2 *nusumu* 'steal' can establish semantic links such as "V1: purpose–V2: means," they still cannot constitute a coherent semantic frame. That is why **tori-nusumu* (get-steal) does not exist.

[5] The shading and the border of the frame elements represent the semantic links (resemblance).

essential event of V1 *nusumu* 'steal' based on their semantic resemblance. Similarly, the purpose of V1 is "to get the goods," which can build another semantic link with the essential event of V2. It is these semantic links that make a semantic frame of a compound coherent.

Regarding the second question, an appropriate semantic relation of V1 and V2 is selected by the semantic links as well. Based on the semantic links, we know that V1 is the Means of V2, and V2 is the Purpose of V1; therefore, this compound would be interpreted as a "means compound" (V1: means–V2: purpose).

As to the third question, we interpret or determine the meaning of a polysemous V2 by establishing coherent semantic links. As (10) shows, when the background frame of V2 *toru* is Removing, V1 *nusumu* 'steal' and V2 *toru* 'remove' cannot build the semantic links as in (9). Therefore, when combined with V1 *nusumu* 'steal', V2 *toru* can only be interpreted as 'get'. This is how a particular meaning of *toru* is selected for a particular compound.

(10) Semantic frames of V1 *nusumu* 'steal' and V2 *toru* 'remove'

	V1 *nusumu* 'steal' Background Frame: Theft	V2 *toru* 'remove' Background Frame: Removing
Essential Event	**A [Perpetrator]$_{agt}$ takes [Goods]$_{pat}$ from a [Victim]/[Source]**	**An [Agent]$_{agt}$ causes a [Theme]$_{pat}$ to move away from a [Source]**
Event Participants	**Perpetrator$_{agt}$, Goods$_{pat}$, Victim/Source,** Instrument	**Agent$_{agt}$, Theme$_{pat}$, Source,** Goal
Related Events	Purpose (to get the goods; etc.) Means (by sneaking into; etc.) Manner (swiftly; etc.) Result (the perpetrator gets the goods; caught by police; etc.)	Purpose (to remove the theme) Means (by washing; by wiping; etc.) Manner (efficiently; etc.) Result (the source became clean; etc.)

As mentioned earlier in Section 1.2, there is a problematic example in regards to the verb *kosuru* 'rub' since it can be combined with V2 *toru* 'remove' or *tukeru* 'attach', which respectively carry the opposite meanings. However, now we can solve this problem by semantic frames. Based on the different background frames (Removing or Attaching), the Purposes of V1 *kosuru* 'rub' are different ("to remove the patient" or "to attach the patient"). Also, both V2 *toru* 'remove' and *tukeru* 'attach' have the Means "by rubbing." Therefore, V1 *kosuru* can be combined with V2 *toru* or *tukeru* based on the different semantic links. Table (11) shows the semantic links between V1 *kosuru* and V2 *toru* under the background

frame Removing.

(11) Semantic links between V1 *kosuru* 'rub' and V2 *toru* 'remove'

	V1 *kosuru* 'rub' Background Frame: Removing	V2 *toru* 'remove' Background Frame: Removing
Essential Event	**An [Agent]$_{agt}$ applies pressure and friction to a [Patient]$_{pat}$ on a [Surface]**	**An [Agent]$_{agt}$ causes a [Theme]$_{pat}$ to move away from a [Source]**
Event Participants	**Agent$_{agt}$, Patient$_{pat}$, Surface,** Instrument	**Agent$_{agt}$, Theme$_{pat}$, Source,** Goal
Related Events	Purpose (to remove the patient; etc.) Manner (repeatedly; etc.) Result (the patient removed from the surface; etc.)	Purpose (to remove the theme) Means (by rubbing; etc.) Manner (repeatedly; etc.) Result (the theme no longer exists in the source)

Under a different background frame Attaching, the semantic links between V1 *kosuru* and V2 *tukeru* will be like the ones shown in (12).

(12) Semantic links between V1 *kosuru* 'rub' and V2 *tukeru* 'attach'

	V1 *kosuru* 'rub' Background Frame: Attaching	V2 *tukeru* 'attach' Background Frame: Attaching
Essential Event	**An [Agent]$_{agt}$ applies pressure and friction to a [Patient]$_{pat}$ on a [Surface]**	**An [Agent]$_{agt}$ attaches an [Item]$_{pat}$ to a [Goal]**
Event Participants	**Agent$_{agt}$, Patient$_{pat}$, Surface,** Instrument	**Agent$_{agt}$, Item$_{pat}$, Goal,** Connector
Related Events	Purpose (to attach the patient; etc.) Manner (repeatedly; etc.) Result (the patient attached to the surface; etc.)	Means (by rubbing; by painting; etc.) Manner (repeatedly; etc.) Result (the item attached to the goal)

Let us now return to the classification of V2 *toru* in (8). With the third group of verbs in (8), V2 *toru* can be interpreted as 'get' or 'remove' depending on their background situations. Therefore, the same verb *nuki-toru* (pull-get/remove) will be interpreted as 'get by pulling' in the context such as "mushroom hunting," whereas in the context like "weeding" it will be interpreted as 'remove by pulling'. This alternation of meaning is due to that the different contexts evokes different background frames (e.g. Getting or Removing), thus the meaning of V2 *toru* would be determined under the evoked background frame.

Moreover, compounds such as *ne-toru* (sleep-get) requires one to possess rich sociocultural knowledge to understand its meaning 'steal someone else's partner by sleeping with her/him'. Besides, *ne-toru* is a good example to show that in order to explain the construction of meaning in compound verbs, we need the concept of Event Participants which may not be realized as arguments. V1 *neru* 'sleep' is an intransitive verb which does not take an object, and the subject of V1 *neru* will be identified with the subject of V2 *toru*. Thus, the object of V2 *toru* (here the theme of getting) is not an argument of V1 *neru* 'sleep'. However, the object of V2 *toru* must participate in the event designated by V1 *neru* as an event participant (Partner_2), since one cannot get someone else's partner by sleeping himself/herself. In such cases, the LCS used by Kageyama and Yumoto cannot account for the meaning construction of compounds, since it only contains the information of arguments, whereas semantic frames consisting of frame elements include event participants which may not be realized as arguments.

(13) Semantic links between V1 *neru* 'sleep' and V2 *toru* 'get'

	V1 *neru* 'sleep' Background Frame: Personal_relationship	V2 *toru* 'get' Background Frame: Getting
Essential Event	**[Partner_1]$_{agt}$ has a sexual relationship with [Partner_2]$_{pat}$**	**A [Recipient]$_{agt}$ starts off without the [Theme]$_{pat}$ in their possession, and then comes to possess it**
Event Participants	**Partner_1$_{agt}$, Partner_2$_{pat}$,** Time, Place	**Recipient$_{agt}$, Theme$_{pat}$,** Source
Related Events	Purpose (to get someone else's partner) Manner (secretly; etc.) Result (the agent gets someone else's partner)	Purpose (to possess the theme) Means (by sleeping with him/her; etc.) Manner (secretly; etc.) Result (the recipient gets the theme)

4 Conclusion

In this paper, I have shown that in order to elucidate the meaning construction of JCVs, a rich semantic structure like *semantic frame* is required. By looking into JCVs with V2 *toru*, this study suggests that the meaning of a verb is not activated in isolation. Instead, a verb has richly related concepts. By virtue of such related concepts, we can establish semantic links between V1 and V2, which thus constitute the coherent semantic frame of $[V1+V2]_V$.

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A Frame-Semantic Approach to Japanese Compound Verbs

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An Optimal Construction Morphology Approach to Augment Consonants in Kannada[1]

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Introduction

The current paper provides an analysis of optimal consonant augment selection in the South Dravidian language Kannada, which is primarily spoken in the south-east Indian state of Karnataka. Augment consonants (hereafter ACs)[2] in Kannada appear between the stem and suffix in certain phonotactic environments. Of all ACs, a subset is constrained in terms of the phonotactic environment in which they may occur. They apply to both derivational and inflectional morphology, particularly (but not exclusively) of nouns, the latter of which will be the sole focus of the current analysis. The nouns in (1) illustrate consonant augments in case morphology:

(1) *hudugi*	'girl'	*hudugi-l-inda*	'from the girl'
		hudugi-y-inda	
		**hudugi-n-inda*	
huDuga	'boy'	*huḍuga-n-a*	'of the boy'
		**huḍuga-l-a*	
caa	'tea'	*caa-d-aage*	'to the tea'
		**caa-n-aage*	

[1] I would like to thank audience members of BLS 39 who provided feedback, as well as Sharon Inkelas for her guidance throughout the development of this project from its inception. Additional thanks to Larry Hyman and Eve Sweetser for their helpful comments. I would also like to thank my consultant Vidwath.

[2] Augment consonants are also known as epenthetic consonants. I retain the term 'augment' here in order to remain consistant with how it is referred to in Kannada grammars.

Usually, the augments are considered an initial segment of the following suffix (Chisum 1975 and Hiremath 1961). However, I propose that they must be analyzed independently of inflectional or derivational suffixes, a practice which also results in a reduction of the amount of allomorphy in the language. I will provide a constraint-based semantic account of augment selection as I explain why the starred items in (1) are ungrammatical. The analysis is carried out in the framework of Optimal Construction Morphology (OCM) (Caballero and Inkelas, to appear, hereafter C&I), and concludes that the emergence of augments in the first place is explained as an optimal word-formation mechanism. In Kannada, stems achieving word status via inflection cannot do so purely by bare suffixation, and augments are inserted so as to avoid vowel hiatus and to observe syllable coda requirements. However, in addition to these expected phonotactic constraints, there are also semantic motivations for augment selection. Namely, this paper argues that Kannada has come to take advantage of these existing mechanisms of phonological well-formedness in order to encode semantic features in what was once an empty morph. When comparing the augment inventory of Kannada and its morphological and semantic behavior with analogous morphemes in Malayalam, I also illustrate that a) a progression from an originally vacuous to a meaningful augment may have occurred fairly recently, and b) due to the availability of such a semantically contentful slot, the inventory of augments in Kannada has subsequently diversified relative to that in Malayalam. It did so in order to accommodate the rich semantic distinctions for which the augment is now used.

Like Kannada, Malayalam also observes the phenomenon of insertion of a glide in order to avoid vowel hiatus after suffixation: -*y*- after a stem ending in front vowels /i, e/, and -*v*- after those ending in back vowels /a, u/ (Mohanan 1986, Asher and Kumari 1997, Krishnamurti 2003). However, Kannada has taken this phenomenon beyond pure phonological necessity. Thus, I propose that while Kannada follows Dravidian languages in developing this augmental consonant to observe phonotactic constraints, it has come to use these augments as an encoding site for semantic information. The OCM framework, which has been applied by C &I to explain how multiple exponence falls out naturally from wordhood building towards a target meaning, is extended in this paper to showing that Kannada empty morphs acquire functionality. Once they serve their purpose in advancing a stem towards wordhood, morphological items, as much as possible, take on a semantic value.

1 Language Background

The morphosyntactic facts about Kannada that are most relevant to this augment-insertion phenomenon are the gender-agreement system and the nominal case inflection system. First, Kannada does not have systematic grammatical gender-marking on nouns, whereby each noun would fall in a grammatical gender catego-

ry (as is the case with Bantu and many European languages) but it has strategies for distinguishing animate from inanimate referents, and feminine from masculine human referents, a phenomenon called natural gender (Hiremath 1961) or 'rational' gender (Schiffman 1979). Among human referents, nouns underlyingly ending in *-a* can either be masculine or feminine, and those ending in *-i* are usually feminine. Verb agreement paradigms provide inflectional forms reflective of this natural gender:

(2) a.	*aane-y-uu*	*maahuta-n-uu*	*band-a**r**-u*
	elephant-AUG-CONJ	rider-AUG-CONJ	came-3pl.hum
	"The elephant and its rider came."		
	maahuta-n-uu	*aane-y-uu*	*band-a**v**-u*
	rider-AUG-CONJ	elephant-AUG-CONJ	came-3pl.non-hum
	"The rider and his elephant came."		

(from Sridhar 1990:246)

(2) b.	*bart-aane*	'he comes'
	bart-aa[e	'she comes'
	bar-atte (*bart+d*)	'it comes'

(from Schiffman 1979:56)

In (2a), the inflectional plural forms -a*r*- and -a*v*- are in agreement with the natural gender of 'elephant' (non-human) and 'rider' (human), respectively[3], but there is no morphology on the noun itself triggering this agreement other than the natural gender of the noun. In (2b) we see a verbal agreement paradigm for masculine, feminine and neuter (non-human) gender.

A second important aspect of Kannada is the role of the epenthetic vowel, as it contributes to word-formation, much as augments do. Uttered in isolation, all words must end in a vowel, and therefore those stems that are underlyingly consonant-final receive an epenthetic vowel. So, *kaal-* 'foot' becomes *kaal-u*, but *magu* 'child' is underlyingly vowel-final. Augment insertion patterns and suffixation help illustrate that *magu* is a stem or word while *kaal-u* is a derived word, as in (3):

[3] This data is in fact showing that agreement with coordinated nouns follows the most immediate noun; in this case, the human plural is used because the human-denoting noun is closest to the verb and the non-human plural is used when 'elephant' is closest to the verb.

(3) Case paradigms for Kannada nouns

	'man'	**'grass'**	**'criticism'**	**'girl'**	**'boy'**
Nom.	*gaŋɖas-u*	*hull-u*	*ʈikaa*	*huɖugi*	*huɖuga*
Acc.	*gaŋɖas-na*	*hul-na*	*ʈikaa-na*	*huɖugi-na*	*huɖuga-na*
Abl.	*gaŋɖas-**in**-inda*	*hull-**in**-inda*	*ʈikaa-**d**-inda*	*huɖugi-**ɭ**-inda* *huɖugi-**y**-inda*	*huɖuga-**n**-inda*
Dat.	*gaŋɖas-ge*	*hull-ige*	*ʈikaa-kke*	*huɖugi-ge*	*huɖuga-ge*
Gen.	*gaŋɖas-**in**-a*	*hull-**in**-a*	*ʈikaa-**d**-a*	*huɖugi-**ɭ**-a* *huɖugi-**y**-a*	*huɖuga-**n**-a*
Loc.	*gaŋɖas-**in**-alli*	*hull-**in**-alli*	*ʈikaa-**d**-alli*	*huɖugi-**ɭ**-alli* *huɖugi-**y**-alli*	*huɖuga-**n**-alli*

	'child'	***'one'***	***'cow'***	***'road'***	***'foot'***
Nom.	*magu*	*ond-u*	*asu*	*daari*	*kaal-u*
Acc.	*magu-**v**-anna*	*ond-**r**-anna*	*asu-**v**-anna*	*daari-**y**-anna*	*kaal-anna*
Abl.	*magu-**v**-inda*	*ond-**r**-inda*	*asu-**v**-inda*	*daari-**y**-inda*	*kaal-**in**-inda*
Dat.	*magu-**v**-ige*	*ond-**r**-ige*	*asu-**v**-ige*	*daari-(**y**)-(i)ge*	*kaal-ige*
Gen.	*magu-**v**-a*	*ond-**r**-a*	*asu-**v**-in-a*	*daari-**y**-a*	*kaal-**in**-a*
Loc.	*magu-**v**-alli*	*ond-**r**-alli*	*asu-**v**-in-alli*	*daari-**y**-alli*	*kaal-**in**-alli*

For instance, we know that *hul* 'grass' is underlyingly consonant-final because the /u/ is not retained when augments or other suffixes are added. On the other hand, *asu* 'cow' is a stem to which suffixes attach. The epenthetic vowel, thus, creates words out of stems, and this is the epenthetic vowel's only morphological function (Tirumalesh 1991). When case suffixes (which are all vowel-initial) combine with stems, the epenthetic vowel is not inserted, although it would be in some derivational processes where suffixes need to combine with words (as the gerunds in (4) below do).

ACs surface at other stem edges not involved in case suffixation, and therefore maintain a stable phonological basis uniformly throughout the language and are not a phenomenon exclusive to case morphology.

(4) Noun-noun derivation:

sere	'custody'	*sere-y-aaɭu*	'captive'
otte	'pawn'	*otte-y-aaɭu*	'hostage'

Verb-gerund derivation:

hoog-u	'go'	*hoog-u-v-ike*	'going'
ood-u	'read'	*ood-u-v-ike*	reading'

Here in (4) we see augments combining with words in two different forms: words that are underlyingly vowel-final and words that are vowel-final after epenthesis. As I proceed to discuss the distribution of ACs, their combinatorial properties will be elaborated beyond the basic -*y*- and -*v*- glide augments.

2 Optimal Construction Morphology

To show how Kannada takes advantage of phonological conditions in order to encode more semantics, I will use the framework of Optimal Construction Morphology developed by C&I. My analysis shows that, assuming an OCM perspective, the semantically vacuous augment developed as a skipping-stone towards wordhood. It did not remain this way for long, instead developing as an encoding site for useful semantic information that the language otherwise has no mechanism for encoding in certain high-frequency paradigms (such as pronouns): namely, information pertaining to gender and animacy. Subsequently, this spread unevenly to other nouns in (only subsets of) the case paradigm. The approach in this paper depends in particular on one main premise of OCM: that "semantically vacuous layers of morphology can be optimal if and only if they make a contribution to structural well-formedness, e.g., by producing stems that meet phonological requirements or which advance a form along the wordhood scale (ibid:13)." This paper will use an OCM-based realizational approach to the building of case-marked nouns in Kannada while also considering the relative ranking of phonological and morphological constraints to stem-building. Furthermore, using the principles of realizational morphology (Stump 2001) and the concept of cophonologies applying at different levels (Anttila 2002), I also propose that before words are formed, constructions are selected from an internally organized constructional hierarchy of augments to incrementally build optimal structures.

3 Kannada Consonant Augments

3.1 Description

ACs found in Kannada nominal inflection are summarized in (5):

(5) Kannada augmental consonants

	BASE ENDING:	INPUT CONSTRAINT:	SEMANTIC CONSTRAINT:	THE FOLLOWING SUFFIX:
-v-	u, -a	word	---	all cases, plural suffix, clitics
-y-	-i, -e	word	---	all cases, plural suffix, clitics
-r-	CC	stem	---	all cases, plural suffix, clitics
-in-	C	stem	---	abl, loc, gen
-n-	V	word	masculine	abl, loc, gen
-ḷ-	V	word	feminine	abl, loc, gen
-d-	V	word	non-human	abl, loc, gen

Nominative: --- Accusative: -(*an)na* Dative: -*(aa/i)ge*
Ablative: -*inda* Locative: -*alli* Genitive: -*a*

As (5) shows, four of the seven ACs have phonologically predictable behavior: -

v- comes after stems ending in back vowels, -*y*- after stems ending in front vowels, and -*r*- and -*in*- after stems ending in geminate consonants or consonants. By definition, morphological units ending in consonants are stems and those ending in vowels are words. For stems ending in consonants, the attachment of ACs does not achieve wordhood but simply brings the stem closer to wordhood. The wordhood scale, adapted from I&C and based on previous scales from lexical phonology and morphology (Kiparsky 1982, Selkirk 1982, and others), is a scale that places roots, stems and words, in that order, along a scale of morphological development where each landmark point on the scale affords that item a special status in morphological and syntactic processes.

The ACs whose behavior is not phonologically predictable are the last three: -*n*-, -*l*-, and -*d*-. First, along with -*in*- these have constraints as to what inflectional morphology they can occur with. Namely, they occur before a subset of case inflections: ablative, locative and genitive. Second, these three ACs, as I will show, are sensitive to the natural gender and humanness of the noun.

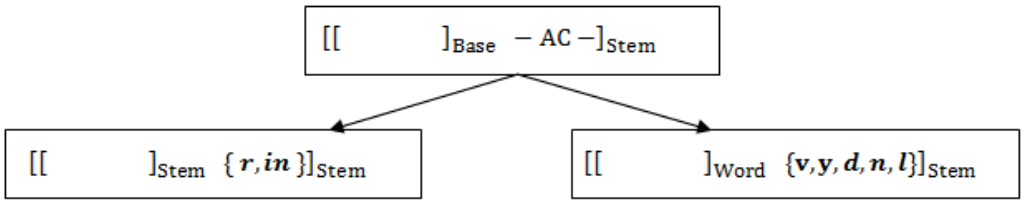
The distribution of augments, and the asymmetry they display across cases and across noun classes sets us up nicely for a meaning-driven OCM approach to word-building, which retains the assumptions of realizational approaches to morphology (Xu & Aronoff 2011). Specifically, upon dipping into the lexicon in order to build the next layer of a stem, AC constructions make themselves available to fulfill some semantic or morphosyntactic property or properties that the target meaning may need represented. They do so while first respecting phonological constraints and while operating within their respective cophonological domains. While a P>>M ordering of constraints is observed by default (appearing in the form of a stem shape and size constraint, vowel hiatus avoidance, and vowel feature conditioning on the stem), subsequent constraints on augment positioning and augment choice are determined by finer-grained cophonological structures, which I will explore in detail in the next section.

3.2 Cophonologies and Constructions

The availability of several phonologically different ACs for the same slot points to the reality of structured cophonologies in Kannada. Cophonologies are phonological functions holding between more and less schematic morphological constructions in a construction (Inkelas et al. 1994, Inkelas and Orgun 1995, Orgun 1996). Cophonologies arise from a theory that assumes a constructional organization of the lexicon (Booij 2010), which posits that the lexicon consists of a structured network of form-meaning pairings (constructions). Meaning compositionality is achieved through unification and constructions are related to each other via the principle of inheritance. A schematic construction sets the ordering and type constraints on morphology, while cophonologies instantiate particular subconstructions or constructs. Therefore, in Kannada there is a general noun for-

mation morphological construction that unifies with some base form and creates a stem to which case suffixes can attach:

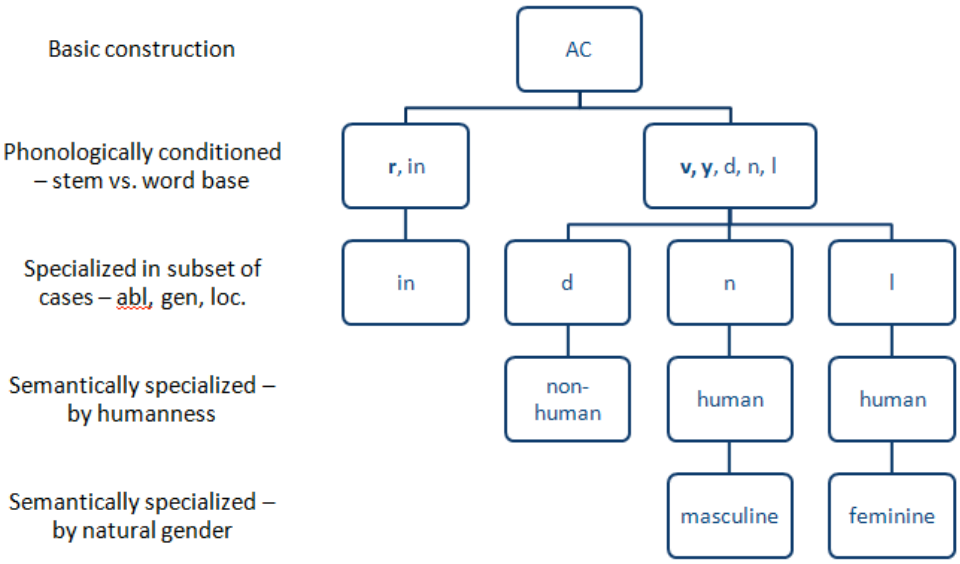
(6) General stem-building construction for Kannada nouns



This in turn has two sub-constructions: one for which the base is necessarily a stem and one for which the base is necessarily a word. Each of these two sub-constructions has several cophonologies available to them: -*r*- and -*in*- for stem bases and -*v*-, -*d*-, -*n*-, -*l*-, and -*y*- for word bases. Thus, in the realizational approach taken here, these are distinct cophonologies rather than distinct allomorphs. This distinction is a phonologically-motivated one: whether the base is a stem or a word makes a difference to the syllabic well-formedness of the resulting word given the phonological shape of the augment.

From these two basic AC sub-constructions, distinguished only by phonological constraints, cophonologies are selected according to three additional ordered criteria: 1) that the AC be limited to ablative, locative or genitive cases, 2) humaness, and 3) natural gender (feminine or masculine). Their hierarchical ordering in the constructional lattice is illustrated in (7):

(7) Constructional layers and their cophonologies



According to the constructional lattice in (7), then, any given noun has at its disposal several paths when pursuing wordhood: the cophonology most specialized to it, and also every cophonology set above that level (i.e., more schematic and less specified for semantic, grammatical, or phonological constraints on the construct). For instance, looking at the paradigms in (3) we see that this generally works for nouns such as *huḍugi* 'girl.' This noun can have two AC forms available to it, given that the case constraint is observed. It is a noun referring to a feminine referent, so the most informative AC is *-l-*; but it also has *-y-* available to it, because, while not semantically specific, it is still upstream from *-l-* in the constructional lattice, and unlike *-v-* does not violate phonotactic constraints in matching vowel [-back] feature. On the other hand, *-d-* and *-n-* are not available because they are competing cophonologies at the same level, and these are specialized to other genders. Every noun in (3) can be run through the constructional lattice in (7), and they all respect this hierarchy.[4]

3.3 Optimally-built Words

In this section I will demonstrate, using OT tableaus in the OCM framework, how case-marked nouns in Kannada are built incrementally. Each tableau below represents one dip into the construction, whereby each constructional level treats each previous constructional level as the base. With each 'dip' there is a meaning target, and candidates are subject to only two ranked constraints: 1) that the resulting stem be formed with a stem or a word as a base, according to the requirements of a particular AC, and 2) that the resulting construct be a stem.[5]

In (8), we are building the noun 'foot' with an ablative case suffix and with the meaning "from the foot." At this juncture in the constructional process the word does not mean anything beyond the core meaning of the root, but has only fulfilled one step in word-building. Candidates a, b, d, e, and f are eliminated because they require words as a base. Candidate h is eliminated because it has already reached wordhood and case cannot attach. There are three remaining candidates, c, g, and the identity candidate, that go on to round two.

Only one of the three remaining candidates crashes completely, and this is because it violates phonotactic constraints, which, according to P>>M, are always most highly ranked. It fails in both not having a CC-final base, as *-r-* usually expects, and also in producing a liquid cluster. The identity candidate is not completely eliminated, but is less preferred by not poviding the speaker with the most

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[4] Where logically possible alternative forms are not represented in (3), as they were for *huɩugi*, it is simply because they were not explicitly elicited from the speaker, and not because they are not possible. The current proposal predicts that they would be possible, (for instance, *-v-* for *huɩuga* 'boy') and future additional elicitations should support this.

[5] There are certainly more constraints involved, as evident in Figure 2, but for the sake of simplicity they are not included here. They may show up when breaking a tie between candidates, as in Figure 4.

specific construction available to him, which is that provided by candidate a.

(8) Building FOOT-ABL, first dip

	kaal 'foot'	M: FOOT	STEM-AS-BASE	BE STEM
a.	-v-	kaal]-v]-[6]	*!	
b.	-y-	kaal]-y]-	*!	
☞c.	-in-	kaal]-in]-		
d.	-l-	kaal]-l]-	*!	
e.	-n-	kaal]-n]-	*!	
f.	-d-	kaal]-d]-	*!	
☞g.	-r-	kaal]-r]-		
h.	-u	kaal]-u]		*!
☞i.		kaal]-		

(9) Building FOOT-ABL, second dip

	kaal 'foot'	M: FOOT-ABL.	*LR STEM-CC	OBL.-CASE	MAX-IO
☞a.	-in]-inda	kaal]-in]-inda			*
b.	-r]-inda	kaal]-r]-inda	*!		
☞c.		kaal]-inda		*	

The tableaus in (10) and (11) provide a second example, this time with *huḍugi* 'girl.'

(10) Building girl-gen, first dip

	huḍugi 'girl'	M: GIRL	STEM-[αback]	WORD-AS-BASE	BE-STEM
a.	-v]-	huDugi}-v]-	*!		
☞b.	-y]-	huDugi}-y]-			
☞c.	-d]-	huDugi}-d]-			
☞d.	-l]-	huDugi}-l]-			
☞e.	-n]-	huDugi}-n]-			
f.	-in]-	huDugi}-in]-		*	
g.	-r]-	huDugi}-r]-		*	
h.	-u}	huDugi}-u}			*
☞i.		huDugi}			

Here there is a local competition between a and b relative to the vowel feature matching constraint. Otherwise, in addition to the winner b, there are multiple other winners, including the identity candidate, which together are the sole candi-

[6] Curly brackets represent word edges, while square brackets represent stem edges.

dates that make it to the second dip:

(11) Building girl-GEN, second dip

	huḍugi 'girl'	M: GIRL-GEN	*VOWEL-HIATUS	MATCH-GENDER	MATCH-HMN	OBL-CASE
☞a.	-y]-a[7]	huDugi}-y]-a				*
b.	-d]-a	huDugi}-d]-a			*!	
☞c.	-l]-a	huDugi}-l]-a				
d.	-n]-a	huDugi}-n]-a		*!		
e.		huDugi}-a	*!			

The identity candidate e is eliminated due to violating a highly ranked P constraint. The remaining constraints are semantic, and they are ranked in an order matching that of the constructional lattice in (10): gender distinctions are most specific, followed by humanness, and lastly the case subset constraint. Candidate b crashes by failing to match humanness, while d crashes by failing to match gender. The last remaining candidates, a and c, are both available to the speaker, although c is more preferred due not violating any constraints. Candidate a survives because -*v*- is available upstream in the constructional lattice, and thus continues to be a viable, albeit less semantically informative variant.

4 Implications

The questions must now be asked: why these particular alloconstructions cophonologies and not others? And why should such diversity in ACs be available in Kannada? To address these questions, I provide a comparison with an analogous phenomenon in a closely-related language, Malayalam. As part of its AC inventory, Malayalam has only -*v*-, -*y*- and -*in*- (12).

(12) Augmental consonants in Malayalam (data from Asher & Kumari 1997:192):[8]

kuru	'seed'	*kuru-**v**-um*	'also the seed'
puu	'flower'	*puu-**v**-um*	'also the flower'
fooʈʈoo	'photo'	*fooʈʈoo-**v**-il*	'in the photo'
kuʈʈi	'child'	*kuʈʈi-**y**-um*	'also the child'

[7] The most specific semantic specifications for each of the candidate formants are:

-*y*-	no semantics	-*d*-	non-human
-*l*-	human feminine	-*n*-	human masculine

[8] In Malayalam -*n*- and -*l*- are available as gender markers, and are lexicalized as part of the noun in some cases. For instance, the pre-case stem for 'son' is *maka**n*** and for daughter is *maka**l***. However, these do not appear as ACs.

tii	'fire'	*tii-**y**-il*	'in the fire'
iviṭe	'here'	*iviṭe-**y**-um*	'also here'
caaya	'tea'	*caaya-**y**-um*	'also the tea'
viiṭ	'house'	*viiṭ-**in**-re*	'of the house'
coor	'rice'	*coor-**in**-re*	'of the rice'

The phonotactic constraints on their distribution are nearly identical to those in Kannada. There is a difference in the stem vowel between the two languages, with -*v*- being restricted to /u/, probably on the basis of shared labiality, while in Kannada -v- follows all back vowels. However, as (13) summarizes, Kannada has a much larger inventory of ACs, one that includes some ACs with identical phonotactic constraints.

(13) Comparison of Malayalam and Kannada AC inventories

Malayalam Inventory			Kannada Equivalent		
AFTER	AC	BASE	AFTER	AC	BASE
u-	-v-	stem	u-, a-	-v-	word
a-, i-, e-	-y-	stem	i-, e-	-y-	word
C	-in-	stem	C	-in-	stem
			CC	-r-	stem
			V	-l-	word
			V	-n-	word
			V	-d-	word

On the basis of this comparison, I propose that cross-linguistically in the linguistic region, ACs started as empty morphs but specialized as contentful (non-empty) morphs in Kannada. When an empty morph acquires meaning, it becomes more like a genuine construction: a form-meaning pairing with conventional use as well as unification constraints on combining with other constructions (such as case-marking) (Goldberg 1995, Booij 2010). To aid in its endeavor to become a bona fide construction, the noun formation construction recruited phonological forms from morphemes in the verb agreement paradigm and from gender marking present elsewhere in the language. We saw, for instance, in example (2b) that verb agreement takes an -*al*- suffix for agreement with nouns denoting feminine entities, and -*an*- for agreement with nouns denoting masculine entities. Furthermore, the pronominal paradigm in Kannada is revealing of the origins of these ACs as well:

(14) Pronominal paradigm in Kannada

	1sg	1pl	2sg	2pl
Nom	*n-aa**n**-u*	*n-aa-v-u*	*n-ii**n**-u*	*n-ii-v-u*
Acc	*n-a**nn**-ann-u*	*n-amm-ann-u*	*n-i**nn**-ann-u*	*n-i-mm-ann-u*
Abl	*n-a**nn**-inda*	*n-amm-inda*	*n-i**nn**-inda*	*n-i-mm-inda*
Dat	*n-a**n**-age*	*n-am-age*	*n-i**n**-age*	*n-i-m-age*
Gen	*n-a**nn**-a*	*n-amm-a*	*n-i**nn**-a*	*n-i-mm-a*
Loc	*n-a**nn**-alli*	*n-amm-alli*	*n-i**nn**-alli*	*n-i-mm-alli*

	3sg.masc	3sg.fem	3pl (m+f)	3sg.neut	3pl.neut
Nom	*a-v-a**n**-u*	*a-v-a**ḷ**-u*	*a-v-a**r**-u*	*a-**d**-u*	*a-v-u*
Acc	*a-v-a**nn**-u*[9]	*a-v-a**ḷ**-ann-u*	*a-v-a**r**-ann-u*	*a-**d**-anna*	
Abl	*a-v-a**n**-inda*	*a-v-a**ḷ**-inda*	*a-v-a**r**-inda*	*a-**d**-ar-inda*	
Dat	*a-v-a**n**-ige*	*a-v-a**ḷ**-ige*	*a-v-a**r**-ige*	*a-**d**-akke*	
Gen	*a-v-a**n**-a*	*a-v-a**ḷ**-a*	*a-v-a**r**-a*	*a-**d**-ar-a*	
Loc	*a-v-a**n**-alli*	*a-v-a**ḷ**-alli*	*a-v-a**r**-alli*	*a-**d**-ar-alli*	

Although lexicalized, these forms preserve some trace of agreement on the basis of natural gender and humanness, with *-n-* reserved for 3sg masculine pronouns, *-l-* for 3sg feminine pronouns, and *-d-* for 3sg neuter pronouns. The masculine *-n-* is also the default human marker, as it applies to all 1sg and 2sg pronouns.

5 Conclusions

Kannada exhibits a structured noun formation constructional lattice with different, increasingly specialized cophonologies. The latter are evident in the schematic stem-forming construction provided by ACs, and are sensitive to semantic features: namely, the humanness and natural gender of the noun. Although ACs appear elsewhere in noun formation, it is in case morphology that the augment-insertion function is most developed in the language, and most specialized according to semantic and grammatical characteristics. The augments *-n-*, *-l-* and *-d-* seem to be introduced into case morphology from gender- and humanness-marking morphs borrowed from verb agreement and from pronouns. These surface only in a subset of case inflections: ablative, genitive, and locative. It is unclear why these cophonologies should respond a) only to a subset of cases, and b) why these particular ones. To tentatively address (a): it may be that we are seeing an incomplete intermediate stage of spread throughout the case inflection paradigm. To tentatively address (b): there are other studies arguing that morphological syncretism among cases occurs when those cases share some semantics (cf. Lakoff and Johnson 1999 for comitative-instrumental case syncretism, for instance), and some form of specialized case syncretism may be occurring here as

[9] The accusative here is still *-ann*, but sandhi rules apply.

well, one in which ablative, genitive and locative cases share some semantic or pragmatic motivation.

Finally, the combined top-down and bottom-up approach provided by the OCM framework has enabled us to incorporate both phonological and semantic constraints into one optimal word-building process. Further, by allowing multiple sequential 'dips' into the construction for further additions to the stem, it was also possible to have multiple winning candidates, thus also more accurately reflecting same- and across-dialect variation in grammatical forms as well as the simultaneous availability of multiple forms in Kannada. We saw that the extent of variability available for any given noun is subject to the strictly-structured constructional lattice with its available cophonologies according to semantic constraints.

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Binding as Co-indexing vs. Binding as Movement: Evidence from Personal Datives

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1. Introduction

Several languages license structures known as personal dative constructions (PDCs); e.g., sentences (1) through (4). These are constructions that contain a pronoun, normally dative, that is not related to the valency of the verb.

(1) *Southern American English*
Sue bought **her** a nice truck.

(2) *Lebanese Arabic*

Na:dya	ʃtarit-**la**	kam	hdiyye
Nadia	bought-**her.DAT**	a few	gifts

'Nadia bought her a few gifts.'

(3) *French* (from Boneh and Nash 2011:61 (3a))

Jeanne	**s'**est couru	trente km.
Jeanne	**her-**ran	thirty km

'Jeanne ran her thirty kilometers.'

(4) *Modern Hebrew* (from Zahre and Boneh 2010:2 (2))

Salma	rakda	**la**
Salma	danced	**her.DAT**

'Salma (just) danced (it's a minor issue).'
'Salma danced (she indulged in it with some delight).'

PDs are problematic from a syntactic perspective because they seem to violate Condition B of Binding Theory without leading to ungrammaticality. Condition B states that a pronoun should be locally free. Therefore, by allowing a pronoun to be coreferential with a local c-commanding antecedent, PDCs are expected to induce a violation, but they don't. How can syntactic theory account for these facts in a principled way?

Two relatively recent approaches may help account for this apparent violation: BINDING BY A FUNCTIONAL HEAD (Kratzer 2009) and MOVEMENT AND ANTI-LOCALITY (Grohmann 2003). I explore the two approaches in Sections 3 and 4, focusing on Southern American English and Lebanese Arabic. Both analyses indicate that PDs fall outside the constraints of Binding Theory, which explains why their realization as free pronouns does not lead to ungrammaticality. However, I show that the latter approach is superior as far as PDCs are concerned.

A point that will be relevant to the discussion of Kratzer's and Grohmann's approaches in relation to PDCs is the merging site of PDs. I discuss this point first in Section 2. Section 5 addresses an important question: If PDs are not subject to Condition B, how do they determine their antecedent? Section 6 is a conclusion.

2. Where Do PDs Merge?

As I mentioned in the introduction, a PDC contains a non-truth conditional pronoun, usually dative case marked that does not belong to the thematic grid of the predicate. Proof that this is the case comes from the fact that the deletion of the pronouns in boldface in (1) through (4) above does not alter the truth conditions of the sentences. In other words, (1) would still mean that Sue bought a nice truck after the deletion of *her*, and (2) would still mean that Nadya bought a few gifts after the deletion of *-la*. It should be noted, however, that PDs do make a non-truth-conditional, pragmatic contribution, underscoring or understating the importance of the accomplishment depicted by the predicate. For example, the PD in (1) highlights the import of Sue's accomplishment (Horn 2008), while the PD in (2) makes Nadia's accomplishment sound insignificant (Zahre and Bonneh 2010).

In addition, PDs are neither beneficiaries nor recipients. For example, (1) and (2) above may be realized as (5) and (6) with the son and the kids as the beneficiaries respectively.

(5) *Southern American English*
Sue bought her a nice truck for **her son**.

(6) *Lebanese Arabic*

Na:dya	ʃtarit-la	kam	hdiyye	**la-l-wle:d**
Nadia	bought-her.DAT	a few	gifts	**for-the-kids**

'Nadia bought her a few gifts for the kids.'

Further evidence that PDs fall outside the thematic domain of predicates comes from the fact that PDs may not be questioned or negated (see Bosse, Bruening, and Yamada 2012). As the following examples from Southern American English illustrate, only events may be questioned (7) or negated (8). In (7) the speaker asks the addressees if they ever loved a woman. The question is not about whether loving a woman brought the addressees the expected satisfaction. Simi-

larly, in (8) the speaker says that she or he does not want the red sauce. The speaker does not mean that she or he wants the red sauce without the satisfaction it brings (see Horn 2008:182-184).[1]

(7) Have you ever loved you a woman?
(8) I don't want me any of that red sauce.

The same observation applies to Lebanese Arabic, as (9) and (10) illustrate. In (9) the question is about whether Nadia passed at least one exam this year, with the implication that even if she did, her success wouldn't be significant. The question is not about whether Nadia's experience of passing an exam was insignificant. In (10) the sentence is about Ziad not holding a job; it is not about Ziad holding a job though not for the sake/benefit/satisfaction/etc. of the speaker.

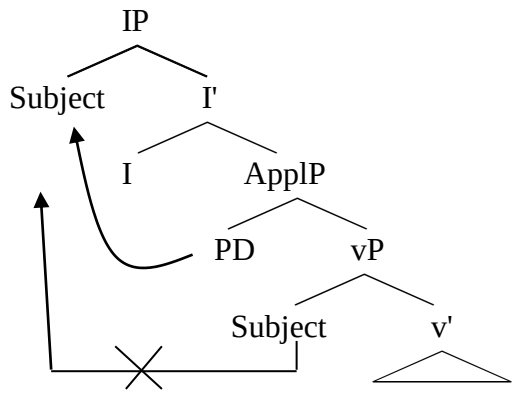
(9) nijħit-**la** Na:dya bi-ʃi: ʔimtiħa:n bi-ha-l-madrase ?
succeeded-**her.DAT** Nadia in-some exam in-this-the-school?
'Did Nadia ever pass an exam in school?

(10) Ziya:d ma: byaʕmil-**li** la: ʃaɣgle wa-la ʕamle
Ziad NEG do-**me.DAT** no job and-no task
ʔe:ʕid-**li** bi-l-be:t kil l-nha:r
sit-**me.DAT** in-the-house all the-day
'Ziad has no job; he stays home all day. This is unacceptable.'

The fact that PDs fall outside the scope of negation and that they do not alter the truth condition of PDCs indicates that PDs are more likely to merge as high applicative heads (Pylkkänen 2008). For the sake of this paper, let us assume that PDs merge immediately above vP; that is, between vP and IP, as in (11). See Roberge and Troberg (2009:251) and Boneh and Nash (2010) for a similar suggestion. Let us also assume that the subject in both languages under examination moves or may move from Spec-*v*P to Spec-IP. In this case, the PD becomes an intermediate site between Spec-*v*P and Spec-IP, as (11) illustrates. That is, the movement of the subject would violate minimality since the PD is closer to Spec-IP and should thus be a better candidate for movement. Closer examination, however, shows that the PD in (11) is not an appropriate candidate for movement to Spec-IP. The reason is that PDs are heads rather than phrasal structures, as Cuervo (2003) also observes (see also Haddad 2011). According to the Structure Preservation Hypothesis (Emonds 1976), only phrasal structures can move to specifier positions; heads may only move to head positions.

[1] (7) and (8) were retrieved on 01/04/13 from the following websites respectively:
http://www.youtube.com/watch?v=U7aQZZsEPmA
http://www.urbanspoon.com/r/89/817026/restaurant/Baldys-BBQ-Bend-Westside-Bend

(11)



If this is correct, this means that the subject in Spec-*v*P is the closest appropriate candidate for movement to Spec-IP; it may move over the PD without violating minimality. Now we turn to Kratzer's approach to Binding Theory.

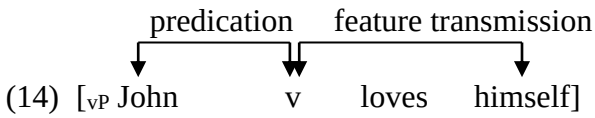
3. Binding as Co-indexing

Condition B of Binding Theory states that a pronoun should be locally free. By allowing a pronoun to be coreferential with the subject, which is a local c-commanding antecedent, PDCs should induce a violation of Condition B. Of course, this should be the case if we assume that subjects are binders. This problem may be solved, however, if we assume with Kratzer (2009:191) that "binders for pronouns are provided by verbal inflectional heads, rather than by 'antecedent' DPs." More specifically, Kratzer holds that *v* and C are the true syntactic binders for pronouns. A pronoun is bound by the closest *v* or C via two operations: predication (12; in original 18) and feature transmission (13; in original 60).

(12) Predication (Specifier-Head Agreement under Binding)
When a DP occupies the specifier position of a head that carries a λ-operator, their ϕ-feature sets unify.

(13) Feature Transmission under Binding
The ϕ-feature set of a locally bound pronoun unifies with the ϕ-feature set of the head that hosts its binder.

What (12) and (13) amount to is that the proper binder of the reflexive pronoun in a structure like (14) is *v*; *v* shares all the phi-features of the subject in its specifier position via predication, and the reflexive and *v* share all the phi-features via feature transmission.



If this approach to binding is on the right track, it explains why PDs are not realized as reflexive pronouns. PDs undergo first merge outside the thematic domain of the predicate in PDCs. This means that they are not c-commanded by *v*; therefore, they are not bound although they have a local antecedent DP. For example, sentences (15a) and (16a) each contain a reflexive pronoun and a PD. As (15b) and (16b) illustrate, only the reflexive pronouns are bound by *v*; the PDs will eventually be c-commanded by subject DPs after they move to Spec-IP, but they will not be bound by a functional head.

(15) a. I need **me** a little more time for **myself**. (from Horn 2008:172 (9c))

Predication Feature Transmission

b. [$_{IP}$[$_{AppP}$ **me** [$_{vP}$ I v need a little more time for **myself**]]]

(16) a. Na:dya ʃtarit-**la** hdiyye sɣi:re **la- ħa:l-a:**
Nadia bought-**her.DAT** gift small **for-self-her**
'Nadia bought her a small gift for herself.'

Predication Feature Transmission

b. [$_{IP}$[$_{AppP}$ **-la** [$_{vP}$ Na:dya v ʃtarit hdiyye sɣi:re **la- ħa:l-a:**]]]
[$_{IP}$[$_{AppP}$ **-her** [$_{vP}$ Nadia v bought a small gift **for herself**]]]

This analysis seems to explain why PDs are realized as free pronouns. One problem remains, however. According to Kratzer, two functional heads qualify as binders and pronoun makers: *v* and C. This predicts that if a PD has an antecedent DP in Spec-CP, such as a wh-element or a quantifier, it must be realized as a bound reflexive pronoun. This prediction is not borne out. For example, sentences (17) and (18) from Southern American English contain CP elements; still, a PD is possible. Sentences (19) and (20) are similar examples from Lebanese Arabic.[2]

Predication Feature Transmission

(17) [$_{CP}$ **Who** **C** [$_{IP}$ loves **him** some Dr. Murray Vindaloo]?]

Predication Feature Transmission

(18) [$_{CP}$ **Every man** **C** [$_{IP}$ loves **him** some Double D's]]

[2] (17) and (18) were retrieved on 05/18/12 from the following websites respectively:
http://rockvillecentre.patch.com/articles/poll-how-do-we-fill-the-store-vacancies-in-rvc
http://www.gamespot.com/forums/topic/26754355/the-quotsay-something-true-about-yourselfquot-thread.-?page=318

Predication Feature Transmission

(19) [$_{CP}$ **mi:n** **C** [$_{IP}$ ʕimil-**lo** ʃaɣle btinfaʕ lyo:m]]
[$_{CP}$ **who** **C** [$_{IP}$ did-**him.DAT** job benefit today]]
'Who did something useful today?'

Predication Feature Transmission

(20) [$_{CP}$ **kil tilmi:z** **C** [$_{IP}$ daras-**lo** nisˤ se:ʕa]]
[$_{CP}$ **every student** **C** [$_{IP}$ studied-**him.DAT** half hour]]
'Everyone studied for a half hour.'

An alternative to Kratzer's approach is the movement approach to Binding, which I explore in the next section.

4. Binding as Movement[3]

Within the framework of the Minimalist Program, several researchers have suggested reducing binding construal and the relation between reflexive pronouns and their antecedents to movement. This idea was probably initiated by Hornstein (2001); see also Kayne 2002. According to Hornstein, the derivation of (21a) looks roughly like (21b): *John* starts out as the object of *loves* before it moves to Spec-*v*P and occupies the subject position. Details aside, the lower copy is realized as a reflexive pronoun. Movement is assumed to be restricted, which normally means that it is subject to locality constraints or the maximum distance a syntactic object may move.

(21) a. John loves himself.
b. [$_{CP}$[$_{IP}$ John [$_{vP}$ John $^{\theta 2}$ [$_{VP}$ loves John$^{\theta 1}$]]]]

Grohmann (2003) adopts Hornstein's reductionist approach to construal as movement and argues that movement is subject, not only to locality constraints, but also to anti-locality constraints or the minimal distance an object is allowed to move. He holds that a clause is divided into three Prolific Domains: (i) the Θ-Domain or *v*P which is responsible for thematic relations; (ii) the Φ-Domain or IP which is responsible for agreement information; and (iii) the Ω-Domain or CP which is in charge of discourse information. Movement may not take place within the same Prolific Domain, a restriction that Grohmann calls the Condition on Domain Exclusivity (CDE).

It may be readily noted that the movement of *John* in (21b) violates the CDE since it takes place within the Θ-Domain. According to Grohmann, such movement is allowed only if it results in the spell-out of a copy, not only in the final

[3] This analysis was first proposed exclusively for Southern American English in Haddad 2011.

landing site, but also in the launching site (2003:108). That is (21b) must be phonologically realized as (22).

(22) John_i loves John_i.

One problem with the above proposal is that multiple copy spell-out is restricted by Kayne's (1994) Linear Correspondence Axion and Nunes's (2004) conditions on linearization. According to Kayne, linear order in a structure is a precedence relation that is regulated by hierarchical structure. If a non-terminal X c-commands a non-terminal Y, this means that X – as well as every terminal that is dominated by X – precedes Y and the terminals that are dominated by Y. This means that two copies x^a and x^b of the same syntactic object x may not be both pronounced if they are in a c-command relation, or if they are dominated by non-terminal nodes X and Y that are in a c-command relation. If both copies are phonologically realized, the structure cannot be mapped into a linear order at PF. This is exactly the case of the two copies of *John* in (22).

One way to salvage the derivation in (22) is through the deletion of the lower copy, assuming that this is the copy with fewer checked features (Nunes 2004). The deletion of the lower copy, however, means a violation of the CDE. This is so because the movement of *John* took place within the same Prolific Domain: the Θ-Domain. In this case, the CDE requires multiple spell-out of the moving object. According to Grohmann, the computational system may circumvent this problem by replacing the lower copy by "an item from the inventory" of the language – "a (default) filler" – that looks phonologically different but is interpreted as the original copy. Reflexive pronouns, Grohmann suggests, are such fillers; "they are treated as the Copy Spell Out of the moving element … repair[ing] an otherwise illicit movement," thus satisfying the CDE (2003:107-112).

Therefore, sentence (21a) above has the derivation in (23). The derivation starts with the numeration in (23a). *John* and *love* undergo first merge, (23b). In (23c), *v*P projects, but there is no item in the numeration that can merge in Spec-*v*P. This is why *John* moves to Spec-*v*P and the lower copy is marked for deletion. This movement violates the CDE because it takes place within the same Prolific Domain. This is when the *self* anaphor is inserted as a default filler in order to repair an illicit movement, (23d). The structure converges as (23e).

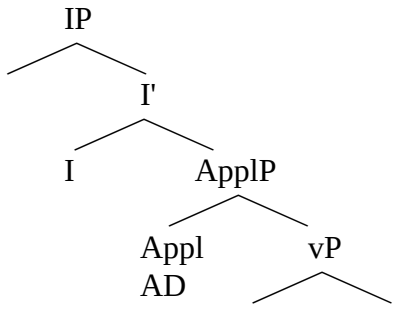
(23) a. LA = {*John, love, v, V, I* }
b. $[_{VP}$ loves John]
c. $[_{vP}$ John $[_{VP}$ loves ~~John~~]]
d. $[_{vP}$ John $[_{VP}$ loves himself]]
e. $[_{CP}[_{IP}$ John $[_{vP}$ ~~John~~ $[_{VP}$ loves himself]]]]

One problem with this approach, as Grohmann (2003:296) himself points out, is that it may be taken to violate the Inclusiveness Condition (Chomsky 2000:113). The Inclusiveness Condition indicates that no new features or items

other than those in the numeration may be introduced during the derivation. Beyond Grohmann's suggestions for a way out, I suggest that one way to circumvent this problem is to consider *self* anaphors on a par with dummy *do* which is inserted as a default filler to save the derivation – arguably in line with Hornstein's (2001) and Grohmann's (2003) conception of "grammatical formatives".

Back to PDCs! We saw in Section 2 that PDs merge above *v*P or the Θ-Domain and as such fall outside the thematic grid of the predicate.

(24)

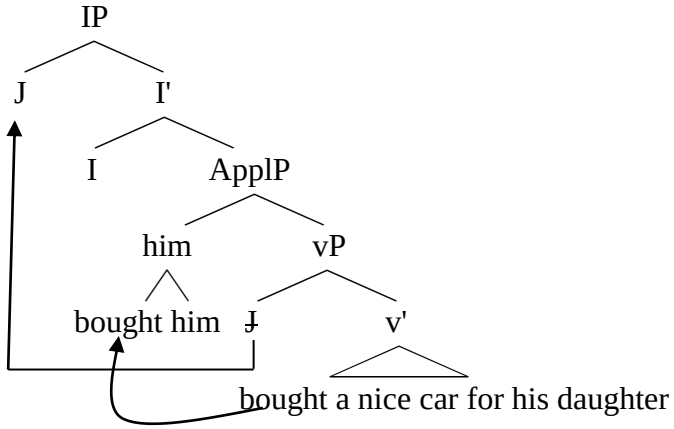


If this is correct, it explains why PDs are realized as free pronouns although they are coreferential with a c-commanding subject within the same clause. Take the PDCs in (25) and (26), for example. Both have the derivation in (27). The subject *John/Jamil* undergoes first merge in Spec-*v*P, while the PD *him/-lo* undergoes first merge in ApplP above *v*P. *John/Jamil* moves to Spec-IP. After that, C^0 projects and the structure converges. Note that the verb may undergo head merge with the PD for the purpose of cliticization.

(25) John bought him a nice car for his daughter

(26) žami:l ʃtare:**-lo** sayya:ra ħilwe la-bint-o
Jamil bought-**him.DAT** car nice for-daughter-his
'Jamil bought him a nice car for his daughter.'

(27)



The PD *him/-lo* in (25) and (26) is coreferential with *John/Jamil* and, under usual assumptions, is expected to be realized as a locally-bound reflexive pronoun. However, we learnt in this section that reflexive pronouns are not the result of locality; they are the result of movement and the anti-locality restrictions on movement. The derivation in (27) shows that *him/-lo* and *John/Jamil* are not related through movement. More specifically, no movement of the PD within the same Prolific Domain is involved. Therefore, no reflexive pronoun is needed to salvage the derivation.

Compare (25) and (26) to (28) and (29). The latter contain a reflexive pronoun each. As (30) shows, *John/Jamil* starts out as an internal argument of *bought/ʃtara* before it moves to Spec-*v*P where it takes on the external theta role of the predicate. This movement takes place within the same Prolific Domain, the Θ-Domain, which is a violation of the CDE. In order for the derivation to be salvaged, the lower copy of *John/Jamil* needs to be pronounced. However, pronouncing the lower copy along with the copy of the subject, which eventually lands in Spec-IP, is a violation of the Linear Correspondence Axiom. One way around this problem is by substituting for the lower copy of *John/Jamil* with a default filler: an element that phonologically looks different but that may be interpreted the same. This filler is the *self* anaphor *himself/ħa:l-o*.

(28) John bought h**imself** a car.

(29) žami:l ʃtara **la- ħa:l-o** sayya:ra
Jamil bought **for-self-his** car
'Jamil bought himself a car.'

(30) a. [$_{vP}$ J [$_{VP}$ bought [Ɉ] [a car]]]
b. [$_{CP}$[$_{IP}$ J [$_{vP}$ Ɉ [$_{VP}$ bought **[himself]** [a car]]]]]

Once PDs are freed from binding restrictions, the choice of antecedent becomes a purely pragmatic decision that may be subject to other syntactic constraints. The following section explores this possibility.

5. Attitude Datives, Intersubjectivity, and Accessibility

PDs may be considered as epistemic pronouns, similar in several ways to epistemic modals. For example, both PDs and epistemic modals seem to merge above vP; they both are speaker-oriented and both are situated in the speech time. Also, they both express the attitude of the speaker given what s/he knows about the subject and the *v*P event (see Hacquard 2010). For example, by using the epistemic modal *had to*, the speaker of (31) expresses the following: Given what I know now about John and the situation last night, I believe that John was at home last night.

(31) John **had to** be home last night.

Similarly, by using a PD, the speaker of (32) expresses the following: Given what I know about John, his daughter, and the buying event, I believe that the purchase gave John satisfaction and a sense of accomplishment.

(32) John bought **him** a nice car for his daughter.

The same sentence in Lebanese Arabic possesses a different conventional implicature. A Lebanese speaker of (32) would be saying: Given what I know about John, his daughter, and the buying event, I believe that John's accomplishment was insignificant; for example, John is so rich that buying his daughter a car is not a challenge.

In this sense, PDs assume a role that goes beyond the referential role normally attributed to pronouns and make a pragmatic contribution. One way to explain this multi-functional role is through the theory of (inter)subjectivity as proposed by Traugott (2003, 2009). Building on Lyons (1982), Traugott (2003) holds that intersubjectivity is the way a language allows its speakers to express their awareness of their own and the addressee's attitudes and beliefs. When examined from the perspective of this definition, PDs may be defined as linguistic markers that index (inter)subjectivity (Traugott 2009:32). They are the result of what Traugott calls semantic polysemy, whereby an element acquires a pragmatic (inter)subjective meaning in addition to – or in place of – its original meaning. In the case of the dative pronouns under examination, the two meanings they have are the following: (i) a purely referential meaning, and (ii) a pragmatic meaning.

Of course, an important question follows: How is the referential meaning determined? In other words, how do these dative pronouns determine their referent as the subject? I suggest that an answer may be found in Accessibility Theory as proposed by Ariel (1988, 1991, 2001).

Accessibility Theory "offers a procedural analysis of referring expressions," such as r-expressions and reflexive pronouns, and argues that the choice of a referring expression depends on the degree of salience of its referent or antecedent, whereby salience may be linguistic and sentential or extra-linguistic, discoursal, and extra-sentential (Ariel 2001). Ariel further argues that shorter and less stressed referring expressions are higher accessibility markers as they take salient entities – i.e., entities with high degree of accessibility, such as discourse topics – as referents or antecedents. Ariel (1991, 2001:31) puts forth an accessibility marking scale; the following rank ascendingly as the highest accessibility markers: Unstressed pronoun > cliticized pronoun > verbal personal inflections > zero.

PDs are clitics. This makes them high accessibility markers that require a salient antecedent. Salience is related to the status of the referent as topic; "most High Accessibility markers refer to unmarked, contextually salient entities (especially discourse topic)" and sentential subjects (1988:71, 82–83; 2001:32). Rizzi and Shlonsky hold that "subjects … share an interpretive property of topics, the

'aboutness' relation linking subjects and predicates as well as topics and comments" (2007:118). This means that subjects make good candidates as antecedents for unstressed, cliticized pronouns like ADs.

Sentential subjects are not the only salient discourse elements. Other salient discourse elements are speech event participants: speaker and addressee (Ariel 2001:32). This may be the case because they are constantly available in the speech event and because the pronouns used to refer to the speaker and hearer, namely, *I/me* and *you*, are only sensitive to speech roles; they are normally dissociated from their referent. In other words, *I/me* refers to the person speaking regardless of her/his identity. This is why languages tend to use appositives for identifying the referents of *I/me* and *you*; for example, *I, Jean Do, ...* (Bhat 2004:10, 38–40). This characteristic of *I/me* and *you* makes them salient discourse elements that are structurally available in CP, albeit unpronounced, and function as antecedents. (See Collins and Postal 2012 and Sigurðsson 2012 and works cited within for proposals that speech participants are syntactically present in the left periphery. Also see Borer and Grodzinsky 1986 for a unified analysis of subject-oriented datives and speaker/hearer-oriented datives.) Therefore, the prediction is that what we have been referring to as Personal Datives do not have to be subject oriented; they may be speaker or hearer oriented. This prediction is born out for Lebanese Arabic, as (33) illustrates.

(33) Ziya:d byisˤrif-**li/lik/lak** kil maʕa:ʃ-o
Ziad spend-**me/you.FEM/you.MAS.DAT** all salalry-his
3a-l-tye:b w-l-dˤahra:t
on-the-clothes and-the-going.out
'Ziad wastes all his money on clothes and going out.'

These speaker- and hearer-oriented datives are also epistemic in the sense that they express the speaker's attitude towards the event depicted by the predicate. However, unlike PDs, these datives express an attitude that is based, not on the speaker's knowledge of the subject per se, but on the speaker's knowledge of the cultural norms of her/his community and what is considered acceptable or unacceptable. For example, in (33), Ziad's behavior is considered unwise regardless of who does it (see Haddad 2013, 2014 for a more detailed analysis of these pronouns).

In addition to subjects and speech participants, research on the left periphery tells us that topics are other salient discourse elements. Consider for example a situation where two people are talking about a woman, Layla. Layla is married to a man who is cheating on her. The speaker may say something like (34).

(34) ha-l- mʕatra Layla žawz-a byidˤhar-**la** kil yo:m
this-the-poor Layla husband-her go.out-**her.DAT** every day
maʕ wiħde (w-hiyye ya ɣe:fil ʔilak ʔalla:)
with one.FEM (and-she has.no.idea)
'Poor Layla, her husband goes out with a different woman every day (and she has no idea).'

Note that the dative in (34) does not have to depict Layla as a real affectee; she may be blissfully ignorant about the situation, as the parenthetical part in (34) indicates. In this case, the dative expresses an attitude of empathy on the part of the speaker. The speaker believes that Layla would feel awful if she knew and in this sense the dative depicts Layla as a potential affectee and experiencer from the perspective of the speaker. Of course, this judgment depends on the speaker's knowledge of, not only cultural norms, but also Layla and her reactions to similar situations. The speaker will not use the topic-oriented dative if s/he knows that Layla would not care what her husband does when she is not around.

The choice between subject, topic, or speech participants as antecedents of epistemic dative pronouns depends on the salience of these entities as sentential or extra-sentential elements that are present, overtly or covertly, in the left periphery. At the same time, the choice depends on the pragmatic meaning that these datives express. When a speaker uses a subject-oriented dative, s/he assumes a dismissive attitude towards the depicted event and its subject. For example, in (35) the attitude of the speaker towards the event as insignificant is crucially based on her/his familiarity with Ziad and the fact that Ziad can hold his liquor. The same number of drinks may be considered just enough if someone else drank them, in which case, no PD would be used.

(35) Ziya:d ʃìrib-lo ke:se:n
Ziad drank-him.DAT two.drinks
'Ziad had a couple of drinks; nothing significant.'

On the other hand, if the speaker uses a topic-oriented dative, s/he expresses an attitude of empathy towards the topic. And finally, when speakers use speaker/hearer-oriented datives, the attitude they express depends on their familiarity with the culture of the community and what is considered acceptable or unacceptable. By using a dative that refers to one of the speech event participants, speakers appoint themselves and their addressees as representatives of the culture and as judges of what may be considered laudable or reprehensible. See Haddad 2013, 2014 for more details.

6. Conclusion

In this article, I presented structures known as Personal Dative Constructions licensed in Southern American English and Lebanese Arabic. These are constructions that contain non-thematic, subject-oriented dative pronominal clitics. These datives are problematic because they are locally c-commanded by a coreferential subject, yet they are realized as free pronouns in violation of Condition B of Binding Theory. I looked for an explanation for this apparent violation in two places: binding by a functional head (Kratzer 2009) and binding as movement (Grohmann 2003). Both approaches show that subject-oriented datives are allowed to be realized as free pronouns because they are not subject to the syntactic restrictions that normally apply to bound reflexive pronouns. However, I show that the movement approach is able to account for a wider range of data.

If subject-oriented datives are freed from binding restrictions, the choice of antecedent becomes determined pragmatically rather than syntactically. This seems to be the case since the dative pronouns I examined here do not have to be subject oriented; they may also be speaker, hearer, or topic oriented. Accordingly, I suggested that these datives, as attitude holders, may be considered as high accessibility linguistic markers that index intersubjectivity.

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Do sighs matter? Interactional perspectives on sighing

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Why do we sigh? The consensus on sighing as a physiological phenomenon regards it as important for restoring healthy variability to the respiratory system, specifically effecting lung compliance (Caro et al. 1960) and restoring the chemical properties of gas exchange (Cherniack et al. 1981). The psychological literature embarks from these accounts to link respiratory characteristics to psychological states, finding that sighs are produced in both positive (Keefe and Block 1982, Wuyts et al. 2011) and negative emotional states (Hirose 2000, Vlemincx et al. 2009). This research suggests that the physiological and psychological functions of sighing are intertwined since respiratory patterns are generally related to emotions (Boiten et al. 1994 [above references via Vlemincx et al. 2009]). By only focusing on the phenomenon as it occurs at the individual level, however, these studies ignore the social function that sighs may play. In treating them as acts performed in solitude, in other words, such studies assume sighs to be involuntary reflexes of private internal states. Cursory reflection would reveal, however, that the production of a sigh in conversation may be consequential for the interaction. Furthermore, in contrast to largely involuntary respiratory acts like yawning or sneezing, sighing is wholly manipulable, which suggests that its occurrence in interaction may be purposeful. In this preliminary report, I examine natural interactional data containing tokens of sighs to observe and describe the ways in which sighs may manifest as social action.

1 Background

One approximation of an interactional account of sighing comes from Teigen (2008), who administered two questionnaires on subjects' judgments of sighing

and conducted an experiment where actual sighs were observed. The first questionnaire revealed that subjects apprehend sighing in primarily negative emotional terms, though of moderately weak intensity. Subjects associated sighing with feelings of resignation, boredom, longing, exhaustion, and frustration (in that order). The second questionnaire found that the majority of subjects felt that most of their sighing was done alone and a-socially, and that such private sighs carried more intense feelings than ones produced when around others. An interesting contrast between one's own sighs and the sighs of others arose, namely, subjects attributed sadness to the sighs of others, but attributed a broader range of emotions to their own. In the experimental portion, subjects attempted two puzzles and their sighs were noted by experimenters. What emerged was the occurrence of sighing when receiving the puzzles, when handing them into the experimenters, and during the breaks after one or more unsuccessful attempts.

Teigen's study, while not an analysis of actual sighs 'in the wild', provides a helpful starting point for assessing popular attitudes towards sighs. His findings articulate how participants understand sighs, and suggest how sighs may be occasioned in interaction and how participants could design relevant responses. In delimiting the scope of emotions that conversationalists may display through a sigh, the present analysis can evaluate the accuracy of the experimental subjects' assessments of sighs. To do so, I take the view that emotion, whatever its psychophysiological manifestation, is in cases better described as a social phenomenon.

Rather than viewing emotions as an involuntary psychological force over which people have no control, they may be profitably understood as actions situated in social activities (Averill 1974, Goodwin and Goodwin 2000). In this view, displays of affect are orchestrated according to interactional contingencies and rendered visible through linguistic and bodily practices. This interactional approach to the study of emotions has revealed how nonlinguistic and paralinguistic phenomena may be communicative and intentional, rather than visceral eruptions. In this tradition, some researchers have approached emotion from the 'inside out', by presuming some psychological or cognitive state, then demonstrating its possible manifestations in interaction. Such studies have investigated the expression of frustration (Yu 2011), confusion (Drew 2005), disgust (Wiggins 2012), and surprise (Wilkinson and Kitzinger 2006). By contrast, other researchers have approached tokens of (non-)speech as they appear in conversation, and have explicated how they function within and organize conversation – an 'outside in' approach. Gail Jefferson, for instance, in a series of seminal papers, demonstrated how laughter in conversation is carefully systematized and coordinated by multiple parties to pursue multiple actions (Jefferson 1975, 1979, 1984). Similarly, other researchers have focused on the interactional usage of 'sound objects' like in-breaths (Lerner and Linton 2004), crying (Hepburn 2004, Hepburn and Potter 2007), clicks, and whistles (Reber 2012).

In the present study, I take the latter 'outside in' approach, surveying tokens

of sighs and analyzing their organization and discourse functions. In what follows, I describe the research methodology and data used for this examination, and then in what constitutes the bulk of the paper, I provide an analysis of sighs as they appear in interaction. Following this is a discussion of the findings, in which I make special note of the psychological and cognitive aspect of sighs. I close with a conclusion of the primary results of this study and remark on possibilities for further research.

2 Methodology and data

The data for this analysis come from the Santa Barbara Corpus of Spoken American English (Du Bois et al. 2000, Du Bois et al. 2003, Du Bois and Englebretson 2004, 2005), a corpus of audio recordings of natural, primarily conversational speech transcribed according to the conventions set out in Discourse Transcription (see Appendix) (Du Bois et al. 1993). In this corpus, sighs were identified by transcribers and labeled in the transcripts as *(SIGH)*. A search of the entire corpus returns 41 tokens of *(SIGH),* of which seven representative samples are analyzed in this report. The methodological framework adopted is Conversation Analysis (cf. Atkinson and Heritage 1984, Sidnell and Stivers 2013), which recognizes interaction as the primordial site of sociality and seeks to explicate its organization through meticulous microanalysis of audiovisual recordings and their transcripts. Sighs are analyzed according to participants' orientations and understandings of their meaning and consequence in a given situated environment.

3 Analysis

Two broad patterns emerge from the data. First, sighs may be produced for the display of affect, which may accomplish a variety of actions such as alignment or affiliation. And second, sighs may function in conversation on an interactional level, contributing to turn or topic management. Given the characteristic multifunctional nature of discursive elements, these two patterns may coexist in one token, so the conversational excerpts below were chosen as representative samples of their respective functions.

This study is predicated on the understanding that emotions appear in conversation *as* publicly available (i.e., visually and audibly perceptible) for co-present participants. A sigh is put 'out there' in order that others may perceive it and retroactively reconstitute its meaning in its contextualized environment. Often, this action takes the form of alignment/affiliation regarding some assessable item. In (1), four female friends are discussing Mister Samuel, a teacher they had in elementary school:

(1) Fragment from SBC004 (*Raging Bureaucracy*)

```
03 CAR:  But he won't do anything to the girls if they give him backrubs.
04 SHA:  ... That's right.
05              .. That's righ[t].
06 CAR:                       [(TSK)]
07 SHA:  ... (H) Mister ~Samuel .. had like,
08              .. the [most] &
09 CAR:               [What a j]erk,
10          man.
11 SHA:  & ... unethical &
12 CAR:  (SIGH)
13 SHA:  & classroom,
14          [I can ever re]mem[2ber,
15 CAR:  [He was a fool].
16                            [2He was an absolute2] fool.
```

The extract begins with Carolyn's addition of a lecherous detail about the teacher as an example of his venality (line 3). Sharon affirms this detail, displaying her independent epistemic access to the matter in the process (lines 4-5), then proceeds to initiate a summary assessment (lines 7-8, 11, 13-14) (Drew and Holt 1998, Heritage and Raymond 2005). In overlap with Sharon, Carolyn appears to initiate a summary assessment of her own (lines 9-10), which is followed by a sigh (line 12), a re-evaluation, and an upgrade of that evaluation (lines 15-16).

Although the other participants do not respond to Carolyn's sigh directly, we can understand it as part of her assessment since it is situated between two other negative evaluations (*jerk* and *fool/absolute fool*). This sequence of ASSESSMENT + SIGH + SUMMARY ASSESSMENT demonstrates how Carolyn produces the sigh as an embodied continuation of her verbalized negative assessments. This token is representative in that the affect displayed is largely negative, a fact that is consistent with the psychological studies noted above. This same pattern may be seen in (2), where four girls converge on and share their assessments of strawberry daiquiris, which two of the girls had had at an earlier event.

(2) Fragment from SBC050 *(Just Wanna Hang)*

```
01 ARI:  [Those strawberry daiquiris were so=] good.
02 NAN:  [2Weren't they2] ^so good?
03 ARI:  [2(H)2]
04 DAN:  .. What,
05          .. you had strawberry daiquiris?
06 ARI:  ... Yeah,
07          [with like] cream on the top.
08 NAN:  [Mhm].
```

09 DAN: (GASP)
10 NAN: They were [so good].
11 KEL: [Yum].
12 DAN: ... **(SIGH)**[2=2]
13 ARI: [2They were so=2] good (H).
14 Can't you [3just --
15 NAN: [3They weren't like too3] strong,

Arianna gives an assessment of the drinks in first position (line 1), which is followed by a second assessment from Nancy (line 2). Dana responds to these evaluations with ritualized disbelief (Heritage, 1984:339), an action that typically makes relevant an expansion on the object of disbelief. Specifically, Dana displays disbelief through the open class repair initiator *What* (Drew, 1997) and by specifying the type of information she seeks (lines 4-5). Arianna in turn replies with a type-conforming affirmation (line 6) and an elaboration of the source of astonishment.[1] These actions together prepare a place for the demonstration of surprise, delivered here in the form of a gasp (line 9), which is released as a sigh (line 12). This token is issued as part of a surprise sequence (Wilkinson and Kitzinger 2006), itself a component of the larger project of doing assessments together. After surprise is demonstrated, Dana produces a sigh to express longing or perhaps regret at having missed the opportunity to share in the experience.

The previous examples of affective sighs demonstrate how sighing may be used for the outward presentation of affect in evaluating some assessable. Notably, the sighs in (1) and (2) occur during talk as *part* of assessment sequences. By contrast, sighs also regularly appear *outside* of and *on the borders* of sequences, activities, and projects. That is, in addition to being indexically related to affect, sighs appear to invoke boundaries of discursive units, and, in doing so, are treated by participants as having interactional import. Consider first a non-interactional example to see how such a usage may have emerged. Here, Dana is involved in the mundane action of getting some juice for herself.

(3) Fragment from SBC050 (*Just Wanna Hang*)

01 DAN: ((*opens juice bottle*))=**(SIGH)**
02 ((*pours juice, replaces cap on bottle*))
03 ((*walks away, returns juice bottle*))
04 ((*wa*[*lks back*))
05 [**(SIGH)**

[1] Nancy, who had claimed equal access to the daiquiris, also provides the exact same response of a type-conforming affirmation (*Mhm* in line 8) followed by an elaboration of the object of disbelief (*They were so good* in line 10).

This extract occurs outside of interaction; there is no talk, participation, or engagement to speak of. The two sighs are situated in an activity, but that activity is opening, pouring, and putting away the juice. Note how the sighs each appear after the recognizable completion of a sub-section of the project, namely, opening the bottle and returning from putting the bottle back. Where the sigh occurs is important because it ostensibly underlies the interactional function of sighs. The remainder of the examples in the analysis exhibits how sighs often appear at the boundaries of interactional episodes. This boundary-marking (or boundary-invoking) function is particularly clear in the following exchange between loan officers who are voting on the passage of a loan:

(4) Fragment from SBC014 (*Bank Products*)

08 JIM: ... Okay.
09 ... (TSK) All in favor aye.
10 FRE: ... [Aye].
11 KUR: [Aye].
12 JOE: Aye.
13 JIM: .. Opposed same sign.
14 .. Motion carries.
15 FRE: ... **(SIGH)**
16 ... Is that the only one (Hx)?
17 JOE: .. (TSK) (H) That's the= only loan I have.

The fragment begins with Jim initiating a voting ritual known as *viva voce* ('live voice'), in which one party officially provides opportunities for affirmative votes (line 9), negative votes (line 13), and finalizes the result of those votes (line 14). Upon Jim's utterance of *Motion carries*, the activity is recognizably complete and there is no ratified next speaker (Sacks et al. 1974). In this transition space, Fred enters with a sigh (line 15), and then there is a beat of silence before he self-selects and initiates a new sequence (line 16). Much in the same way as the completion of a physical activity like opening a bottle prompts a sigh, this example shows how the completion of a communicative joint activity is a relevant place for a sigh. The brief pause after the sigh indicates that Fred did not intend to use the sigh as a place for starting a new sequence, but rather as a way to finalize the project and thereby publicly recognize that some new sequence or speaker transition would be relevant.

From this usage as a marker of the end of a project, conversationalists may extend sighs to other environments, suggesting a process of intersubjectification (Traugott 2010). The project-closing function seen in (4), by virtue of its syntagmatic position between projects, may be interpretable as opening a sequence. That is, because a sigh often appears at the recognizable termination of some sequence, it concurrently occupies both the ending of some episode and the

relevant beginning of some new one.[2] This Janus-like function is observable in the following example involving the same women from (1), who are still discussing how terrible Mister Samuel was as a teacher.

(5) Fragment from SBC004 (*Raging Bureaucracy*)

```
01 SHA:  [His classroom was like],
02 KAT:  .. And [2that was the on2][3ly way to do it3].
03 CAR:         [2No doubt2].
04 SHA:                             [3(H) cra3]zy.
05 CAR:  No doubt.
06       That man was insa=ne.
07       ... [Definitely insa]ne.
08 SHA:     [(SIGH) Hey !Coop].
09       ... What I was gonna tell you about,
10        that really frustrates me is that,
```

Their series of assessments of the teacher comes to a perceptible end by means of a summary assessment from Carolyn (lines 3, 5-7). This overlaps with Sharon's sigh (line 8) and the opening of a completely new sequence about a frustration of hers (lines 8-10). The sigh's position after a point of possible completion in Carolyn's turn (line 6) reveals how Sharon is oriented to the closure of the sequence about Mister Samuel. Moreover, Sharon's usage of a sigh to launch into a new sequence shows how the token has both retrospective and prospective qualities.

As a way to summarize, I close this section with a token that exhibits the uses detailed above, both affective and interactional. In this fragment, a group of friends are at home complaining about a neighbor and about neighborhood kids:

(6) Fragment from SBC002 (*Lambada*)

```
01 JAM:  We're gonna have babies crying.
02       ... [in the middle of the night].
03 HAR:     [(GROAN)]
04             ... Well it's no worse than her screaming at em,
05       is it?
06 PET:  ... Yeah but now you'll have both.
07 JAM:  ... Yeah right.
08       ... Probably be like,
09       <VOX shut up you ki- VOX>,
10       you know,
```

[2] This place is also the structurally provided position for expanding the just-finished sequence, resuscitating a suspended or abandoned topic, or for the emergence of a lapse in talk.

11		XX?
12		Oh= Go=d.
13		... I feel --
14		I s- feel like such an old lady.
15		But I --
16		they just really annoy me.
17		(2.5) **(SIGH)** [kay],
18	MIL:	[Hunh].
19	JAM:	New subject,
20		@@
21	PET:	Hm.

In the course of a series of negative assessments, Jamie launches into an imagined reenactment of her own reaction (lines 8-9) to the *babies crying* (line 1) and the neighbor's *screaming at em* (line 4). The reenactment itself is a negative assessment, and comes to possible completion with *you know?* (line 10) and two inaudible syllables (line 11). However, her performance receives no audible uptake from Pete, James, or Harold, so Jamie expands with response cry *Oh= Go=d* (line 12), which is a slightly more concrete expression of her frustration than the reenactment. This re-completion of her turn is again met with no turn transition, so she again expands with a direct articulation of her emotion (lines 13-17). After 2.5s of no uptake or transition (both of which would be relevant in this position), Jamie sighs, latching on *kay* (line 17) then proceeding to inaugurate a new sequence herself with *New subject* (line 19).

We may note several things about this sigh token. First, it can be justifiably understood as punctuating the just-articulated negative affect by Jamie, as it occurs directly after them in a place commonly reserved for just 'post-completion stance markers' (Schegloff 1996). Second, since it occurs after a number of attempts by Jamie to implement turn-transition, the sigh may be seen as re-completing her turn, marking it as final, and furnishing another transition-relevance place. In this way, Jamie does 'being finished', one consequence of which is turn transition. Miles responds to the sigh, however minimally, with *Hunh*, indicating his understanding that some response was relevant. Lastly, the token is treated as a relevant position for inaugurating a new topic, which can be seen in Jamie's latching *kay* onto the sigh then explicitly stating *New subject* (line 19). This token encapsulates and neatly summarizes the points made in this section, that sighs may be used affectively for implementing a variety of actions, and that they are often used for turn and topic management.

4 Discussion and conclusion

If the psychophysiological literature is to be taken at face value, sighs represent involuntarily generated by-products of a given internal emotional state, be it sadness, resignation, relief, or joy. Such a scenario suggests that people have

relatively little control over the production of a sigh, which is to say, little control over the expression of emotion. However, one observation that inspired this study was the fact that sighs are conscious and controllable. Indeed, as shown above, sighs do not appear randomly in conversation, but very often show up between interactional units, specifically at the boundaries of conversational projects, sequences, and turns. What this indicates is an alternative and complementary account to the psychophysiological accounts of sighing and its relationship to emotion.

As other researchers within the interactional tradition have demonstrated for other reaction tokens and response cries, the manipulability of a conventionalized sign is important for its public social value. Many tokens in the analysis exhibited an affective component, one that arose in the sequential position where such affect would be relevant. When such affect was tangential or immaterial to talk in progress, sighs were treated differently. These positions regularly coincide with the recognizable termination of a turn, sequence, activity or project, and in such places, a display of affect may or may not be relevant. The fact that sighs occupy such junctures shows participants' understandings of the respiratory tokens as relevant for marking or invoking boundaries. In this way, the production of a sigh does not always indicate a psychological state.

At the same time, this analysis does not wholly discount the previous physiological and psychological studies. Sighs are at times attended to in conversation and at other times treated as unaccountable, which would seem to complicate the division between what is socially meaningful versus what is internally valid. Such an observation means that sighs represent something intermediate between a purely interactional act and a purely physiological or psychological one. Indeed, synergistic research on cognition and emotions points away from a distinct division between the two domains, and submits that an combined approach should be taken in which they are integrated and analyzed as interdependent (Pessoa 2010, de Oliveira-Souza et al. 2011). One aspect of the present analysis that supports such a view is the multifunctionality of sighs.

In the process of grammaticalization, a given linguistic form is reanalyzed as performing some other function, and this function is then extended to other environments. That is, the cognitive processes of reanalysis and analogy undergird grammaticalization pathways insofar as speakers and hearers are constantly rearranging their linguistic representations along paradigmatic and syntagmatic axes. The current analysis suggests that something similar is at work in the multifunctionality of sighing. A sigh may be used in non-interactional contexts to signal the end of some physical activity, as in the successful opening, pouring, and returning of the juice. This usage may then be extended to a more abstract domain, as demonstrated by the sigh emphasizing the end of a *viva voce* ritual. Once a form is abstracted and reanalyzed, it may then be applied to other domains and develop different functions. The suggested syntagmatic reanalysis for sighs is this: in punctuating the end of some project, a sigh may also be

interpreted as initiating the following project. If this reanalysis is performed, then the sigh may be used solely to preface a new project or sequence.

While a strict definition of grammaticalization allows only movement from lexical forms to more grammatical ones, I understand the process as a more generalized cognitive one whereby concrete forms become more abstract. As such, a sigh can be a genuine candidate form to undergo grammaticalization. Moreover, evidence from sign languages converges on this same conclusion. Signers make use of non-linguistic elements as sources for grammaticalization, for instance, in the development of facial expressions into grammatical markers like polar questions, topic markers, conditionals (Macfarlane 1998, Janzen 1999), and in the development of gestures into classifier constructions (Zeshan 2003). That gestures are available for manipulation in such general cognitive processes indicates that paralinguistic and non-linguistic forms, as long as they play some role in the machinery and organization of conversation, should be taken into account for a complete picture of human interaction.

Indeed, given their lack of lexical or propositional content, it is easy to see how sighs may develop discourse-pragmatic functions. As Levinson has stressed (2006a, 2006b), a fundamental element of our capacity for conversation is intention reading, specifically our ability to model what someone else is thinking about our own intentions. This underlies the conversation analytic notion of recipient design, for utterances are tailored to be recognized and understood as embodying certain actions. In this sense, then, the inherent ambiguity of sighs permits a range of interpretations, including (but not limited to) the ones detailed in the examples above. That is to say, recipients are tasked with the responsibility of making sense of the multimodal signals in interaction, and the speaker must style an utterance in a way that is accessible, intelligible, and relevant. What the present analysis contributes to this discussion is the observation that even when a supposedly inner state is overtly expressed, these expressions may be treated as accountable or not. This means that participants in conversation make decisions about whether a sigh is intended to embody an internal psychological state, whether it is being used interactionally, some combination of the two, or neither. What remains to be shown, then, is whether the interactional functions of sighs are necessarily outgrowths of their psychophysiological reflexes. Their multifunctionality suggests a physiological origin with subsequent development of interactional functions. But, their very ability to change functions over time and across cases, and even their paradoxical interpretability as positive or negative, shows a plasticity of usage and potential to take on a life of their own, a life possibly divorced from any psychological or physiological grounding. This question merits further scrutiny, and sighs, given their variable accountability in interaction, represent a fruitful area of research.

Another natural outgrowth of this analysis would be to examine sighing in video recordings of conversation. Sighs have a characteristic gestural component in the heaving of the chest and shoulders. Sighs then are visually recognizable as such, and so even if the initial inhalation is undetectable in an audio recording, the

trajectory of a sigh may be clearly visible in video. This has implications for, e.g., the precision timing of actions, since participants may recognize a sigh early in its trajectory and may thereby tailor their actions or speech-in-progress to contingently respond to whatever action they interpret the sigh to be embodying.

In conclusion, sighs are not purely functions of an inner emotional state, but are also social in nature. Their expression is often indexical of a presumed emotional state, but the actual existence of that state is not necessarily consequential for interaction. Moreover, their appearance may be devoid of a supposed inner condition, functioning instead as boundaries for the closing or opening of conversational projects.

Appendix: Discourse Transcription conventions

.	Final Intonation	..	Short Pause (.2-.3)
,	Continuing Intonation	(H)	Inhalation
—	Truncated Intonation	(Hx)	Exhalation
-	Truncated Word	%	Creaky Voice
=	Elongated Segment	@	Laughter
^	Word-level Contour Tone	(())	Researcher's Comment
[ ]	Speech Overlap	X	Indecipherable Syllable
/	Syntactic Completion	<VOX>	Speech of Another
…(.n)	Long Pause (.6 or more)	<QUOT>	Self Quotation
…	Medium Pause (.3-.5)		

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Testing the Learnability of Writing Systems

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1 Introduction

The world's sound-based writing systems differ according to the size of the typical speech chunk which is mapped to a symbol: the phone, in so-called alphabetic writing systems, and the mora, demisyllable or syllable, in so-called syllabaries. This paper reports the results of an artificial learning study designed to test whether the acoustic stability of the speech chunks mapped to symbols is a factor in subjects' ability to learn a novel writing system.

2 Background

Sound-based writing systems in the world's languages are typically classified as syllablaries or alphabetic systems (see e.g. Sampson 1990, Daniels & Bright 1996, Coulmas 2003). In true syllabaries, symbols represent possible syllables (V, CV, VC, CVC) and are atomic, not analyzable into combinations of segment-sized symbols. Japanese kana and Cree orthography, for example, use distinct symbols for speech chunks like [ka], [ki], [ku], [ke], [ko], [ta], [ti], [tu], [te], [to], etc. (see e.g. Smith 1996:211, Nichols 1996:600). In a true alphabetic system, each symbol would correspond to a single phone. Spanish is a relatively good example of an alphabetic system, though, like most alphabetic systems of any vintage, departs from canonicity (e.g. the silent "h", digraphs such as "ch", "qu").

Syllabaries are far more common, among independently evolved writing systems, than alphabets. However, most syllabaries are impure, either

incorporating alphabetic symbols in some cases or providing too few symbols to accurately transcribe all of the possible words in the language.

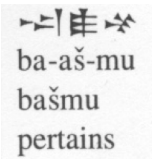
Cherokee is an example of an impure syllabary. Symbols in the Cherokee writing system generally correspond either to V or to CV, which are possible syllables in the language. There is also a symbol for [s], used to write syllables beginning with sC clusters. However, Cherokee has syllables beginning with other consonant clusters than cannot be accurately transcribed using the symbols in the inventory, below (Scancarelli 1996):

(1) Cherokee syllabary

D	a	R	e	T	i	Ꭻ	o	Ꮿ	u	i	v
Ꭶ	ga	Ꭾ	ge	Ꭹ	gi	A	go	J	gu	E	gv
Ꭲ	ka										
ᏼ	ha	Ꭿ	he	Ꭼ	hi	Ꭾ	ho	Ꭽ	hu	Ꭻ	hv
W	la	Ꮷ	le	Ꮺ	li	Ꮝ	lo	M	lu	Ꮻ	lv
Ꭷ	ma	Ꮸ	me	H	mi	Ꭾ	mo	Ꭿ	mu		
Ꮎ	na	Ꮑ	ne	Ꮒ	ni	Z	no	Ꮓ	nu	Ꮕ	nv
Ꮧ	hna										
G	nah										
Ꭴ	qua	Ꮥ	que	Ꮤ	qui	Ꮦ	quo	Ꮨ	quu	Ꮩ	quv
Ꮝ	s	Ꮞ	se	Ꮟ	si	Ꮠ	so	Ꮡ	su	R	sv
Ꮥ	sa										
Ꮭ	da	Ꮽ	de	Ꮾ	di	V	do	S	du	Ꮿ	dv
W	ta	Ꮻ	te	Ꮼ	ti						
Ꮽ	dla	L	tle	C	tli	Ꮿ	tlo	Ꮽ	tlu	P	tlv
Ꮮ	tla										
G	tsa	V	tse	Ꮹ	tsi	K	tso	Ꮺ	tsu	Ꮻ	tsv
G	wa	Ꮽ	we	Ꮾ	wi	Ꮿ	wo	9	wu	6	wv
Ꮾ	ya	Ꮿ	ye	Ꮿ	yi	Ꮿ	yo	Ꮿ	yu	B	yv

Consonant clusters not involving [s] are written with CV symbols one of whose vowels is not pronounced. This is a common strategy in syllabaries. An example is given in (2a), from Scancarelli 1996:520, in which [li]+[s] = [ls]:

(2) a. W-Ꮺ-Ꮝ-A-Ꭼ
ta-li-s-go-hi
[tʰaʔlsko:hi]
‘twenty’

b. 

Another example of how syllabaries accommodate complex syllables comes from Akkadian cuneiform, in which symbols represent V, VC and CV, and a

subset of the possible CVC syllables in the language. As shown in (2b), above, from Cooper (1996:56), CV_i and V_iC could combine into a CV_iC syllable: [ba] + [aš] = [baš].

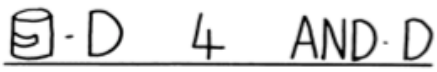
For a syllabary to be able to transcribe all possible words in a language with complex syllables, the number of symbols would have to be very large. Compromises like those in Cherokee and Akkadian cuneiform avoid this explosion, yet render the system imperfect. Why, given this frequent need to incorporate alphabetic symbols or compromise on accuracy, are syllabaries so common among independently evolved writing systems? Could there be a phonetic or phonological reason for this?

Our hypothesis, based on earlier observations (see e.g. Daniels 2009), is that symbols mapping to CV or VC speech chunks have a clear advantage over symbols mapping to phones. CV and VC speech chunks, in which each segment is cued by the other, have greater motor-acoustic stability than individual phones. The instability of single segments in psychoacoustic space has also been recognized by specialists in literacy, some of whom have advocated for teaching writing syllable-sized chunks:

> "[Two] critical cognitive problems normally are confounded in reading instruction. The first is learning that English orthography directly maps sound rather than meaning, and the second is learning that orthographic units correspond to highly abstract and inaccessible phonological segments that must be blended to form words... The barrier to acquisition of alphabetic units apears to be purely psychoacoustic: the child has difficulty in segmenting the sound-stream into phonemic chunks and therefore cannot map the discrete alphabetic units onto equivalently discrete speech units." (Gleitman & Rozin 1973:479)

Gleitman & Rozin used the above observation as the jumping-off point for a study in which young children who were struggling to learn to read in school were successfully taught writing systems in which symbols corresponded to syllables, as used in (3) to write the phrase "Candy for Andy":

(3)



3 Hypotheses

Our study compares the learnability of four different possible writing systems:

(4) Segmental: one symbol per consonant, vowel
Mora: one symbol for each CV, one for each (C) coda

Onset-Rime: one symbol for each (C) onset, one for each (VC) rime
Demisyllable: one symbol for each CV, VC

Each of these systems is phonologically motivated. The role of the segment in phonological patterns is uncontested. The role of the mora is strongly supported in languages like Japanese, where the mora governs syllable size, accent placement, and a myriad of prosodic morphology constructions (Hyman 1985, Hayes 1986). The role of the onset and rime is clearly supported by cross-linguistic patterns of poetic rhyme (Kiparsky 1981, Selkirk 1984).

The demisyllable is the only system that does not correspond to syllable-internal constituency commonly assumed by phonologists, though see Fujimura 1989, Ito & Mester 1995. However, the use of diphones is widespread in speech recognition and synthesis, and phoneticians have long recognized the key role that CV and VC transitions play in the production and perception of speech.

These possible systems are also all attested in the world's writing systems. English, with its digraphs and its many-to-one mappings between symbol and sound, is a highly imperfect example of an alphabetic system.

Japanese kana is an example of a moraic system. In Japanese, the maximal syllable is CVX, where X stands for a moraic nasal, the first half of a geminate consonant, the second half of a diphthong, or the second half of a long vowel. (C)V is one mora; X is another. There is a separate symbol for each CV chunk. The 'syllabic' nasal has its own symbol. Consonant gemination and vowel length are indicated with symbols of their own. (See e.g. Smith 1996 for an overview.)

Bopomofo, used to phonetically render Chinese characters in Taiwan, is one of the few examples of an onset-rime system. In Bopomofo, one set of symbols represent initial consonants, while another set represents possible syllable rimes (see e.g. Mair 2006:204-205).

Akkadian cuneiform exemplifies what a demisyllabic writing system might look like, though it also contains symbols for segments and CVC syllables.

Clearly, all four systems are possible ways for a human to segment and transcribe a word. But which is best? Our study tests the Acoustic Stability hypothesis, stated in (5), which ranks the four systems as indicated below:

(5) ACOUSTIC STABILITY: symbols mapping to acoustically stable speech chunks, like VC or CV, will be learned more accurately than those mapping to less stable speech chunks, like V or C.

Prediction: Demisyllable > Mora, Onset-Rime > Segment

Given that our subjects are all familiar with the alphabetic system of English, however, it is possible that they will exhibit a bias for the systems whose symbols are most similar in their sound-to-symbol mapping to English. Thus we also test the alternative hypothesis, in (6), which predicts a different ranking among the four systems being compared:

(6) ENGLISH ORTHOGRAPHY BIAS: subjects will be biased to learn new systems which are similar to the orthographies they already know. In the case of English speakers (those who participated in this study), that bias is for an alphabetic system.

Prediction: Segment > Mora, Onset-Rime > Demisyllable

4 Study procedures

In this computer-based study, subjects learned a set of symbols through exposure and assessment. Subjects were then trained, with feedback, on how to combine symbols into CVC words. Finally, subjects were tested learners on their ability to read aloud new CVC words written with the symbols they learned.

4.1 Subjects

Subjects were recruited from undergraduate classes at UC Berkeley. All were literate in English; some were also literate in other languages, including some with syllabaries (Japanese) or logographic (Chinese) writing systems. Subjects sat at a computer station wearing a head-mounted mike for the procedure, which took between 30 and 45 minutes.

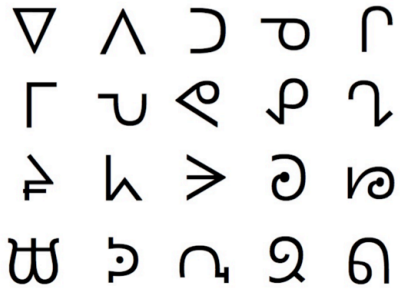
80 subjects completed the study, distributed over the conditions as in (7):

(7) Segment: 20 Mora: 22 Onset-Rime: 19 Demisyllable: 19

4.2 Symbols and symbol learning

All subjects were taught the same 20 symbols, shown in (8):

(8) Symbol set used in study



These symbols come from the (considerably larger) Cree syllabary. They were selected on the basis of a pilot study with several English-speaking subjects, who rated the full set of Cree symbols on their confusability with one another and on their resemblance to letters in the Latin alphabet. The symbols selected for this

study were optimally dispersed in terms of graphical similarity and did not strongly evoke letters in English orthography.

Symbols were associated with the speech chunks shown in (9). It was not possible to keep the number of symbols and the number of phones constant across the three conditions. Priority was given to controlling the number of symbols that subjects had to learn.

(9) Speech chunks associated with symbols in the four conditions

Segment			Onset-Rime		Mora		Demisyllable	
C1	V	C2	C	VC	CV	C	CV	VC
g	i	k	g	ik	gi	k	gi	ik
b	a	m	b	itʃ	bi	tʃ	bi	itʃ
z	o	tʃ	z	im	zi	m	zi	im
h	ɛ	s	h	am	ha	n	ha	am
ʤ		t	ʤ	as	ʤa	s	ʤa	as
w		n	w	ak	wa	t	wa	ak
d		p	d	il	ʤi	f	ʤi	il
v			v	is	wi	l	wi	is
ɹ			j	atʃ	ga	ʃ	ga	atʃ
			ɹ	ap	za	p	za	ap

Speech chunks were recorded in a sound-protected booth by a female speaker of American English. All final consonants except fricatives were audibly released into a very short (around 10 ms.) schwa-like vowel.

A randomizer was used to determine the mapping between speech chunk (V, C, CV, or VC) and symbol. For each condition, ten different randomizations were used. The purpose of randomization was to minimize the effects of any sound-symbol association bias on the part of individual subjects.

Subjects were introduced to individual symbols by being shown a symbol on the computer screen while hearing its corresponding sound value. Subjects were presented with symbols in incremental blocks. The first block contained four symbols. In the next block, four more were added. Successive blocks added three symbols each. The sequence of the symbols shown within a block was randomized. Sampling (within a block) was done with replacement, so that the same symbol might appear multiple times within one block.

Each block of symbols was presented twice, followed by an assessment to determine how accurately subject had learned the symbols. Assessment consisted of subjects choosing, from a grid of all 20 symbols, the symbol corresponding to the sound they heard through the speaker. The location of symbols in the grid

changed with each assessment so that subjects were being tested on their memory of the symbol, not its location. A subject who scored 80% or higher on an assessment was permitted to move to the next block. Otherwise, the subject repeated the block and was assessed again. In order to stay within the one-hour time constraint, a subject was moved to the next block after 4 assessments, even with a score below 80%. The minimum number of assessment blocks an individual subject could experience was 6; the maximum was 24.

4.3 Combination training

Following the symbol training phase, subjects were trained on how to combine symbols into CVC "words". In order not to expose subjects during combination training to any of the CVC combinations used later in the testing phase, the training phase combined each of the 'test' sounds with a 'filler' sound (Figure 10):

(10) Speech chunks associated with symbols in the four conditions

	Segment			Onset-Rime		Mora		Demisyllable	
	C1	V	C2	C	VC	CV	C	CV	VC
Test sounds	g	i	k	g	ik	gi	k	gi	ik
	b	a	m	b	itʃ	bi	tʃ	bi	itʃ
	z		tʃ	z	im	zi	m	zi	im
	h		s	h	am	ha	n	ha	am
	ʤ			ʤ	as	ʤa	s	ʤa	as
	w			w	ak	wa	t	wa	ak
Filler sounds	d	o	t	d	il	ʤi	f	ʤi	il
	v	ɛ	n	v	is	wi	l	wi	is
	ɹ		p	j	atʃ	ga	ʃ	ga	atʃ
				ɹ	ap	za	p	za	ap

The training items are presented in Figure 11. The set of training items varies across the conditions as a consequence of the need to introduce each test symbol in in combination with a filler symbol (as in Figure 10):

(11) Training items

Segment			
got	zɛt	ʤop	dit
gɛk	zok	ʤotʃ	dap
gom	zos	ʤɛs	vat
bɛn	hon	wɛn	vin
bɛtʃ	hɛm	wɛk	ran
bos	hɛtʃ	wom	rip

Onset-Rime			
gil	gis	dik	vik
bil	bis	ditʃ	vitʃ
zil	zis	dim	vim
hatʃ	hap	jam	ram
ʤatʃ	ʤap	jas	ras
watʃ	wap	jak	rak

Mora			
gif	gil	ʤik	wik
bif	bil	ʤitʃ	witʃ
zif	zil	ʤin	win
haʃ	hap	gam	zam
ʤaʃ	ʤap	gas	zas
waʃ	wap	gat	zat

Demisyllable			
gil	gis	ʤik	wik
bil	bis	ʤitʃ	witʃ
zil	zis	ʤim	wim
hatʃ	hap	gam	zam
ʤatʃ	ʤap	gas	zas
watʃ	wap	gak	zak

Subjects had five seconds from the moment of exposure to read the CVC word aloud. The correct recording of the word was subsequently played aloud for the subject as guidance, providing feedback and reinforcement of symbol training.

4.4 Testing

After symbol learning and combination training, subjects were tested on their ability to read aloud novel CVC words constructed from the symbols they had learned. In the testing phase, subjects were shown 18 novel symbol combinations whose phonetic transcriptions are given in Figure 12:

(12) Test items

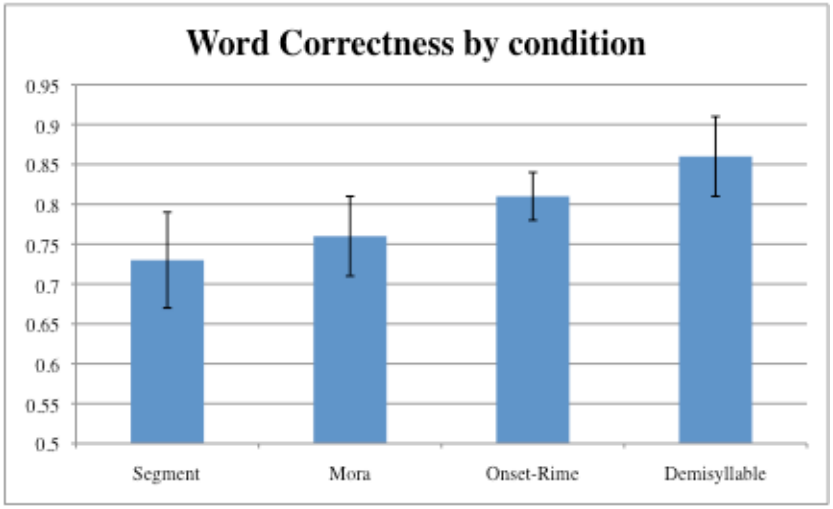
gik	gitʃ	gim	ham	has	hak
bik	bitʃ	bim	ʤam	ʤas	ʤak
zik	zitʃ	zim	wam	was	wak

Subjects were instructed to read the word in the five-second recording time frame, but were not given guidance on their level of correctness. The information from these final recordings was coded for accuracy and reaction time.

5 Results

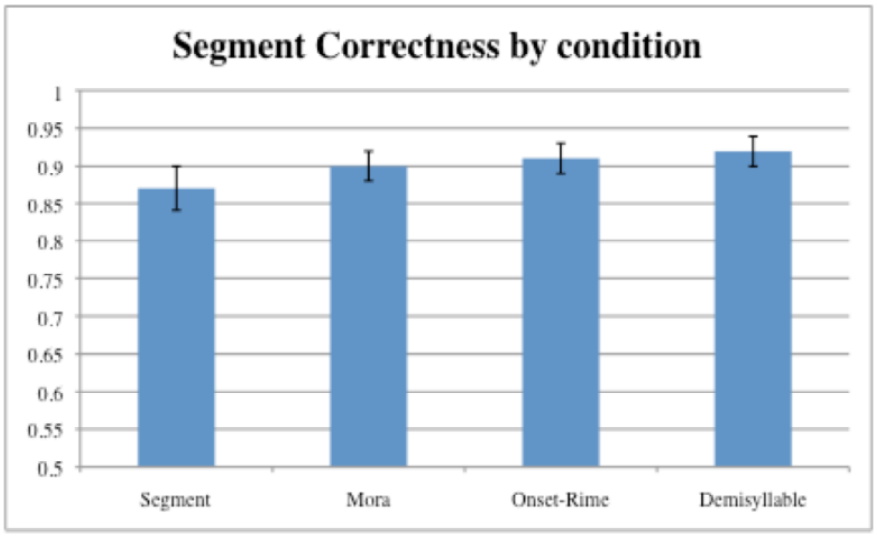
The accuracy data support the Acoustic stability hypothesis over the Alphabetic familiarity hypothesis. Figure 13 illustrates performance on the four conditions, measured by overall correctness on the 18 test items. Participants in the Demisyllable condition were most accurate (86%) than those in the Segment condition (73%), with Mora (76%) and Onset-Rime (81%) in between. The difference between Demisyllable and Segment did not, however, reach statistical significance ($p < .096$ on a 2-tailed t-test).

(13)



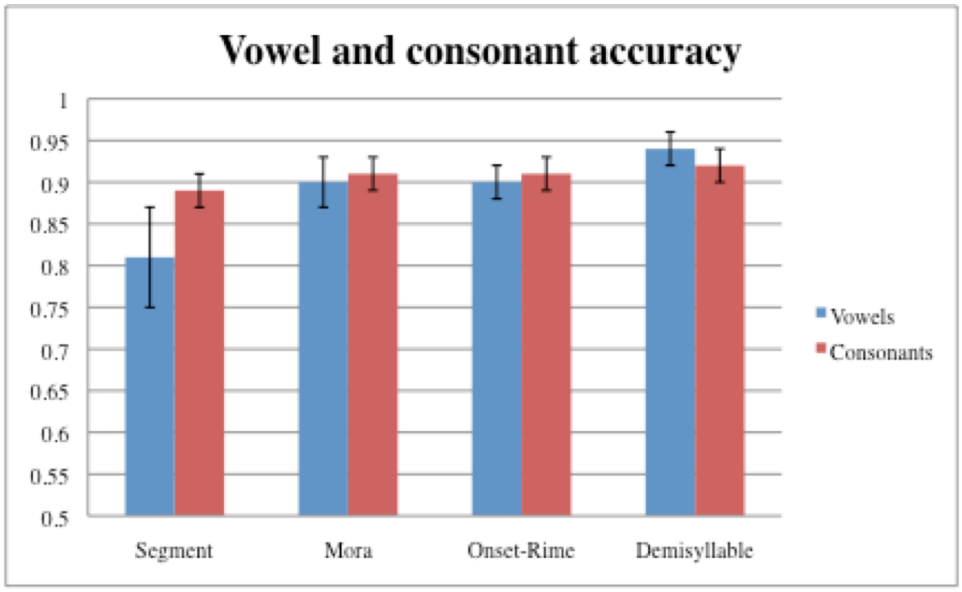
Examination of accuracy at the segmental level revealed a similar distribution. Subjects in the Demisyllable condition were the most accurate, overall, on each indvidual segment in the test words (92%) vs. subjects in the Segment condition (87%) (14):

(14)



Overall segment accuracy differences across conditions did not reach statistical significance. However, significant differences did appear when vowel and consonant accuracy were examined separately. Vowel accuracy was 94% in the Demisyllable condition vs. only 81% in the Segment condition ($p < .05$ on a 2-tailed t-test). Consonant accuracy did not differ across the four conditions (15).

(15)



Learning the mapping between a vowel phone and a symbol appears to be significantly enhanced when the vowel is part of a VC or CV chunk in which the

transitions provide cues to vowel quality. This is consistent with the Acoustic Stability hypothesis. (Recall that individual consonants, other than fricatives, were produced with a vocalic release in the audio stimuli; this may explain why consonant accuracy did not vary across the conditions. Perhaps all consonants derived sufficient benefit from vocalic cues.) In conclusion, the accuracy results support the Acoustic Stability hypothesis over the Alphabetic Familiarity hypothesis.

6 Discussion

Two confounding factors must be addressed before accepting the conclusion that the Acoustic Stability hypothesis has been supported: symbol count and phonetic space. Each predicts that the Segment condition will be more difficult for subjects and that the other three will be equally difficult.

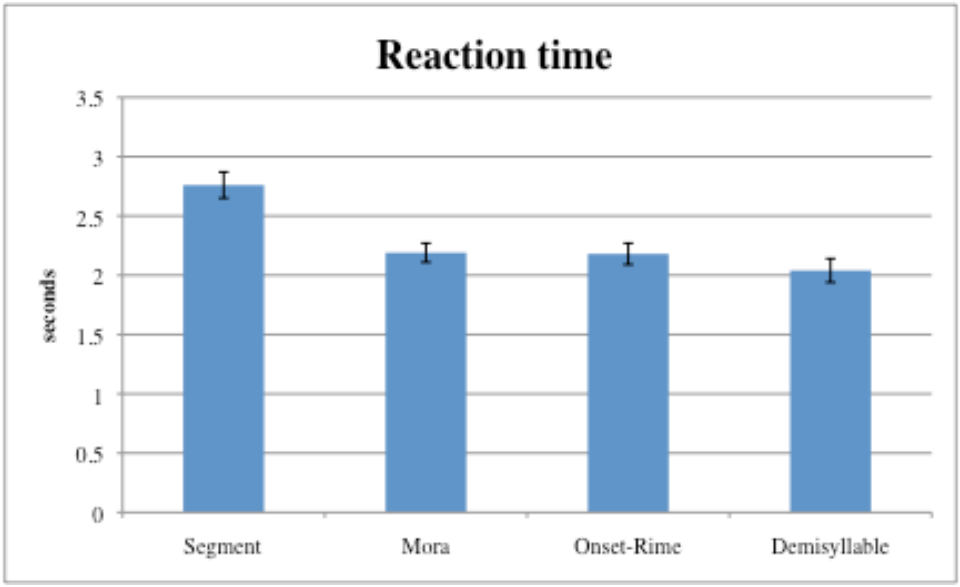
6.1 Symbol count

While the study controlled the number of symbols that subjects had to learn, symbol count in combination training and testing items differed across the three conditions. The Scgment condition required subjects to process strings of three symbols, while the other conditions used only two symbols to write CVC words. If symbol count is a factor, then subjects would be predicted to perform less well in the Segment condition than in the other three conditions.

As seen, subjects did perform less accurately in the Segment condition. However, we also observed differences in performance across Mora, Onset-Rime and Demisyllable conditions that cannot be attributed to symbol count.

What does correlate particularly well with symbol count is reaction time (RT). We measured the time each subject took to start speaking in the testing phase. (Sometimes subjects provided two responses — an original and a correction — in the time allotted; in such cases we did not include RT in the averages reported below.) RT for the segment condition, at 2.76 seconds, was considerably higher than RT in the other three conditions (2.19 seconds for the Mora condition, 2.18 for the Onset-Rime condition, and 2.04 for the Demisyllable condition). Pairwise comparisons in RT between Segment and each of the other three conditions were significant ($p < .01$, according to a 2-tailed t-test).

(16)



It is of course not surprising that subjects would take longer to compute and read aloud a string of 3 symbols, vs. a string of 2 symbols.

6.2 Phonetic space

The four conditions differed in the phonetic space defined by the set of phones used in the speech chunks mapping to symbols. While the set of phones employed in testing was identical (because the test items were identical) across conditions, the conditions differed in the number and type of filler symbols needed to introduce all of the symbols in combination training while avoiding any combinations used in testing. Figure 17 lists the phone sets required:

(17)

	C1									V				C2								
	g	b	z	h	ʤ	w	d	v	r	j	a	i	o	ɛ	k	ʧ	m	s	t	p	n	l	f	ʃ
Demi																								
Mora																								
Onset-Rime																								
Segment																								

The size of the phonetic space that a set of symbols could be used to describe might be expected to correlate positively with difficulty of learning the system. Phonetic space can be computed either additively or multiplicatively. Either

method produces a scale in which the Demisyllable condition has the smallest phonetic space and the Segment condition has the largest.

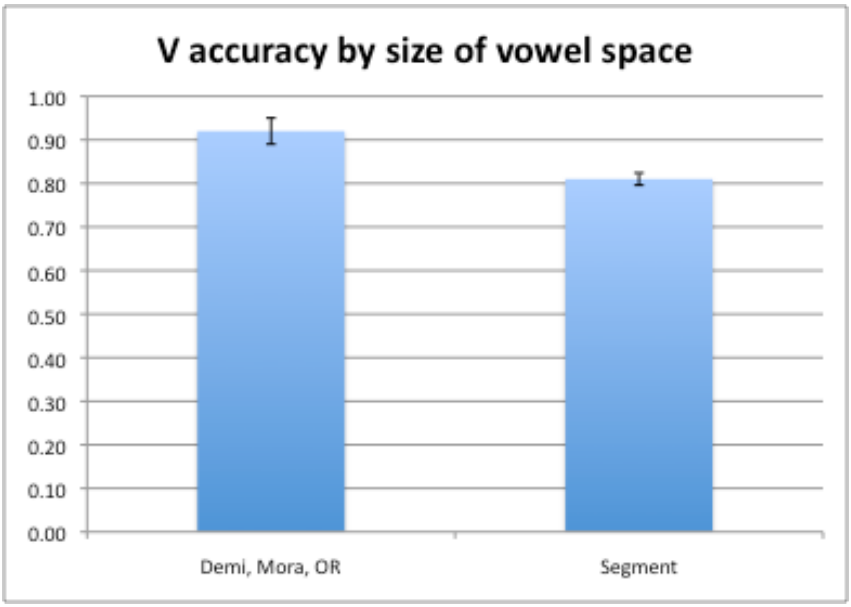
(18) Phonetic space

	Additive (# of phones)	Multiplicative (# of CVC words constructable from phone set)
Demi	14	6*2*6 = 72
Mora	18	6*2*10 = 120
Onset-Rime	18	10*2*6 = 120
Segment	20	9*4*7 = 252

The resulting ordering is consistent with the ordering predicted by the Acoustic Stability hypothesis, creating doubt as to which factor is the most explanatory: Acoustic Stability, phonetic space, or (as discussed just above) symbol count?

We can address this question by focusing on vowels. As observed earlier, vowel accuracy is the dimension on which subjects differed most sharply across the conditions. The figure below plots vowel accuracy by (additive) vowel phonetic space. Subjects in the Segment condition, with 4 vowel phones, displayed 94% phonetic accuracy on vowels in testing, while subjects in the other three conditions, all of which had 2 vowel phones, were accurate on 89% of their vowels. This difference is significant ($p < .01$).

(19)



Vowel phone count correlates with symbol count (in training and testing items) in how it divides the conditions into groups. This makes it difficult to know whether

vowel phone count, symbol count or acoustic (in)stability is the cause of the observed poorer accuracy of subjects in the Segment conditions.

However, only the Acoustic Stability hypothesis predicts differences among Mora, Onset-Rime and Demisyllable conditions. Our results do show differences, but they are not statistically significant. Follow-up studies with more statistical power are needed to illuminate these suggestive findings.

7 Conclusions and implications

The findings from this study show that despite the inevitable bias in favor of alphabetic systems our subjects brought to the study, they performed better at learning nonalphabetic writing systems. Our results clearly show that subjects performed better in the Demisyllable condition than in the Segment condition. Whether this is due to acoustic stability of symbols (our hypothesis) or to the confounding factors of symbol count or phonetic space, the implications for literacy teaching are clear: people will learn a writing system better if the symbls are presented to them in speech chunks larger than the individual phone.

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Quantifier Float, Focus, and Scope in Thai

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1. Introduction

There are two divergent views on the proper analysis of Q(uantifier)-float. On one hand, the adverbial position of floated quantifiers (FQs) indicates that they are verbal adjuncts (Dowty and Brodie 1984, Bobaljik 1995, Doetjes 2007, Nakanishi 2007). On the other hand, locality restrictions on Q-float support the idea that it involves movement (Belletti 1982, Kayne 1984, Sportiche 1988, Miyagawa 1989, Miyagawa and Arikawa 2007).

Q-float in Thai is no exception. Adverbs occur at the right edge of the VP, and this is where we find FQs in Thai as well, as (1b) shows.

(1) a. *nák.rian* ***thúk-khon*** [$_{\text{VP}}$ *ʔaan nàŋsʉ̌ʉ*] *mʉ̂ʉawaanníi*
student every-CLF^{person} read book yesterday

b. *nák.rian* [$_{\text{VP}}$ *ʔaan nàŋsʉ̌ʉ*] *mʉ̂ʉawaanníi* ***thúk-khon***
student read book every-CLF yesterday
(both) 'Every student read a book.'

At the same time, there are syntactic restrictions on which nouns can host FQs. For example, while objects can host FQs (2a), genitive NPs cannot (2b):

(2) a. *Pong cà* [$_{\text{VP}}$ *hây* [$_{\text{DP}}$ *nǎŋsʉ̌ʉ khɔ̌ɔŋ dèk* ***thúk-khon***] *kàp Nít*]
Pong IRR give book POS child every-CLF to Nit
'Pong will give every child's book to Nit.'

b. **Pong cà* [$_{VP}$ *hây* [$_{DP}$ *nǎŋsǔu khɔ̌ɔŋ dèk*] *kàp Nít*] ***thúk-khon***
Pong IRR give book POS child to Nit every-CLF

The basic generalization, as we will see below, is that only nouns which are arguments of the main predicate can host FQs.

Another phenomenon, Quantifier Raising (QR) has been argued to account for inverse scope in examples like the following (May 1985):

(3) Some student read every book.
a. [Every book$_y$ [Some student$_x$ [x read y]]]
b. [Some student$_x$ [Every book$_y$ [x read y]]]

Quantifier Raising (QR) has been independently claimed to possess similar properties as Q-float. First, recent analyses of QR have been argued to target a position between VP and TP, often analyzed as an adjunct (Hornstein 1995, Beghelli and Stowell 1997, Johnson and Tomioka 1997, Fox and Nissenbaum 1999, Fox 2000). Second, QR is subject to locality constraints, applying within a CP or DP (May 1985, Reinhart 1997). I argue below that Q-float and QR share these properties because Thai Q-float is overt QR (Jenks 2011). I will show that Q-float from both subjects and objects in Thai targets a position adjoined to vP, where it is interpreted. I propose that Q-float involves movement of the entire DP, and that it is only the pronunciation of these elements which is discontinuous. Unlike in the analysis of Jenks (2011), however, I will argue that Q-float is driven by focus on the floated quantifier, following Simpson (2011). This is unsurprising, as other rightward movement phenomena such as heavy-NP shift and subject inversion are associated with focus on the rightward element.

Section 2 outlines the basic properties of Q-float in Thai, including its effect on quantifier scope. Section 3 introduces the QR-based analysis of Q-float. Section 4 introduces the role of focus, and section 5 sketches how the focus facts can be integrated with the QR-based analysis of Q-float.

2. Properties of Quantifier Float in Thai

In this section I summarize three properties of Q-float in Thai, which will form the basis for my analysis. These properties are: 1) Q-float is general, meaning it is able to apply to any quantifier, 2) Q-float is sensitive to locality restrictions, reminiscent of movement phenomena 3) Q-float affects the scope of quantifiers relative to negation. The role of focus is discussed later, in section 4.

2.1. Locality Restrictions on Quantifier Float

Q-float in Thai is quite free, as FQs can be associated with subjects (19b), direct objects (5), and indirect objects (6) (Wongbiasaj 1980):

(4) SUBJECT QUANTIFIER FLOAT

a. *nák.rian* ***thúk-khon*** / ***săam-khon*** [$_{VP}$ *ʔaan nàŋsŭu*] *mûuawaannii*
student every-CLF^{person} / 3-CLF read book yesterday

b. *nák.rian* [$_{VP}$ *ʔaan nàŋsŭu*] ***thúk-khon*** / ***săam-khon*** *mûuawaannii*
student read book every-CLF / 3-CLF yesterday
(both) 'All the students/Three students read a book.'

(5) OBJECT QUANTIFIER FLOAT

a. *nák.rian* [$_{VP}$ *ʔaan nàŋsŭu thúk-lêm* / ***săam-lêm***] *lɛ́ɛw*
student read book every-CLF^{volume} / 3-CLF already

b. *nák.rian* [$_{VP}$ *ʔaan nàŋsŭu*] *lɛ́ɛw* ***thúk-lêm*** / ***săam-lêm***
student read book already every-CLF / 3-CLF
(both) 'The students have already read every book/three books.'

(6) INDIRECT OBJECT QUANTIFIER FLOAT

a. *Tát* [$_{VP}$ *hâi năŋsŭu kaʔ dèk* ***thúk-khon*** *pai*]
Tat give book to child every-CLF^{person} PRF

b. *Tát* [$_{VP}$ *hâi năŋsŭu kaʔ dèk pai*] ***thúk-khon***
Tat give book to child PRF every-CLF^{person}
(both) 'Tat gave books away to every child.'

Regardless of the position of its nominal host, Thai FQs appear in a position on the right edge of the clause, basically the same position where adverbs appear.

As was discussed in the introduction, however, there are clear locality restrictions on Q-float. Thus, quantifiers cannot float from genitives (7), noun complements (8):

(7) NO Q-FLOAT FROM GENITIVES

a. *Pong cà* [$_{VP}$ *hây* [$_{DP}$ *năŋsŭu khɔ̌ɔŋ dèk* ***săam-khon***] *kàp Nít*]
Pong IRR give book POS child 3-CLF to Nit
'Pong will give the three children's book to Nammon tomorrow.'

b. * *Pong cà* [$_{VP}$ *hây* [$_{DP}$ *năŋsŭu khɔ̌ɔŋ dèk*] *kàp Nít*] ***săam-khon***
Pong IRR give book POS child to Nit 3-CLF

(8) NO Q-FLOAT FROM NOUN COMPLEMENTS

a. *Jôo wâat* [$_{DP}$ *phâap mǎa* ***săam-tua***] *lɛ́ɛw*
Joe draw picture dog 3-CLF^{animal} already
'Joe drew three pictures of dogs already.'

b. * *Jôo wâat* [$_{DP}$ *phâap mǎa*] *lɛ́ɛw* ***săam-tua***
Joe draw picture dog already 3-CLF

Q-float also cannot apply out of relative clauses (Simpson 2004, ex. 43):

(9) NO Q-FLOAT OUT OF RELATIVE CLAUSES

a. *phǒm khəəj cəə* [$_{DP}$ *phûu-chaaj* [$_{CP}$ *thîi mii rót* ***kwaa-sìp-khan***]]
I PRF meet man REL have car exceed-10-CLF
maa lɛ́ɛw.
ASP already
'I have met men who have owned more than 10 cars.'

b. * *phǒm khəəj cəə* [$_{DP}$ *phûu-chaaj* [$_{CP}$ *thîi mii* ***rót***]] *maa lɛ́ɛw*
I PRF meet man REL have car ASP already
kwaa-sìp-khan.
exceed-10-CLF

Finally, Q-float cannot be hosted by a noun phrase contained within an adjunct PP (Wongbiasaj 1980):

(10) NO Q-FLOAT OUT OF PREPOSITIONAL PHRASES

a. *Bill róp nai sanǎamróp* ***thúk*-hɛŋ** *yàaŋ-klâahǎan*
Bill fight in battlefield every-CLF^{place} bravely
'Bill fought bravely in all the battlefields.'

b. * *Bill róp nai sanǎamróp yàaŋ-klâahǎan* ***thúk*-hɛŋ**
Bill fight in battlefield bravely every-CLF^{place}
'Bill fought bravely in all the battlefields.'

The basic generalization which covers these examples is that Q-float can only be hosted by nominal arguments of the predicate to which the FQ attaches.

2.2. All Quantifiers Can Float

Quantifier float in Thai is not only liberal in the positions that can host quantifier float, but nearly all quantifiers can float in Thai, including strong quantificational determiners (19b), numerals (19b), modified numerals (11), and weak quantificational determiners (12):

(11) *nák-riian [ʔaan nǎŋsǔu*] ***sǎam-kwaa-khon***
student read book three-exceed-CLF
'More than three students read (a book).'

(12) *nák-riian [kin khâaw lɛ́ɛw*] ***lǎaj-khon***
student eat rice already several-CLF
'Several students have already eaten.

All of the quantificational elements above must occur with a classifier, but at least one quantifier which does not require a classifier also floats, the universal quantifier *tháŋ-mòt*:

(13) *nák-riian [kin khâaw lɛ́ɛw*] **tháŋ-*mòt***
student eat rice already all-finish
'All the students are already asleep.'

This fact precludes the possibility that the ability for quantifiers to float in Thai is dependent on the presence of the classifier.

While nearly all of these quantifiers can float in Thai, the distributive operator *tɛ̀ɛlá?-khon* 'each' cannot float:

(14) a. *nák-riian* **tɛ̀ɛlá?-khon** *[kin khâaw lɛ́ɛw*]
student each-CLF eat rice already
'Each student read a book.'

b. * *nák-riian [kin khâaw lɛ́ɛw*] **tɛ̀ɛlá?-khon**
student eat rice already each-CLF

In addition, the quantifier *sùuan-mâak* 'majority' cannot float:

(15) a. *nák-riian* **sùan-mâak** *[kin khâaw lɛ́ɛw*]
student part-many eat rice already
'Most students read a book.'

b. * *nák-riian [kin khâaw lɛ́ɛw*] **sùan-mâak**
student eat rice already part-many

There is reason to believe that neither of these elements are true quantifiers. The more obvious case is *sùan-mâak* 'majority,' literally 'part-a.lot.' English *most* is ambiguous between a majority reading and and relative reading, only the latter of which has quantificational semantics. Thai *sùan-mâak* lacks the relative reading (Boškoviċ and Gajewski to appear).[1] The other unfloatable element is *tɛ̀ɛ-lá?-khon* 'each,' literally 'but-per.' As the semantic components of this morpheme are associated with disjunction and distribution, I propose that *tɛ̀ɛ-lá?-khon* is a distributive operator rather than a quantifier, leaving the details of this proposal for further work.

With these two cases put tentatively aside, I conclude that every element with clearly quantificational semantics can float in Thai. This means that whatever Thai Q-float is, it should be a process that applies to quantifiers generally.

2.3. The Effect of Quantifier Float on Scope

Q-float in Thai has a clear effect on quantifier scope relative to negation:[2]

(16) a. Q-float lowers the scope of subject quantifiers relative to negation.
b. Q-float raises the scope of object quantifiers relative to negation.

[1] According to Boškoviċ and Gajewski (to appear), this is a property of languages which lack overt articles, which is true of Thai.

[2] Sentences with multiple quantifiers are more complex, allowing inverse readings regardless of whether Q-float applied.

Evidence for the lowering effects of Q-float on subject quantifier comes from the indefinite quantifier *sák*, which is unavailable in subject position in Thai (17a), a fact which is related to the definiteness of Thai subjects (Ekniyom 1982). Below negation, this quantifier must have an NPI interpretation (17b):

(17) a. * *nák-riian* ***sák-khon*** *yaŋ* ***mâj*** [$_{VP}$ *kin khâaw*]
student even.one-CLF still NEG eat rice
'Not even one student has eaten.' (Intended)

b. *ʔaacaan yaŋ* ***mâj*** [$_{VP}$ *tii nák-riian* ***sák-khon***]
teacher still NEG hit student even.one-CLF
'Teachers haven't hit even one student'

Yet *sák* can occur as a subject-hosted FQ, saving (17a) and resulting in an NPI interpretation for the quantifier:

(18) *nák-riian yaŋ* ***mâj*** [$_{VP}$ *kin khâaw*] ***sák-khon***
student still NEG eat rice even.one-CLF
'Not even one student has eaten.'

Quantifier scope data point to the same conclusion. While subject Qs must scope above negation (19a), subject-hosted FQs can scope below negation (19b):

(19) a. *nák-riian* ***thúk-khon*** *(yaŋ)* ***mâj*** [$_{VP}$ *kin khâaw*]
student every-CLF still NEG eat rice
'Every student still hasn't eaten.' $\forall > \neg$, $*\neg > \forall$

b. *nák-riian (yaŋ)* ***mâj*** [$_{VP}$ *kin khâaw*] ***thúk-khon***
student still NEG eat rice every-CLF
'Every student still hasn't eaten.' $\forall > \neg$, $\neg > \forall$

Q-float shows the opposite effect on object quantifiers. While quantifiers in object position must scope below negation (20a), object FQs can scope above negation (20b):

(20) a. *Joe* ***mâj*** [$_{VP}$ *phóp nákriian* ***thúk-khon*** *]* *mûuawaannii*
Joe NEG meet student every-CLF yesterday
'Joe didn't meet all of the students yesterday' $*\forall > \neg$, $\neg > \forall$

b. *Joe* ***mâj*** [$_{VP}$ *phóp nákriian*] *mûuawaannii* ***thúk-khon***
Joe NEG meet student yesterday every-CLF
'Joe didn't meet all of the students yesterday' $\forall > \neg$, $\neg > \forall$

The scopal effects of Q-float from subject and object position relative to negation is summarized below:

(21)

		$\forall > \neg$	$\neg > \forall$
Subject-Q	NP-$\forall \ldots \neg \ldots$		*
Subject-FQ	NP $\ldots \neg \ldots \forall$		
Object-Q	$\neg \ldots$ NP-$\forall \ldots$	*	
Object-FQ	$\neg \ldots$ NP $\ldots \forall$		

While the examples related to scope above are illustrated for universal quantifiers, these facts seem to be quite general, holding for both strong and weak quantifiers.

One pressing question is how to account for the scopal ambiguity of FQs relative to negation, the answer to which will reveal the structural position of the FQ. Assuming semantic scope is dependent on syntactic c-command (Reinhart 1983), there are two possibilities. First, the FQ might be attaching at two different positions, either above or below an invariant position for negation. Second, negation might be occurring in two positions, above or below the attachment site for FQs.

The position of negation is variable in Thai, lending plausibility to the second approach. First, Visonyangoon also argues that negation is a verbal specifier, as it does not license ellipsis, unlike other verbal heads (p. 132):

(22) a. *khǎw dùu thiiwii, tɛ̀ɛ chǎn* ***mâj*** *duu*
3P watch T.V. but 1P.SG NEG watch
'He watches T.V. but I don't.'

b. **khǎw dùu thiiwii, tɛ̀ɛ chǎn* ***mâj***
3P watch T.V. but 1P.SG NEG

She further demonstrates that negation can occur in multiple positions (p. 166):

(23) *khǎw* ***mâj*** *nâa-càʔ* ***mâj*** *tɔ̂ŋ* ***mâj*** *tham ŋaan*
3P NEG should NEG must NEG do work
'It is unlikely that he does not have to not work.

In light of these facts, I take the variable scope of FQs in (19b) and (20b) to correspond to two positions for negation. Clausal negation is marked in the (inner) specifier of TP, while constituent negation of VP is marked in the specifier of VP. Assuming the FQ to be right-adjoined to an intermediate vP, the two scopal possibilities of these examples are predicted:

(24) STRUCTURES FOR THE TWO READINGS OF (19b)

a. [$_{TP}$ *nák-riian* T^0 [$_{vP}$ [$_{vP}$ **mâj** *kin khâaw*] **thúk-khon**]]

b. [$_{TP}$ *nák-riian* **mâj** T^0 [$_{vP}$ [$_{vP}$ *kin khâaw*] **thúk-khon**]]

This analysis makes several desirable predictions. The higher position of negation can be disambiguated in negative past tense forms. In this case, negation scopes above FQs:

(25) *nák-riian* ***mâj*** *dâj chɔ̂ɔp kin ʔahǎan-faràŋ* ***thúk-khon***
student NEG PST like eat food-Western every-CLF
'Every student didn't like to eat Western food.' *$\forall > \neg$, $\neg > \forall$

Furthermore, VP-fronting in Thai, triggered by *dâj* 'can' and other modals (Visonyanggoon 2000, Simpson 2001), clearly shows that an account based on the variable position of negation is correct:

(26) a. *nákrian* ***thúk-khon*** $[_{vP}$ *klap bâan* $]_i$ *mâj dâj* t_i
student every-CLF return home NEG can
'Every student can't return home.' $\forall > \neg$, *$\neg > \forall$

b. *nákrian* $[_{vP}$ *mâj klap bâan* $]_i$ *dâj* t_i ***thúk-khon***
student NEG return home can every-CLF
'Every student can not return home.' $\forall > \neg$, *$\neg > \forall$

c. *nákrian* $[_{vP}$ $[_{vP}$ *klap bâan*] ***thúk-khon*** $]_i$ *mâj dâj* t_i
student return home every-CLF NEG can
'Every student can't return home.' *$\forall > \neg$, $\neg > \forall$

d. *nákrian* $[_{vP}$ *klap bâan* $]_i$ *mâj dâj* t_i ***thúk-khon***
student return home NEG can every-CLF
'Every student can't return home.' $\forall > \neg$, $\neg > \forall$

Example (26a) shows a subject quantifier in a sentence with the negated sentence-final modal *dâj*, a verbal auxiliary which forces its complement to be fronted.[3] In (26b) the verb is negated below the auxiliary. As clausal negation is only available when the highest auxiliary, here *dâj*, is negated, this example must be interpreted with constituent negation on the verb. This position for negation must be interpreted under the scope of the floated quantifier. In (26c), the situation is reversed: the FQ is fronted along with the VP, and there it must scope below clausal negation on the auxiliary. This is predicted by the lower position of the FQ relative to negation before movement. Interestingly, (26b-26c) also indicate that the FQ can attach to distinct positions when multiple auxiliaries are present — a well-known property of Q-float in English and French (Sportiche 1988). Further evidence for this conclusion comes from the fact that when the subject quantifier is floated to a position after the negated modal in (26d), it again has ambiguous scope relative to negation, perhaps due to multiple positions for the FQ.

So, we can conclude, while the position of both negation and the FQ are variable, both attaching to verbs and their auxiliaries, the relative scope of these elements is directly read off their surface position. This was also true for quantifiers in subject and object position in Thai, which we saw scope rigidly relative to negation

[3] Note that this modal is homophonous to the 'past' form *dâj* in (), both grammaticalized from a homophonous verb meaning 'get,' which develops to a wide range of related meanings in Southeast Asia (Enfield 2003).

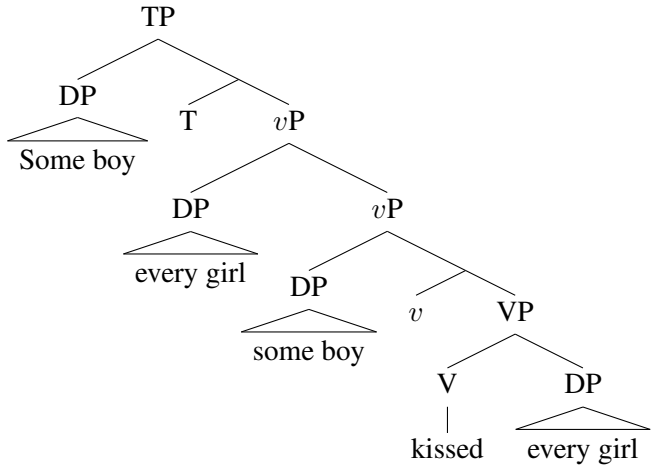
as well. The fact that Thai Q-float has rigid scope means that it is like all other attested cases of Q-float, which have been shown to create scopally rigid structures (Williams 1982, Dowty and Brodie 1984).

3. Quantifier Float as Quantifier Raising

This section lays out the connection between Q-float in Thai and the semantic operation of Quantifier Raising (QR) (May 1985). Postulating syntactic movement of quantifiers (QR) accounts for a number of problems in the syntax-semantics interface, among them scopal ambiguity of sentences with multiple scope-bearing elements in English, problems in ellipsis related to Antecedent-Contained Deletion, and the mismatch between the type required by a verb of its object (type e) and the type of generalized quantifiers (type $\langle et, t\rangle$) (e.g. Heim and Kratzer 1998, ch. 7).

While the traditional analysis of May (1985) analyzed QR as A-bar adjunction to S (=TP), this view was problematic because QR turns out to be "roughly clause-bound" (Reinhart 1997), while other forms of A-bar movement can apply across clauses. In response to this discrepancy, more recent analyses of QR view it as targeting the middle of the clause (Hornstein 1995, Beghelli and Stowell 1997, Johnson and Tomioka 1997, Fox and Nissenbaum 1999, Fox 2000). For subjects, this means reconstructing to their base position in vP. For objects, this means scrambling to a position past the trace of the subject:

(27) QR to the English *mittelfeld*



If we maintain a uniform interpretation for object quantifiers, the object-QR option in (27) is obligatory. On the other hand, whether the subject quantifier is reconstructed depends on the desired scopal interpretation of the subject.

We can translate this perspective on QR directly to the facts about Thai Q-float and scope established in the previous section. If we view the surface position of FQs as transparently reflecting the application of QR, the position of FQs adjoined to vP, and their rigid scope, follows directly:

(28) a. *Subject Q-float as QP-movement*
$[_{TP}$ [QP$_i$ student every-CLF] $[_{vP}$ t_i $[_{vP}$ read book]]]

b. *Object Q-float as QP-movement*
$[_{TP}$ student $[_{vP}$ [QP$_i$ book every-CLF] $[_{vP}$ read t_i]]]

In addition to accounting for the scopal effects of Q-float, positing movement also accounts for the locality restrictions Q-float, as [Spec, vP] is an A-position, restricted to nominal arguments of the verb. In addition, by equating Q-float with QR, we can explain why it is such a general process in Thai, as all quantifiers must take scope.[4]

There are two gaping holes in the Q-float as QR analysis, though. First, while specifiers (e.g. subjects and topics) generally occur on the left in Thai, FQs occur on the right, contra the predictions of the 'reconstruction' analysis. While the QR analysis predicts that the nominal restriction of the FQ should occur with the FQ, it is instead occurring in its case position adjacent to the verb. In the following section, I argue that the explanation for both of these problems comes from the fact that QFs are pragmatically marked, as they always represent new, or focused, information.

4. Quantifier Float and Focus

It is well-known that whether information is discourse-new predicts the occurrence of phenomena such as English inversion (Birner 1994). Thai Q-float is analogous to inversion in the sense that it involves the rightward dislocation of new information. Q-float has been associated with focus in Japanese (Takami 2001, cited in Nakanishi 2008), as well as Burmese and Thai (Simpson 2011). In this section, I will expand on Simpson's evidence that Q-float in Thai is associated with focus on the quantifier. The notion of focus I am relying on here is what Kiss (1998) calls *information focus*, which is simply the discourse-new information provided by an utterance.

The first way of seeing that Q-float is associated with new information on the quantifier is in presentational contexts, where the existence of the relevant group or individual is being asserted (Simpson 2011, ex. 65):

(29) *mii dèk maa ŋaanpaatîi raw sìisìp-kwàa khon*
have child come work.party around forty-plus CLF
'There were more than forty children that came to the party.'

It is important to note that these are necessarily existential, hence quantificational uses of indefinites. A sentence like (29) can be used in a context where we already know that children came to the party; only the quantifier is discourse new.

[4] The locality conditions on QR are different from the locality conditions on Q-float: QR allows possessors and objects of prepositions to take inverse scope, for example, a fact which May (1985) attributes to the possibility of adjunction to the XP containing the quantifier, allowing it to c-command out. I will return to this issue below

Quantity questions also provide evidence that Q-float is associated with new information on the quantifier. As predicted, quantity questions and their answers are preferentially floated:[5]

(30) Q: *nákriian chɔ̂ɔp kin ʔahǎan-faràŋ kìi-khon?*
student like eat food-western how.many-CLF
'How many students like to eat western food?'
A: *(nákriian chɔ̂ɔp kin ʔahǎan-faràŋ) sǎam-khon*
student like eat food-western 3-CLF
'Three students like to eat western food.'

The quantifier can stand alone as the answer to the question above, licensing ellipsis of the rest of the sentence.

Another context where an FQ licenses ellipsis is in fragment answers to polar questions, which in Thai must be verbal elements, either verbs or a certain subclass of adjectives and adverbs, including temporal adverbs (Noss 1964, pp. 120-121):

(31) Q: *Nít chɔ̂ɔp kin ʔahǎan-faràŋ mǎj?*
Nit like eat food-western YNQ
'Does Nit like to eat western food?'
A: *chɔ̂ɔp (kin)*
like (eat)
'Yes.'

(32) Q: *Nít kin ʔahǎan-faràŋ bɔ̀ɔj mǎj?*
Nit eat food-western often YNQ
'Does Nit eat western food often?'
A: *(kin) bɔ̀ɔj*
(eat) often
'Yes.'

In these two examples, the positive response to the polar question contains the new information which is affirmed by the positive response. That is to say, the questions in (31) and (32) can both be asked in a context where we already know that Nit eats western food. Thus, these question-answer pairs serve as a probe for how new information is expressed.

Turning to Q-float, FQs can also be the answer to a polar question, as expected:

(33) Q: *nákrian sɔ̀ɔp tòk thúk-khon mǎj?*
students V:test fall every-CLF YNQ
'Did every student fail the test?'

[5] This answer as given would be somewhat awkward. The subject would be preferentially omitted, and, even then, repeating the sentence itself would be somewhat marked.

A: *(sɔ̀ɔp tòk) thúk-khon*
(V:test fall) every-CLF
'Yes.'
A: ??*thúk-khon sɔ̀ɔp tòk*

In fact, quantifiers can be floated and serve as the answer to a polar question even when they are not floated in the question itself:

(34) Q: *nákrian thúk-khon sɔ̀ɔp tòk mǎj?*
students every-CLF V:test fall YNQ
'Did every student fail the test?'
A: *(sɔ̀ɔp tòk) thúk-khon*
(V:test fall) every-CLF
'Yes.'
A: ??*thúk-khon sɔ̀ɔp tòk*

We concluded above that the positive answer to a polar question contains the content of the positive response. The fact that FQs are floated when the serve this function provides clear evidence that the floated position of the quantifier which is associated with new information.

To summarize, existential constructions, quantity questions, and polar questions all show that floated quantifiers are associated with information focus. Additional evidence could be produced, for example, from VP-ellipsis in Thai, which can strand FQs, or from texts, but I take these diagnostics to provide sufficiently strong evidence that FQs represent new information in the discourse. In the following section I lay out a proposal for how this fact might explain the two outstanding problems with the QR-based analysis of Q-float in the previous section.

5. A Constraint-based Analysis of Quantifier Float

Q-float structures feature a mismatch between their syntax and semantics in that the nominal host of the FQ is the restriction of the quantifier. This means that the quantifier is expected to compose with the noun before it composes with the verb to which it attaches. The choice to analyze Q-float as QR represents one of two possible solutions of this mismatch, as the QR analysis takes the surface position of the FQ to be the position where both the quantifier and its nominal host are interpreted. Evidence for this choice came from the fact that FQs were always interpreted with their surface scope. The other solution would be to propose that the quantifier was interpreted in the position of their nominal associate, but this analysis cannot account for the scopal effects of Q-float.[6]

[6] A third solution would be to claim that floated quantifiers are not quantifiers at all, but, for example, distributive operators on events. This is the main idea behind the analysis of Nakanishi (2007) and other adverbial analyses of Q-Float. While these approaches are an important alternative, I do not believe they are correct for Thai, based in no small part on the fact that the FQ so frequently includes a classifier which is clearly controlled by the nominal host of Q-float.

Thus, the QR analysis takes the noun to be adjacent to the FQ when it is interpreted. In traditional GB analyses, a typical way to analyze this kind of syntax-semantics mismatch would be to claim that the noun moves to the position of the FQ covertly, at LF. In Minimalism, however, LF is eliminated, and covert movement arises via pronunciation of the lower copy under the copy theory of movement (Bobaljik 2002, Nunes 2004). The mechanisms regulating which copy is pronounced are varied; while there is a generally acknowledge preference for pronouncing the highest copy in a chain, some other relevant considerations include logical scope (Bobaljik and Wurmbrand 2012) and the desire to pronounce heads in positions where their features are checked (Fanselow and Ćavar 2002).

In Jenks (2011), I proposed that in analytic languages like Thai, which feature rigid SVO word order, case relations are marked by a general preference to pronounce DPs in their case positions are transparent:

(35) ARGUMENT TRANSPARENCY ("ArT') (Jenks 2011)
Syntactic relations must be transparently reflected at PF.

While the notion of 'transparently reflected at PF' is still somewhat ill-defined, what is relevant to the analysis of Q-float is that this preference is realized as the requirement that the nominal associate of a floated quantifier be pronounced in its canonical position.

This constraint is based on another transparency constraint, defended extensively in Bobaljik and Wurmbrand (2012), which requires transparent mapping between syntax and scopal semantics:

(36) SCOPE TRANSPARENCY ("ScoT")
If the order of two elements at LF is A $\gg$ B, then pronounce syntactic objects which transparently reflect that order.

While Bobaljik and Wurmbrand (2012) articulate this constraint by requiring isomorphism between scope relations and phonological precedence, Thai FQs can have higher or lower scope than their preceding nominals, despite, I claim, respecting ScoT. Because of this, I state the constraint in terms of pronunciation of the syntactic copy which is interpreted, which is able to capture the rigid scope of FQs.

On their own, however, these two constraints are inadequate. Jenks (2011, ch. 6) represents an attempt to capture the attested scope effects in Thai with just these constraints, and reveals a number of undesirable predictions of this approach, such as that the lower copy of object quantifiers, in [Comp, VP], should be preferentially pronounced when object quantifiers scope under negation.

I believe that Jenks (2011) was missing any way of incorporating the relationship between focus and Q-float outlined in the previous section. I propose that this association between focus and Q-float follows from a third transparency constraint:

(37) FOCUS PROMINENCE (Truckenbrodt 1995)
A focused XP is more prosodically prominent than non-focused XP.

What counts as prosodically prominent in Thai? In the focus typology of Büring (2009), Thai is an *Edge Language*, where prosodic prominence is associated with the right edge of a prosodic phrase. One piece of evidence for this conclusion is Q-float itself, which we saw occurs at the right edge marking focus. FQs are just one of a larger class of elements that are focused in this position, including sentence final particles and adverbs. The effect of Focus Prominence in Thai is to derive the rightward position of FQs. Thai Q-float is thus analogous to other focus-driven rightward displacement in phenomena for which Focus Prominence has been adopted, such as subject inversion in Italian (Samek-Lodovici 2005) or Heavy NP Shift in English (Williams 2003, pp. 33-38,Bobaljik and Wurmbrand 2012).

If all three of these constraints are never violated in Thai, the scope and information structural properties of Thai Q-float fall out. Consider the examples with Q-float. We know that these cases are associated with rigid scope (section 2.3), and that they involve information focus on the quantifier (section 4). Thus, ScoT and Focus Prominence are both respected in Q-float. The role of ArT is to force the nominal associate of the floated quantifier to be pronounced in its case position.

This result can be illustrated with an OT-style tableau, where ArT, ScoT, and Focus Prominence (FoPro) are the constraints and the candidates correspond to the different possibilities for pronouncing the various copies generated by QR or movement to subject. This kind of analysis is illustrated below:

(38) TABLEAU FOR Q-FLOAT FROM SUBJECT POSITION, $\neg > Q$

Input:N**Q** [¬ [N**Q**]]	ArT	ScoT	FoPro
a. ☞ N~~Q~~...~~N~~Q			
b. NQ...~~NQ~~		*	*
c. ~~NQ~~...NQ	*		

There are several aspects of this tableau which require clarification. The input represents the structure in (24b), where the interpretation will be one where negation scopes above the quantifier. The fact that the Q is bole in the input represents the fact that it is new information, thus constrained by FoPro. The crossed out elements in the candidates represent deleted copies of movement. ArT favors pronunciation of the lexical noun in its case position, which rules out the candidate in (38c). ScoT favors pronunciation of the lower (trace) copy of the subject quantifier, ruling out the non-floated variant in (38b). Candidate (38a) is thus optimal, with the caveat that the quantifier be pronounced in a prosodically prominent position, here the right edge of the clausal Intonational Phrase. Thus, Q-float in Thai represents a case of what Fanselow and Ćavar (2002) term *distributed deletion*, though their model of this phenomenon differs from the one I propose above, which more closely resembles the approach of Bobaljik and Wurmbrand (2012).

The remaining cases fall similarly into place. One case which was problematic for Jenks (2011) was object-oriented FQs with scope below negation. Under that

system, from which FoPro was absent, there was no way of motivating Q-float in such cases. Under the proposal here, these cases are grammatical by virtue of the fact that the Q is focused, hence, Q-float satisfies FoPro.

A few issues deserve further mention before concluding. First, I am not confident that quantifiers cannot be in situ when they are focuses. If they can, Thai Q-float more closely resembles the cases discussed by Bobaljik and Wurmbrand (2012) where three of four combinations of scopal (here, FoPro) faithfulness and some syntactic operation are allowed, where the one impossible case is Q-float would be focus on the quantifier. Further work is needed to clarify the facts.

Second, the analysis outlined above has one more consequence, which is that it may provide an explanation for a generalization introduced in Jenks (2011, p. 307):

(39) QUANTIFIER FLOAT GENERALIZATION
Rightward quantifier float (of *Q-Clf*) is only possible in classifier languages which allow the QP-internal order N-Q.

The basic idea is that rightward, focus-driven movement is constrained by the cyclic nature of the linearization algorithm according to the following constraint:

(40) CONSISTENCY (Fox and Pesetsky 2005, Ko 2007)
If a linear order is established within a phase, that linear order must be respected at later phases in the computation.

Thus, rightward Q-float is permitted only when it does not contradict QP-internal word order. This is because QP is a phase, and if the order Q>N is established within a phase, that order must be respected throughout the linearization of the utterance. Thus, rightward movement of the quantifier is only permitted when the quantifier follows the noun internal to the QP.

6. Conclusion

In this paper I have demonstrated that Q-float in Thai applies generally to quantificational expressions, is subject to locality restrictions, being limited to arguments, and has an adverbial distribution, where the floated quantifier receives a surface-true interpretation. We saw that these basic properties meshed well with recent analyses of QR, which take scope-shifting operations to involve movement or reconstruction to a position around vP.

This part of the analysis was basically identical to the analysis in Jenks (2011), but somewhat embarrassingly, had nothing to say about major properties of Q-float, including why quantifiers are separated from nouns in Q-float and why the floated quantifier appears on the right. To answer these questions, we turned to the observation that Q-float in Thai is associated with contexts where the information carried by the classifier is discourse new (Simpson 2011). Putting these different pieces together, a constraint-based analysis of Q-float was proposed where three constraints, Scope Transparency, Argument Transparency, and Focus Prominence, conspire to

force Q-float in the appropriate discourse contexts. Interestingly, scope shift with negation and quantifiers in Thai is only possible in certain pragmatic context, a fact which support the idea that QR is sensitive to information structure (e.g. Kadmon and Roberts 1986, Erteschik-Shir 1999).

Despite the success of this analysis, its empirical scope for now is somewhat limited. There are three areas where further work is needed. First, despite the similarities between the locality restrictions on Q-float and QR, they are not identical. QR is more liberal, allowing quantifiers to scope out of the nouns that contain them in limited cases — so called cases of inverse linking (May 1985) — while Q-float does not. One way of explaining this discrepancy might be due to the linearization procedure which I argued is responsible for Q-float; because Q-float is overt, it is more restricted. Second, I have not been able to demonstrate that this analysis can be extended to account for the scopal properties of sentences with multiple quantifiers. The main reason for this is that the scopal judgments of speakers for these examples remain extremely murky, but in most cases, including in-situ subject and object quantifiers, inverse scope is a possibility, contrary to the predictions of ScoT. It thus seems that ScoT can be violated in some limited cases in Thai. Finally, the analysis I argued for here represents a departure from the major analyses of Q-float in many respects. I leave it to future work to determine to what extent my analysis might extend to languages beyond Thai.

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Discourse Marker Sequencing and Grammaticalization*

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1 Introduction

This paper deals with the grammatical properties of discourse markers (DMs), specifically their ordering preferences relative to one another. While the data presented here are synchronic, we approach the topic of DM sequencing from the perspective of grammaticalization. From this perspective, DMs can be understood as the result of a process in which elements serving other functions, for example grammatical functions at the level of sentential syntax, come to be conventionally used as markers of discourse-level relations, or what Schiffrin (1987: 31) operationally defined as "sequentially dependent elements which bracket units of talk." Here we are concerned with the final outcome of this process. We ask: to what degree do fully formed DMs retain or lose the grammatical properties associated with their previous role, specifically their syntactic co-occurrence constraints? In other words, what degree of syntactic decategorialization (in the sense of Hopper 1991) do DMs display?

This raises the question of how DMs grammaticalize. As they constitute a broad and diverse class of elements with different developmental trajectories, we draw on Auer's (1996) taxonomy of relevant grammaticalization processes, which covers a wide range of diverse types. Auer's analysis deals specifically with grammaticalization in the syntactic position known as the "pre-front field" (*Vor-Vorfeld*) of spoken German. In drawing on his model, we assume that this

* We thank the audiences at BLS 39 in Berkeley and HLDS 10 in Albuquerque for their comments and suggestions on our analysis. All remaining errors and inaccuracies are our own.

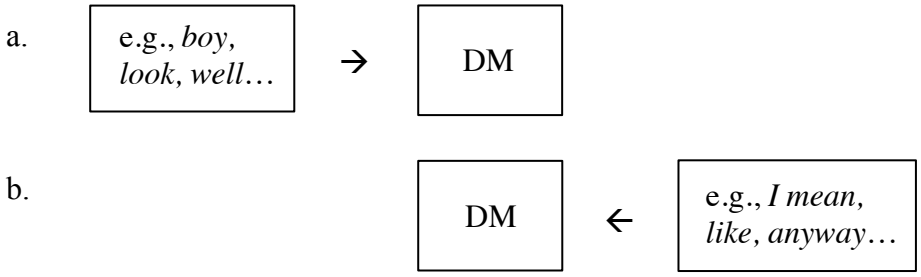
position is broadly comparable to the extra-sentential, utterance-initial position in which many English discourse markers are found (e.g. Schiffrin 2001).

Auer identifies two grammaticalization paths, or clines, along which elements evolve to occupy this position. On the first cline, which we will refer to as the (a)-path, "a dialogical, sequential structure is condensed and 'compacted' into a grammatical one." (313) Elements on this cline include "vocatives and other … constituents which may be used as summons in conversation." (ibd.) There are obvious English equivalents to the types of structures identified by Auer, such as address terms (*boy, man*), imperatives (*listen, look*), interjections (*oh, wow*), as well as forms of assessment and agreeing responses (*well, sure, right*).[1]

On Auer's second cline, which we will call the (b)-path, "a constituent moves out of the grammatical centre of the sentence into its periphery." (ibd.) The types of elements found on this cline also have well-known counterparts in English, for example adverbials (*like, anyway*) and matrix clauses (*I mean, I guess*). Auer's discussion makes it clear that discourse markers that are identical in form to conjunctions (*and, because*) also fall on this cline.

Figure (1) summarizes these two grammaticalization paths, with DMs on the (a)-path coming to occupy the utterance-initial DM slot from the left, as it were, and DMs on the (b)-path moving into this position from the right.

(1) Two grammaticalization paths for DMs



The (b)-path of DM grammaticalization has been investigated in some detail, for example in classic case studies of English discourse markers such as *like* (Romaine and Lange 1991) and *I think* (Thompson and Mulac 1991), among others (see also Traugott 1997). In these studies, decategorialization phenomena are often cited as evidence for the fact that a particular structure has attained DM status. For example, Thompson & Mulac (1991) show that the disproportionately high rate of omission of the complementizer *that* following *I think* and similar "matrix clauses" shows that these structures are not subject to the rules of

[1] Auer (1996) does not consider the final stage of his first grammaticalization cline to be dicourse markers, but merely pre-front field constituents. Our definition of DMs, which follows Schiffrin (1987), is slightly broader and considers many elements at this stage as DMs.

sentential syntax in the same way as genuine, syntactically integrated matrix clauses. In this mode of analysis, then, DM status may be defined negatively, as the lack of some otherwise expected grammatical behavior. But does a DM's dissociation from its syntactic source structure render it devoid of grammar? In other words, is the placement of fully formed DMs wholly determined by discourse-functional constraints, with no persistence of their former grammatical behavior whatsoever? Or, do even fully formed DMs retain properties that are best explained with reference to their former role? These are the question we address in the following.

2 Discourse marker sequencing

It is well known that DMs are often used in direct sequence with other DMs, resulting in two-part sequences like *oh well*, *but then*, etc. It has also been pointed out that such sequences may hold interesting analytical insights. For example, in her discussion of *now*, Aijmer (2002) points to the sequences *so now* and *now therefore* to argue that *now*, unlike *well*, is "oriented toward the upcoming topic." (64) In fact, Aijmer proposes that DM sequences "are perhaps the most important formal indication of what function the discourse particle has." (189) Nevertheless, as noted by Fraser (2011), the phenomenon of DM sequencing has received surprisingly little attention in the literature on discourse markers. The quantitative analyses of DM sequencing we are aware of all come from the field of automatic text generation (Knott 1996, Oates 2000) and have been restricted to DMs in written discourse. The significance of sequencing constraints for theories of DM grammaticalization has not previously been explored.

In two-part DM sequences the question of a DM's relative position becomes relevant. What determines whether a given DM appears in first or second position? Is its placement at least partially determined by its source syntax? From the perspective of decategorialization, one would expect syntactic constraints to loosen, or even disappear, and ordering variability to increase. Indeed, Schiffrin (1987) argues that the use of DMs in syntactically non-canonical combinations, as in (2) and (3), is a formal indicator *that* they are DMs.

(2) They don't even stop. **So: and** they said that they can't even accommodate us.

(3) **And** uh … **but** they have that– they're– they're so conscious of their um … they're always sittin' down and figurin' out their averages.

(Schiffrin 1987:39, boldface in the original)

In (2), the apparent co-occurrence violation consists in having a coordinate conjunction preceded by *so*, rather than the other way around. In (3), according to Schiffrin, the illicit co-occurrence of two coordinate conjunctions is made possible because *and* functions as a DM.

This paper can be understood as an empirical investigation of the status of such examples. How regularly do DMs combine in a non-normative order, such as *so and* as opposed to *and so*? In order to answer this question, we will also have to clarify what it means for two DMs to be used 'in sequence.' For instance, is it justified to argue that the DMs *and* and *but* in (3) were uttered as a planned sequence? How can we rule out the possibility that *but* simply replaces *and* in an act of self-repair? The utterance-initial position in which DMs occur is a likely site of repair, as interlocutors start without having fully planned their turn and produce false starts. An empirical analysis of DM sequencing in spoken discourse therefore faces the considerable challenge of distinguishing 'genuine' DM sequences from accidental ones.

3 Hypotheses and predictions

At the most general level, we test the null hypothesis H0 that DMs are in fact devoid of grammar and their sequencing is unconstrained. The prediction of H0 is that the ordering of two DMs should be free and the likelihood of observing one or the other order is indistinguishable from chance. H0 is opposed to H1, according to which DMs do have (some) grammar, which predicts that DM sequencing is not random, but measurably constrained.

To the extent that H1 is borne out, we can further ask whether a DM's sequencing constraints reflect its linguistic origin. One version of H1 posits that DM ordering shows reflexes of the grammaticalization paths shown in Figure 1. DMs that evolved on path (a) should precede DMs that evolved on path (b). We will call this hypothesis H1a. Secondly, coming back to Schiffrin's examples of non-canonical ordering, another version of H1, which is restricted to those DMs on the (b)-path, holds that DM sequencing shows reflexes of a DM's source syntax. We call this hypothesis H1b. The prediction following from H1b is that DMs tend to occur in sequences which don't violate the order predicted by their source syntax, so that, for example, the DM sequence *and so* should be attested more frequently than the DM sequence *so and*.

4 Methodology

In order to test these hypotheses, we used the set of eleven DMs investigated in Schiffin's (1987) foundational study of discourse markers. Drawing on Schiffrin's analysis has the advantage of providing us with a relatively large and diverse set of DMs whose status as DMs has been independently established on the basis of a

unified definition. The set is given in (4), subdivided according to each marker's historical route of development within the taxonomy of DM grammaticalization paths discussed above. For this analysis, we assume that *oh* and *well* evolved on the (a)-path, while the other nine DMs evolved on the (b)-path.

(4) a. *oh*, *well*
b. *and*, *but*, *or*, *so*, *because*, *now*, *then*, *you know*, *I mean*

We quantified the ordering preferences of these eleven DMs relative to one another by examining the rate of occurrence of all 110 theoretically possible pairwise combinations of them in the Fisher corpus (Cieri et al. 2004, 2005), a telephone speech corpus of North American English. Our first step in the analysis was to obtain exhaustive concordances of each sequence on the basis of the corpus transcripts. This resulted in over 150,000 hits. In the next step, we examined each of the 110 concordances more closely to obtain an estimate of how many of the matches of a given orthographic sequence represent 'genuine' DM sequences. Our selection criteria are discussed below. Because the total number of hits was too large for us to manually edit all concordances, our procedure was to inspect in detail a random sub-sample of 100 hits in each concordance (or all hits, in cases of concordances with 100 or fewer hits) and then to extrapolate the ratio of spurious to 'genuine' sequences to the whole concordance.

4.1 Data selection criteria

Our method of determining whether the elements contained in a superficial match, for example a sequence of the words *so* and *and*, both function as DMs in the context in which they were uttered was closely based on Schiffrin's (1987, 2001) definition of discourse markers, specifically her criteria for distinguishing the DM use of particular structures from their use in other functions.

4.1.1 Lack of obligatoriness

Our first criterion was syntactic obligatoriness. Non-obligatoriness is a key operational criterion in distinguishing DMs from their formally identical non-DM counterparts (Schiffrin 1987:64, 2001:57). If omitting one or both elements in a given sequence resulted an incomplete syntactic structure, or where doing so significantly changed the semantics of the utterance, the item was not analyzed as a DM sequence. To illustrate, the phrases in (5a-c) and (6a-c) contain the superficial sequences *and so* and *so and,* but none of them qualify as DM sequences because in each case the word *so* is obligatorily present. It is part of a larger syntactic construction from which it cannot be omitted.

(5) a. *and so* did everyone else
b. *and so* on *and so* forth
c. *and so* many of them…

(6) a. I would say *so and*…
b. we gave it to *so and* so
c. once a year or *so and*...

We did not analyze *and, but,* and *or* as DMs when they were followed by a constituent smaller than a complete clause (Schiffrin 1987:128). The greatest analytical challenges were posed by the DMs *now*, *then*, and *because.* For the former two, we were able to rely on Schiffrin's semantic and formal criteria (Schiffrin 1987:230-232, 246-248), for example by generally excluding cases in which *now* and *then* function semantically as temporal modifiers of an event. We had to slightly supplement Schiffrin's criteria for *because* (Schiffrin 1987:191-217). We did not analyze *because* as a DM when the *because*-clause preceded the "main clause", i.e. the clause or clauses containing the proposition(s) that the speaker is giving a reason for. We also only included cases in which the *because*-clause had the form of a fragment, i.e. separated from the "main clause" by another syntactic construction or by some discontinuity, or without a clear antecedent in the prior discourse.

4.1.2 Prosodic integration

Having reduced the data to cases in which both sequence elements qualify as DMs, we coded the remaining data for whether the DMs constitute 'genuine' or accidental sequences (see above). For this decision, we used the parameter of prosodic integration. The more integrated two DMs are prosodically, the more certain we can be that they were planned to be uttered and understood together, and the less likely we are to deal with a case of self-repair. Nevertheless, given that DMs are frequently followed by a minor prosodic boundary, the lack of full prosodic integration does not in itself disqualify particular cases. This meant that we also had to distinguish between prosodic boundaries of different strength.

As the Fisher transcripts include no prosodic mark-up, our analysis involved listening to all random sub-samples of our 110 concordances. While time-consuming, the auditory analysis was also an opportunity to verify the accuracy of the transcripts and to discard cases in which the words in question were mistranscribed, untranscribed words intervened between the DMs, or one of the two DMs was not fully produced. This analysis was primarily auditory. In difficult cases, pitch tracks were also inspected.

Our prosodic analysis was based on the notion of an *intonation unit* (IU), aka. *intonational phrase* or *tone unit*. IUs are fundamental to Du Bois et al.'s (1993)

discourse transcription system, which served as our practical framework. We first determined whether both DMs fell within the same IU, i.e. within a "stretch of speech uttered under a single coherent intonation contour" (47). In the following, we will refer to cases that meet this criterion as *strongly integrated* sequences.

Where a prosodic boundary separated the DMs, we further distinguished two types. The first, which we will call *non-integrated* sequences, and which we discarded, includes a variety of prosodic phenomena which can all be interpreted as signals that the second IU was not intended to be understood as a continuation of the larger prosodic structure that includes the prior IU. Very clear instances of this, although not the majority of the cases, are those in which the first DM ends in either Du Bois et al.'s 'final' intonation or in their 'appeal' intonation, i.e. in a fall to a very low pitch or a very high rise (transcribed "." and "?", respectively). More often, non-integration was evident from the onset of the second DM, specifically where the onset of the second DM was much higher in pitch than the offset of the first DM (or, less frequently, where the onset had a much lower pitch), resulting in a salient prosodic discontinuity. Such sudden, dramatic pitch increases were typically accompanied by equally sudden increases in amplitude and tempo. Any one of these three parameters was considered sufficient to identify a sequence as non-integrated. We also considered as non-integrated cases in which the first DM "trails off", i.e. where it was produced with a drawn out, low-pitched quality that, though not sufficiently low to qualify as 'final', clearly indicates that the speaker is opening the floor. Such cases were almost always followed by pauses, sometimes extended ones. However, we did not consider a pause in itself as an indicator of non-integration.

Our last prosodic category, which we will call *weakly integrated* sequences, were cases in which the DMs are separated by a prosodic boundary, but one that doesn't meet the criteria for a non-integrated sequence, as defined above. In these cases, the end of the first IU and the beginning of the second IU were similar in pitch, amplitude, and tempo, resulting in a relatively soft prosodic boundary. [2]

4.1.3 Utterance-initial position

Our third criterion was designed to ensure that both DMs are in utterance-initial position, in keeping with Schiffrin's (2001:57) definition and Auer's (1996) grammaticalization model. Although intuitively obvious, the distinction between utterance-initial or utterance-final occurrence is often difficult to draw in practice. Our method was to first exclude all cases in which the second DM was not followed by any talk by the same speaker. In addition, we applied the same

[2] In terms of Du Bois et al.'s transcription system, our 'weakly integrated' sequences are all cases in which the first DM ends in 'continuing' intonation (transcribed ","). However, there is no one-to-one relationship between Du Bois et al.'s 'continuing' intonation and our 'weakly integrated' category, because our 'non-integrated' category also includes cases of 'continuing' intonation.

prosodic criteria that we used for the between-DM boundary to the transition from the second DM to the following utterance, and excluded all cases of prosodic non-integration (as defined above) of the second DM and the following utterance.

4.1.4 Sequences of more than two DMs

Our final selection criterion addresses sequences of more than two DMs. To see what the problem is with these, consider the 3-DM sequence *so and then*. In this sequence, the part *and then* is a highly conventionalized sequence or 'chunk.' It would therefore be problematic to treat the sequence *so and* as part of *so and then* the same as *so and* occurring by itself as a 2-DM sequence. Doing so runs the risk of artificially inflating the number of *so and* cases because in some instances *and* in *so and* may be licensed only by the larger structure *and then*.

Our solution to this problem was to exclude all cases in which there was quantitative evidence that two markers contained in a longer sequence formed such a 'chunk.' In a first step, we coded separately all cases in which one or more additional DMs precede or follow a 2-DM sequence. In doing this, we considered as DMs not only those items in our set of eleven DMs, but also any other structure that might conceivably qualify as a DM, e.g. *I guess, anyway, gosh* (as part of *oh gosh*) and many more. Having identified all sequences of three or more DMs (about 1000 instances), we excluded those cases in which the sequence included a pair of DMs occurring together more than five times in this subset. For example, all instances of *and but then* were excluded because *but then* constitutes a chunk according to this heuristic, so that the sequence *and but* could be an artifact.

5 Results

The estimated frequencies of all 110 theoretically possible DM sequences in the corpus are given in Table 7. This table is the result of applying the various selection criteria discussed in Section 4 to our sub-samples of the raw, unedited concordances (see above) and extrapolating from the resulting number of 'genuine' cases to the corpus frequencies. Rows represent DMs in initial position, and columns represent DMs in second position. The first value in each cell is the estimated frequency of prosodically strongly integrated sequences. The second value, given in parentheses, is the estimated frequency of strongly and weakly integrated sequences added together.

As can be seen by inspecting the cells associated with opposite orders of the same DM pair, e.g. the frequencies of *oh well* and *well oh*, there are many cases in which two DMs are used much more frequently in one order than in the reverse order. *Oh well* is an extreme example, occurring 1,558 times as a strongly integrated sequence, compared to only a single case of a strongly integrated *well oh*. This asymmetry can be expressed in the form of a ratio of 0.9994 for *oh well*

(1,558/1,559) and a ratio of 0.0006 for *well oh* (1/1,559). In the following discussion, we refer to these as *ordering ratios*. The ordering ratios of all 110 combinations are shown in Table 8. As in Table 7, the two values per cell reflect the frequencies of the different prosodic types. Again, the first value refers to strongly integrated sequences, while the second value, given in parentheses, refers to both strongly and weakly integrated sequences combined.

To determine how many of the asymmetrical pairwise distributions seen in Table 7 deviate significantly from chance, we performed a series of binomial tests over the estimated token frequencies. For the strongly integrated sequences, we find that 82 of the 106 combinations attested in at least one order (77.4%) show a significant asymmetry (*or* and *oh* as well as *or* and *so* are not attested as strongly integrated sequences in either order). For the prosodically weakly integrated sequences, 86 out of 110 combinations (78.2%) show a significant asymmetry. Thus, for most DM pairings one order is significantly preferred over the other.

As can be seen in Table 8, some DMs exhibit consistent ordering preferences. For instance, *oh* occurs in first position with all other DMs, as reflected in the values above 0.5 in the row labeled "oh." The opposite is the case for *I mean*, which is preferred in second position with all other DMs, as reflected in consistent values below 0.5 in the column labeled "I mean." One way to aggregate and summarize these general preferences is in the form of a sequencing hierarchy that ranks all eleven DMs according to their preference for one or the other position. Such a hierarchy predicts one preferred order for each theoretically possible 2-DM sequence. Different hierarchies are possible and can be compared on the basis of their predictive power. For example, a hierarchy which ranks *oh* before *I mean* will make better predictions than one which ranks *I mean* before *oh*. The ideal hierarchy is the one that accounts for the greatest amount of attested orderings. This provides us with a measure of how well individual preferences are accounted for, as well as how strictly constrained DM ordering is in general.

We calculated two such hierarchies: one for the ordering of the strongly integrated sequences only, and one for the ordering of the strongly and weakly integrated sequences combined. The predictive accuracy of different hierarchies was determined on the basis of the cumulative explained ratios, rather than on the basis of the cumulative explained token numbers, to avoid skewing of the results due to some DMs being much more frequent than others. For the mathematical calculation we used a script written in the R programming language (R Development Core Team 2012). The script generates all ~40 million possible permutations of our 11 DMs and for each permutation calculates the total amount of explained ordering ratios.[3] The resulting ideal rank orders are given in (9) and (10). DMs further to the left are predicted to occur in initial position, while DMs further to the right are predicted to occur in second position.

[3] The permutations were generated using the `permn()` function of the `combinat` package.

(7) Estimated token frequencies

	and	*because*	*but*	*I mean*	*now*	*oh*	*or*	*so*	*then*	*well*	*you know*
and		53 (79)	70 (140)	782 (1,564)	206 (274)	82 (151)	15 (38)	6,418 (8,898)	21,990 (21,990)	60 (131)	3,596 (6,934)
because	2 (14)		0 (2)	133 (247)	2 (4)	8 (11)	1 (2)	1 (2)	166 (171)	6 (31)	246 (982)
but	17 (78)	25 (35)		1,806 (2,796)	118 (135)	24 (63)	0 (7)	33 (120)	4,163 (4,702)	5 (46)	1,049 (4,546)
I mean	410 (614)	61 (104)	92 (234)		14 (19)	1 (6)	0 (3)	5 (101)	24 (41)	66 (126)	537 (1,201)
now	0 (27)	0 (5)	0 (0)	18 (32)		0 (2)	0 (0)	0 (11)	2 (2)	3 (4)	9 (62)
oh	228 (294)	16 (29)	39 (120)	33 (74)	43 (69)		0 (3)	330 (860)	22 (37)	1,558 (2,147)	147 (401)
or	9 (29)	0 (4)	1 (12)	27 (84)	1 (2)	0 (1)		0 (0)	15 (19)	7 (27)	304 (1,822)
so	197 (666)	2 (7)	0 (370)	691 (1,788)	81 (99)	0 (13)	0 (9)		704 (794)	19 (80)	511 (2,360)
then	14 (29)	0 (2)	0 (18)	27 (49)	0 (6)	2 (7)	1 (1)	0 (6)		5 (10)	528 (1,201)
well	460 (884)	39 (132)	19 (133)	903 (1,478)	137 (195)	1 (15)	8 (24)	50 (138)	505 (665)		1,237 (2,959)
you know	5,217 (7,192)	561 (1,031)	64 (1,096)	1,700 (2,703)	48 (63)	50 (119)	247 (393)	520 (2,211)	156 (344)	14 (202)	

(8) Ordering ratios calculated from the estimated token frequencies

	and	*because*	*but*	*I mean*	*now*	*oh*	*or*	*so*	*then*	*well*	*you know*
and		0.964 (0.849)	0.805 (0.642)	0.656 (0.718)	1 (0.91)	0.265 (0.339)	0.625 (0.567)	0.97 (0.93)	0.999 (0.999)	0.115 (0.129)	0.408 (0.491)
because	0.036 (0.151)		0 (0.054)	0.686 (0.704)	1 (0.444)	0.333 (0.275)	1 (0.333)	0.333 (0.222)	1 (0.988)	0.133 (0.19)	0.305 (0.488)
but	0.195 (0.358)	1 (0.946)		0.952 (0.923)	1 (1)	0.381 (0.344)	0 (0.368)	1 (0.245)	1 (0.996)	0.208 (0.257)	0.942 (0.806)
I mean	0.344 (0.282)	0.314 (0.296)	0.048 (0.077)		0.438 (0.373)	0.029 (0.075)	0 (0.034)	0.007 (0.053)	0.471 (0.456)	0.068 (0.079)	0.24 (0.308)
now	0 (0.09)	0 (0.556)	0 (0)	0.563 (0.627)		0 (0.028)	0 (0)	0 (0.1)	1 (0.25)	0.021 (0.02)	0.158 (0.496)
oh	0.735 (0.661)	0.667 (0.725)	0.619 (0.656)	0.971 (0.925)	1 (0.972)		0 (0.75)	1 (0.985)	0.917 (0.841)	0.999 (0.993)	0.746 (0.771)
or	0.375 (0.433)	0 (0.667)	1 (0.632)	1 (0.966)	1 (1)	0 (0.25)		0 (0)	0.938 (0.95)	0.467 (0.529)	0.552 (0.823)
so	0.03 (0.07)	0.667 (0.778)	0 (0.755)	0.993 (0.947)	1 (0.9)	0 (0.015)	0 (1)		1 (0.993)	0.275 (0.367)	0.496 (0.516)
then	0.001 (0.001)	0 (0.012)	0 (0.004)	0.529 (0.544)	0 (0.75)	0.083 (0.159)	0.063 (0.05)	0 (0.008)		0.01 (0.015)	0.772 (0.777)
well	0.885 (0.871)	0.867 (0.81)	0.792 (0.743)	0.932 (0.921)	0.979 (0.98)	0.001 (0.007)	0.533 (0.471)	0.725 (0.633)	0.99 (0.985)		0.989 (0.936)
you know	0.592 (0.509)	0.695 (0.512)	0.058 (0.194)	0.76 (0.692)	0.842 (0.504)	0.254 (0.229)	0.448 (0.177)	0.504 (0.484)	0.228 (0.223)	0.011 (0.064)	

(9) Ideal rank order for strongly integrated DM sequences
oh > *well* > *and* > *or* > *but* > *you know* > *so* > *because* > *now* > *then* > *I mean*

(10) Ideal rank order for strongly and weakly integrated sequences combined
oh > *well* > *and* > *so* > *or* > *but* > *because* > *then* > *now* > *you know* > *I mean*

The percentage of explained ordering ratios is 82.3% for the hierarchy in (9) and 79.7% for the hierarchy in (10).

Another way to test the validity of the two hierarchies is through a linear regression analysis. For this analysis, we created a binary independent variable that indicates whether a certain sequence is predicted or not predicted. For example, *but so* is predicted by the first hierarchy but not by the second one. This variable was used to predict the ordering biases given in Table 8. The regression analyses yield highly significant results for both hierarchies ($p<0.001$). The model fit is reasonably good with R-squared values of 0.68 and 0.75, respectively.

The position of the DMs on the hierarchies in (9) and (10) is quite similar overall. In both cases, *oh* and *well* are most strongly associated with the initial position. In the first hierarchy, they are followed by the group of DMs identical in form to coordinating conjunctions (*and, but, or*), which are followed by DMs identical in form to subordinating conjunctions (*so, because*), which are themselves followed by DMs identical in form to adverbs (*now, then*). As for DMs that look like matrix clauses, while *I mean* is strongly associated with the final position, *you know* appears in the center of the hierarchy, i.e. showing no consistent ordering preference. The two DMs which show the greatest difference between the hierarchies are *so,* which precedes both *but* and *or* in the second hierarchy, and *you know*, which here patterns with *I mean* at the right end. A minor difference is that the position of *now* and *then* is reversed.

We also calculated a measure of how stable the rank order of individual DMs is on each hierarchy. For this measure we examined the 1000 'best' hierarchies, in terms of explanatory accuracy, and calculated the standard deviation of each DM's rank order across the 1000 hierarchies. The results are shown in Table 11.

Table 11 shows that the positional variability of most DMs is fairly low, as reflected in standard deviations of about 1. This suggests that individual ordering preferences are generally captured well by the two hierarchies. Still, two DMs stand out as harder to pin down. First, *or* shows extreme variability in the first hierarchy. This may be an artifact due to the very low token frequencies in strongly integrated sequences, leading to less reliable ordering information (see Table 7). More interesting is the case of *you know*, which is the second most variable DM in the first hierarchy and the most variable DM in the second one. The low predictability of *you know* within each hierarchy dovetails with its variability across the two hierarchies.

(11) Positional variability

	strongly integrated sequences		strongly and weakly integrated sequences	
	rank order	variability	rank order	variability
oh	1	0.59	1	0.43
well	2	0.83	2	1.07
and	3	1.16	3	1.13
or	4	2.45	5	1.19
but	5	1.06	6	0.98
you know	6	1.81	10	1.36
so	7	1.06	4	0.92
because	8	1.19	7	1.16
now	9	0.76	9	1.36
then	10	0.81	8	1.07
I mean	11	0.99	11	1.06

Finally, note that the rank orders, especially those in the first hierarchy, strongly suggest that the grammatical categories from which these DMs derive (excepting *oh* and *well*) influence the DMs' ordering preferences. Speaking in terms of traditional grammatical categories, coordinators precede subordinators, which precede adverbs, which precede matrix clauses. To quantify the extent to which canonical syntactic ordering constraints predict the attested DM orderings, we summed the ordering ratios explained by traditional syntactic constraints and compared them to those associated with orders that violate them. The percentage of ordering ratios explained by traditional syntactic constraints is 71.5% for the first hierarchy and 66.7% for the second hierarchy.

6 Discussion

The results show that DM sequencing is clearly not random. This allows us to reject H0 and further pursue H1. The ordering effects captured in our two hierarchies show that a DM's sequencing behavior does indeed reflect its grammaticalization history. First, as predicted by H1a, DMs that derive from independent sequential moves (the a-path of Figure 1) precede those that derive from sentence-level structures (the b-path in Figure 1). This can be seen in the fact that *oh* and *well* remain strongly associated with initial position. Second, as predicted by H1b, the sequencing of DMs that develop on the (b)-path remains to a large extent constrained by the syntax of their source structures.

Coming back to Schiffrin's (1987:39) argument that non-canonical ordering is an expected feature of DMs, we have found that on the whole such combinations are not typical, at least not in the sense that they are more likely to be observed

than canonical combinations. Nevertheless, Schiffrin's observation is supported in that for some DMs non-canonical ordering is very well attested. A case in point is the DM *so*, for which our second hierarchy actually predicts non-canonical sequencing relative to *but* and *or*. Another clear case is *you know*, for which non-canonical ordering is even predicted by our first hierarchy, i.e. for prosodically fully integrated sequences, which are arguably the more conventionalized ones. In fact, Schiffrin's examples (cf. [1] and [2]) turn out to be quite representative. Among the most frequent non-canonical combinations in our data are: *so* preceding coordinators (*so but, so and*), *you know* and *I mean* preceding coordinators or subordinator *because* (*you know and*, *I mean but, you know because*), as well as combined coordinators (*and but*, *but and, and or*).

Future research will address DM sequences like these, whose order regularly violates traditional syntactic constraints, now that their significance has been empirically established. It is an interesting question what motivates such cases. We suspect that as DMs grammaticalize, their 'pragmatic scope' expands, which allows them to precede a greater number of other DMs. Those DMs in our data for which this is best attested can be understood as having reached a relatively higher degree of syntactic decategorialization.

7 Conclusion

Although decategorialization is often taken as a defining criterion in identifying DMs, decategorialization in terms of sequencing constraints appears to be rather weak. Even in grammaticalized DMs, persistence of source constraints appears to be the norm. Thus, there is no contradiction between functioning as a DM and retaining clear ordering preferences.

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Elucidating Nominal Structure in Articleless Languages: A Case Study of Tatar[1]*

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1 Introduction

The central question addressed by this paper is whether languages without articles have the same highly articulated functional architecture in noun phrases, including the DP projection. Previous studies focused on Slavic languages (but see Bošković and Şener 2012 on Turkish); some scholars (cf. Progovac 1998, Engelhardt & Trugman 1998, Rutkowski 2002, *inter alia*) argued in favor of the DP projection, while Bošković (2005, 2008, 2009, 2010; Bošković and Şener 2012) argued against it. Pereltsvaig (2006, 2007, 2013) argued that while some nominals in Russian and other articleless Slavic languages are DPs, others are Small Nominals (SNs) of different sizes. In this paper, we provide novel evidence for the latter position based on another Turkic language, Tatar (spoken by over 5 million in Tatarstan, Russia). Drawing on our fieldwork on one sub-dialect of Tatar (spoken in the village of Kutlushkino), we show that different syntactic constructions call for nominals of different sizes. Moreover, we argue that Differential Object Marking (DOM) in Tatar—unlike in other Turkic languages such as Turkish or Sakha—can only be explained in terms of the amount of

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functional architecture in the object: DP objects receive structural (accusative) Case, as in (1a), while SNs (i.e. NPs or NumPs) remain Caseless, as in (1b).

(a) a. Marat [$_{DP}$ mašina-**nı**] sat-ıp al-dı.
Marat car-**ACC** sell-CONV take-PST
'Marat bought a/the car.'

b. Marat [$_{NP/NumP}$ mašina] sat-ıp al-dı.
Marat car sell-CONV take-PST
'Marat bought a car/cars.'

Thus, we rule out alternative analyses based on distinct positions of accusative and unmarked objects or on the semantic interpretation of the object. More generally, we propose that only DPs must receive structural case while SNs are not subject to such Case licensing requirements and may remain morphologically Caseless.

The rest of this paper is organized as follows. In section 2, we show that nominals in Tatar come in different sizes: some are DPs and others are Small Nominals (in the sense of Pereltsvaig 2006). In section 3, we lay out our proposal for DOM in Tatar that accusative-marked (ACC) objects in Tatar are DPs, whereas unmarked objects are Small Nominals. In sections 4 and 5 we argue against the Semantic and Positional Alternatives, respectively. Section 6 concludes the paper.

2 Noun Phrases in Tatar Come in Different Sizes

We assume that the strict ordering of nominal suffixes reflects the order of functional projections in the noun phrase, following Baker's Mirror Principle (Baker 1985). These suffixes include—in the order away from the noun root—the plural suffix *-lar* in Num°, the ezafe-2 marker *-ı/-sı* in Poss°, the ezafe-3 marker such as *-ım* in D° (note that ezafe-2 and ezafe-3 markers are incompatible with each other, for reasons that are outside the scope of this paper), and case suffix such as *-a* for dative.[2] The word *bala-lar-ım-a* 'to my children' is analyzed as [$_{KP}$ *-a* [$_{DP}$ *-ım* [$_{NumP}$ *lar* [$_{NP}$ [$_{N}$ *bala-*]]]]]. Although Tatar noun phrases are maximally KPs, not all noun phrases are fully projected. Various constructions involve nominals of different sizes: N°, NP, NumP, DP, or KP can be embedded in different constructions.

For instance, the nominal element in complex predicate constructions (CPCs), as in (2a), cannot be ACC-marked, as shown in (2b). Pronouns cannot serve as the nominal element in a CPC (2c); nor does it have room for the plural marker *-lar* (2d) or modifiers of any kind (2e).

[2] The various suffixes in Tatar are subject to vowel harmony, as well as occasional nasal and/or voicing assimilation.

(2) a. Äti-se Marat-ka mašina **büläk** it-te.
father-3 Marat-DAT car gift make-PST
'His father gave Marat a car (as a gift).'

b. * Äti-se Marat-ka mašina **büläk-ne** it-te.
father-3 Marat-DAT car gift-ACC make-PST
intended: 'His father gave Marat a new car (as the gift).'

c. [Context: Marat asked his father for a gift.]
* Äti-se Marat-ka mašina **ul/anı** it-te.
father-3 Marat-DAT car it.NOM/it.ACC make-PST
intended: 'His father gave Marat a car (as a gift).'

d. * Äti-se Marat-ka mašina(-lar) **büläk-lär** it-te.
father-3 Marat-DAT car-PL gift-PL make-PST
intended: 'His father gave Marat cars (as gifts).'

e. Äti-se Marat-ka mašina (*jaxšı / *ber / *tege) büläk it-te.
father-3 Marat-DAT car good / one / such gift make-PST
'Father gave Marat a car as a gift.'

Let us now consider nominal (ezafe) constructions. There are three such constructions in Tatar, known as ezafe-1, ezafe-2, and ezafe-3. As we show below, ezafe-1 embeds a bare N°, ezafe-2 embeds a NumP, and ezafe-3 embeds a KP (or a genitive-marked DP).

The embedded element of ezafe-1, which is used typically for materials, is a bare noun, as in (3a). Like the nominal component in CPCs, it cannot be a pronoun (3b), nor can it contain the plural marker -*lar* (3c), or any modifiers (3d).

(3) a. altın jezek
gold ring
'gold ring'

b. *ul / *anıŋ jezek
it / it.GEN ring
intended: 'a ring from it'

c. *taš-lar jırt
stone-PL house
intended: 'house from stones', 'stone house'

d. * čın altın jezek
real gold ring
intended: 'ring from real gold'

In contrast, the embedded element of ezafe-2 is a NumP: like the nominals considered above, it cannot be a pronoun (4a), nor a proper noun (4b). However, it can include the plural marker -*lar* (4c) or certain modifiers (4d). (The ezafe-2 marker is the suffix glossed here as '3' for 3rd person; it does not show

agreement.)

(4) a. *min däftär-em
I notebook-1SG
intended: 'my notebook'

b. * zefär ata-sı (Grashchenkov 2007)
Zufar dad-3
intended: 'Zufar's dad'

c. kırsak-lı xatın-nar kijem-e
belly-ATR woman-PL clothing-3
'clothing for pregnant women'

d. bala-lar xastaxanä-se tabib-ı
child-PL hospital-3 doctor-3
'a doctor in a children's hospital'
'a doctor of children's hospitals'

Unlike the ezafe-2 marker, the marker of ezafe-3 shows person and number agreement with the possessor, which can be a pronoun or a proper name, unlike with ezafe-2. We propose that the embedded nominal in ezafe-3 is a genitive-marked DP, or a KP.

(5) a. minem däftär-em
I.GEN notebook-1SG
'my notebook'

b. Marat-nıŋ däftär-e
Marat-GEN notebook-3
'Marat's notebook'

As it turns out, ezafe-3 itself is a DP; hence, can be embedded only in ezafe-3 but not in ezafe-2.

(6) a. ezafe-2:
*[[ukučı-nıŋ däftär-lär-e] papka-sı]
student-GEN notebook-PL-3 folder-3
'folder for student's notebooks'

b. ezafe-3:
[[ukučı-nıŋ däftär-lär-e-**neŋ**] papka-sı]
student-GEN notebook-PL-3-GEN folder-3
'folder for student's notebooks'

In addition to the constructions described above, Tatar also has a number of attributivizer constructions. Here, only two such attributivizers, which turn a nominal into an attributive modifier, will be considered. Attributivizer *-lı* selects a bare NP, while attributivizer *-gı* selects a KP, specifically a locative-marked one.

(7) a. [$_{NP}$ …]-*lı* N
b. [$_{KP}$ [$_{DP}$ …]-LOC]-*gı* N

The nominal selected by attributivizer -*lı* cannot be a pronoun (8a), cannot contain the plural marker -*lar* (8b), but unlike with the nominal element in CPCs or the embedded nominal in ezafe-1, it can contain certain modifiers (8c).

(8) a. *ul-lı čaška
it-ATR cup
intended: 'a cup with it' (e.g. a blue flower)
b. *kük čäčäk-lär-le čaška
blue flower-PL-ATR cup
intended: 'a cup with blue flowers
c. kük čäčäk-le čaška
blue flower-ATR cup
'a cup with a blue flower' OR 'a cup with blue flowers'

In contrast, the nominal selected by attributivizer -*gı* is a full-fledged KP: it can be a locative-marked pronoun (9a) or a proper name (9b), even ezafe-3 (9c), which as we have shown above is a DP. It can also contain the plural marker -*lar* (9d) or modifiers (9e).

(9) a. a-n-da-gı uram-nar
it-OBL-LOC-ATR street-PL
'its (e.g. the city's) streets'
b. Kazan-da-gı uram-nar
Kazan-LOC-ATR street-PL
'streets of Kazan'
c. Marat-nıŋ šähär-e-ndä-ge uram-nar
Marat-GEN city-3-LOC-ATR street-PL
'streets of Marat's city'
d. šähär-lär-dä-ge uram-nar
city-PL-LOC-ATR street-PL
'streets of cities'
e. zur šähär-dä-ge uram-nar
big city-LOC-ATR street-PL
'streets of a big city'

3 Our Proposal: Structural Analysis of DOM in Tatar

In the preceding section, we have shown that nominals in Tatar can be projected fully or can be Small Nominals. Here, we argue that the same contrast accounts for the Differential Object Marking (DOM) phenomenon in the language. Our proposal is that the accusative case marker *-nı*, as in (10a), attaches to a DP. Unmarked objects are thus Small Nominals. More generally, we hypothesize that only DPs must receive structural case, while SNs are not subject to such Case licensing requirements and may remain morphologically Caseless. Three arguments are discussed below in support of this analysis.

(10) a. Marat [$_{KP}$ [$_{DP}$ mašina]**-nı**] sat-ıp al-dı. (= 1)
Marat car-**ACC** sell-CONV take-PST
'Marat bought a/the car.'

b. Marat [$_{NP/NumP}$ mašina] sat-ıp al-dı.
Marat car sell-CONV take-PST
'Marat bought a car/cars.'

The first piece of evidence that suggests that ACC-marked and unmarked objects in Tatar are structurally different involves coordination: as shown in (11a), the two types of objects cannot be coordinated. If the unmarked object precedes the ACC-marked one, as in (11b), the sentence is grammatical, but such examples involve phrasal case marking, further illustrated in (11c).

(11) a. *Marat kitap-nı häm gazet sat-ıp al-dı.
Marat book-ACC and newspaper sell-CONV take-PST
intended: 'Marat bought a (certain) book and a newspaper.'

b. Marat [kitap häm gazet]-ne sat-ıp al-dı.
Marat book and newspaper-ACC sell-CONV take-PST
'Marat bought a (certain) book and a (certain) newspaper.'

c. [mädänijat häm sängat]-kä bitaraflık
culture and art-DAT indifference
'indifference to culture and art'

The second argument in favor of our proposal comes from the fact that minimal pairs such as (10) are not always possible. Accusative marker is required whenever the object is or contains some element typically associated with the DP-level. Thus, objects which are pronouns (12a), proper names (12b), or ezafe-3 constructions (12c), as well as objects containing a strong quantifier, such as *här* 'every' or *ike…dä* 'both' (12d), or a demonstrative *bu* 'this' or *šul* 'that' (12e), must be marked accusative.

(12) a. Marat a-lar-*(nı) kür-de.
Marat he-PL-ACC see-PST
'Marat saw them.'

b. Alsu Marat-*(nı) čakır-dı.
Alsu Marat-ACC invite-PST
'Alsu invited Marat.'

c. Marat Ramil-neŋ mašina-sı-*(n) sat-ıp al-dı.
Marat Ramil-GEN car-3-ACC sell-CONV take-PST
'Marat bought Ramil's car.'

d. Marat här birem-*(ne) čiš-te.
Marat every problem-ACC solve-PST
'Marat solved every problem.'

e. Marat bu mašina-*(nı) sat-ıp al-dı.
Marat that car-ACC sell-CONV take-PST
'Marat bought that car.'

Our third argument in support of the structural analysis of DOM in Tatar is that unmarked objects fit the profile of a Small Nominal, as described in Pereltsvaig (2006). First, they cannot have an individuated, specific, partitive, or anaphoric interpretation. For example, only (13a) is an appropriate continuation to 'We have a cat and a dog':

(13) a. Min kübesenčä et-ne jarat-a-m.
I more dog-ACC like-PRS-1SG
'I like the dog more.'

b. Min kübesenčä et jarat-a-m.
I more dog like-PRS-1SG
'I like {a dog/dogs} more.'

Second, unmarked objects cannot have wide scope in relation to other quantifiers (14a) or negation (14b).

(14) a. Här ukučı ike kitap ukı-dı.
every student two book read-PST
'Every student read two books.' □ > 2, ***2 >** □

b. Marat ike kitap ukı-ma-dı.
Marat two book read-NEG-PST
'Marat didn't read two books.' Neg > 2, ***2 > Neg**

While unmarked objects may contain the plural marker *-lar*, if this marker is absent, the object has a number-neutral interpretation (cf. Pereltsvaig 2013, forthcoming), as in (15a). The presence of the plural marker *-lar* entails a plural

interpretation, as in (15b). In contrast to unmarked objects, with ACC-marked objects the absence of plural marker *-lar* does not entail number-neutrality, as shown in (15c).

(15) a. Marat kızıl alma aša-dı.
Marat red apple eat-PST
'Marat ate {a red apple / red apples}.'

b. Marat kızıl alma-lar aša-dı.
Marat red apple-PL eat -PST
'Marat ate {*a red apple / red apples}.'

c. Marat kızıl alma-nı aša-dı.
Marat red apple-ACC eat -PST
'Marat ate {a red apple / *red apples}.'

Finally, unlike ACC-marked objects, unmarked objects cannot control syntactic anaphora: they cannot serve as controllers of PRO, as shown in (16a), or antecedents of reflexives or reciprocals, as shown in (16b, c). It should be noted that the ungrammaticality of unmarked objects as controllers of PRO or antecedents of reflexives or reciprocals is preserved regardless of word order permutations; space limitations prevent us from presenting all the possible word order variations.

(16) a. Marat bala-lar-*(nı) džibär-de [PRO uk-ırga].
Marat child-PL-ACC send-PST study-INF
'Marat sent children to study.'

b. Marat bala-lar-*(nı)$_i$ džibär-de üze-neŋ$_i$ tu-gan
Marat child-PL-ACC send-PST SELF.3-PL be.born-PART
ken-e-neŋ bäjräm-lär-e-nä .
day-3-GEN holiday-PL-3-DAT
'Marat sent children to their own birthday parties.'

c. Marat ber-ber-se-neŋ tu-gan ken-e-neŋ
Marat REC-REC-3-GEN be.born-PART day-3-GEN
bäjräm-lär-e-nä bala-lar-*(nı)čak-tı.
holiday-PL-3-DAT child-PL-ACC call-PST
'Marat invited children to each other's birthday parties.'

To conclude, ACC-marked and unmarked objects are structurally distinct, as suggested by the fact that they cannot be coordinated. DP objects must be accusative marked, while unmarked objects have all the properties of Small Nominals.

In the following sections, we will consider and dismiss two alternative analyses proposed for DOM in other Turkic languages (and some non-Turkic languages as well): the Semantic Alternative and the Positional Alternative.

4 Semantic Alternative

One alternative analysis, which has been proposed for DOM in Turkish by Enç (1991), as well as for DOM in Hebrew by Danon (2006), correlates the accusative case marking or its absence with the semantics of the object rather than its functional structure. According to this group of analyses, ACC-marked objects are referential, specific, or definite, depending on the particular proposal, whereas unmarked objects are not. As mentioned above, unmarked objects in Tatar have a non-individuated, non-specific, non-partitive, non-anaphoric interpretation. Could it be that the same analysis applies in Tatar? We do not think so.

The data that challenges the Semantic analysis for Tatar involves ezafe-3 construction. As mentioned above, an object which is an ezafe-3 construction must receive structural (accusative) case. However, it may simultaneously receive a non-specific interpretation and take narrow scope in relation to other quantifiers or negation, as shown in (17a, b). For example, the sentence in (17a) can be interpreted as 'There are two specific poems by Tukay that every student read' or as 'Every student read some two poems by Tukay'. Similarly, the sentence in (17b) can be interpreted as 'There is a photo of Alsu that Marat didn't see' or as 'It is not the case that Marat saw a/any photo of Alsu'. In both examples, it is the second interpretation that is unexpected under the Semantic Alternative.

(17) a. Här ukučı Tukaj-nıŋ ike šigır-e-*(n) ukı-dı.
every student Tukay-GEN two poem-3-ACC read-PST
'Every student read two poems by Tukay.'
2 > ∀ or ∀ > 2

b. Marat Alsu-nıŋ fotografia-se-*(n) kür-me-de.
Marat Alsu-GEN photo-3-ACC see-NEG-PST
'Marat didn't see a photo of Alsu.'
∃ > Neg or Neg > ∃

Because the presence of accusative case marking does not guarantee a referential, specific, or definite interpretation, we must reject the Semantic Alternative.

5 Positional Alternative

In the preceding section, we have shown that DOM in Tatar cannot be accounted for purely in terms of the semantics of the object. In this section, we consider—and also reject—another alternative theory that places the burden of explanation on the position of the object in the clausal structure. According to this approach, unmarked objects appear in *v*P, whereas ACC-marked objects appear higher, outside *v*P. For example, an analysis along those lines has been proposed for

DOM in another Turkic language, Sakha, by Baker & Vinokurova (2010: 599-602). Furthermore, unmarked objects have been analyzed as pseudo-incorporated into the verb (cf. Massam 2001, Baker 2009). In what follows, we show that although this approach may work for other languages, it is not applicable to Tatar.

The first problem for the Positional Alternative is similar to the challenge we described above for the Semantic Alternative: while unmarked objects behave roughly as expected (i.e. they appear relatively low in the clausal structure), ACC-marked objects do not. In particular, they can appear inside the *v*P boundary marked by (manner) adverbs such as *tiz* 'quickly'. In this respect, Tatar is genuinely different from Sakha, where such sentences are ungrammatical. (The Sakha example (18b) below is from Baker & Vinokurova 2010: 602, their (12b); it is said to be grammatical if the object has contrastive focus.)

(18) a. Tatar

Marat	**tiz**	*botka-**nı***	aša-dı.
Marat	quickly	porridge-ACC	eat-PST

'Marat ate porridge quickly.'

b. Sakha

*Masha	**türgennik**	*salamaat-**y***	sie-te.
Masha	quickly	porridge-ACC	eat-PAST.3sS

'Masha ate porridge quickly.'

Moreover, although unmarked objects in Tatar have some semantic properties associated with pseudo-incorporated nominals (e.g. their obligatory nonreferential interpretation, obligatory narrow scope, and possible number-neutrality), they do not seem to have a particularly tight syntactic connection to the verb. In fact, if anything is pseudo-incorporated in Tatar, it is the the nominal components in CPCs, considered above. First, the nominal component in CPCs and unmarked objects behave differently in causative constructions: in causative constructions based on CPCs, the causee is marked accusative, as shown in (19a). In contrast, in causative constructions with either ACC-marked or unmarked objects, the cause is ablative, rather than accusative, as shown in (19b, c). This shows that nominal components in CPCs and unmarked objects do not appear in the same structural position.

(19)

a.	Ukıtučı		ukučı-nı/*-dan	xezmät	it-ter-de.
	teacher		student-ACC/*-ABL	work	do-CAUS-PST
	'The teacher made the student work.'				
b.	Min	Marat-tan/*-nı	kitap	al-dır-dı.	
	I	Marat-ABL/*-ACC	book	take-CAUS-PST	
	'I made Marat buy a book.'				
c.	Min	Marat-tan/*-nı	kitap-nı	al-dır-dı.	
	I	Marat-ABL/*-ACC	book-ACC	take-CAUS-PST	
	'I made Marat buy a (certain) book.'				

Second, nominal components in CPCs—like other pseudo-incorporated nominals—cannot be focused by particles such as *-gına*, whereas unmarked objects can be. For example, the sentence in (20a) can have one of two interpretations, one with focus on the whole verb phrase and the other with focus just on the object. As shown in (20b), the nominal component in CPC cannot be focused by itself.

(20) a. Marat bala-ga jaŋa *kitap*-**kına** ukı-dı.
Marat child-DAT new book-EMPH read-PST
'The only thing that Marat did is read the child a new book.'
'Marat read the child only a new book.'

b. Äti-se Marat-ka *jaŋa* *mašina* **büläk-kına** it-te.
father-3 Marat-DAT new car gift-EMPH make-PST
'His father only gave Marat a new car as a gift.'
NOT: #'His father gave Marat a new car only as a gift.'

Third, unmarked objects can serve as antecedents for discourse anaphora (though not, as you would recall from above, syntactic anaphora), as shown in (21), whereas nominal components in CPCs cannot, as shown in (22). Thus, the second sentence in (22) can mean only that making the student work is useful, not that work itself is useful. The inability to serve as antecedent for discourse anaphora is another hallmark of pseudo-incorporating nominals, suggesting that while nominal components in CPCs are pseudo-incorporated, unmarked objects are not.

(21) Sin anarga **kitap** ala ala-sıŋ.
you that.DAT book take.IPFV can.PRS-2SG
Häm **a-nı** matur it-ep ter-ep büläk
and that-ACC beautifully make-CONV wrap-CONV gift
it-ergä bula.
make-INF be.PRS
'You can buy him a **book**. You can wrap **it** beautifully and give it to him as a gift.'

(22) Ukıtučı ukučı-nı **xezmät** it-ter-de.
teacher student-ACC work do-CAUS-PST
#**Ul** bik fajdalı eš.
it very useful matter
'The teacher made the student work. It (making the student work) is very useful.'
NOT: 'The teacher made the student work. It (work) is very useful.'

To recap, contrary to the predictions of the Positional Alternative, ACC-marked objects may appear low in the clausal structure, where they structurally compete with unmarked objects. Moreover, unmarked objects can be shown to not be pseudo-incorporated into the verb, whereas nominal components in CPCs fit the profile of a pseudo-incorporated nominal.

6 Conclusion: Functional Architecture, Position and Semantics

In this paper, we argued for the structural analysis of DOM in Tatar whereby DP objects receive structural (accusative) Case, while Small Nominal objects remain Caseless. This serves as an additional argument for the projection of DP in some but not all noun phrases in Tatar, an articleless language. Furthermore, we considered and rejected two alternative approaches to DOM in Tatar: one that places the explanatory burden on the semantics of the object and the other that relies on the position of the object in the clausal structure. We have shown that neither of these alternatives can account fully for the facts concerning DOM in Tatar. The partial overlap between the three possible analyses, however, derives from the fact that Small Nominals lack the DP-layer and consequently lack three things: (a) the semantics of full-fledged DPs (i.e. referentiality), (b) the mobility of full-fledged DPs as they remain invisible to higher Probes searching for [+D], and (c) the ability to be assigned Case. However, such Small Nominal objects are not as low as pseudo-incorporated nominals, such as the nominal components in CPCs. Moreover, we have shown that full DP objects, which are marked accusative, are not necessarily high in the clausal structure and need not be referential.

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The Topic-Comment Structure in Copular Sentences: Evidence from Wolof*

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1 Introduction

This paper investigates the syntax of information structure of Double-DP copular sentences in Wolof, a Niger-Congo language spoken primarily in Senegal. English copular sentences of the structure *DP be DP* are classified into several types. The most discussed distinction is the one between **predicational** sentences, as in (1), and **specificational** sentences, as in (2).

(1) [$_{DP1}$ Carissa] is [$_{DP2}$ a mother]. [PREDICATIONAL]

(2) [$_{DP1}$The department chair] is [$_{DP2}$ Chris]. [SPECIFICATIONAL]

The two sentences differ in several ways. First, while the post-copular DP (DP2) in a predicational sentence predicates a certain property of a discourse referent established by the pre-copular DP (DP1), in a specificational sentence DP2 provides a value for a variable introduced by DP1. Furthermore, it is proposed that different copular sentences are associated with different information-structural properties. In particular, specificational sentences are claimed to obligatorily focus the post-copular constituent (Higgins 1979; Declerck 1988; Mikkelsen 2005, etc.), while predicational sentences carry no such requirements.

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The typology of copular sentences is mostly based on the study of these constructions in English and several other Germanic languages. To determine whether properties associated with different copular sentence types are universal (and consequently, whether there can even be talk of a cross-linguistic typology), it is important to investigate languages in which some of the claims can be tested.

In this paper, I discuss some properties of Double-DP copular sentences in Wolof, a Niger-Congo language which can greatly contribute to our understanding of the syntax and information structure of copular sentences. Wolof marks information-structural phenomena in the morpho-syntax: focused constituents A′-move to a designated position in the clause, and topicalized phrases are left-dislocated and resumed by a pronoun. Both phenomena are apparent in copular sentences, making it possible to study the relationship between the function and structure of copular sentences. I show that the information-structural properties of Wolof copular sentences are not only apparent, but that they have a direct influence on available copular sentence types, in restricting the types of DPs that can occupy DP1 and DP2 position. Furthermore, the Wolof data show that claims about the function and usage of copular sentences based on English and several other Germanic languages need to be reevaluated against data from languages which use different strategies in forming copular sentences.

The paper is organized as follows. In §2, I discuss types of copular sentences and the information-structural properties usually associated with them. I review the relevant properties of Wolof clausal structure in §3. I introduce the data from Wolof copular sentences in §4, and investigate different DP types that occur in different copular sentence structures. In §5, I propose an analysis of the interaction between information-structural properties of copular sentences and DP types that they allow. I conclude the paper in §6.

2 Copular Sentences

2.1 Types of Copular Sentences

Copular sentences contain two constituents usually connected with a copula. This paper only deals with copular sentences in which the constituents are two DPs, as in (3), which I refer to as Double-DP sentences.

(3) a. Tim is a lawyer. b. The professor is Karlos.

One of the first detailed investigations of copular sentences was undertaken by Higgins (1979). Following Akmajian (1970), Higgins highlights a distinction between the **predicational** and the **specificational** meaning of copular sentences. Consider the following examples:

(4) a. [$_{DP}$ Bernard Haitink] is [$_{DP}$ an exquisite musician]. [**predicational**]
b. [$_{DP}$ The main conductor] is [$_{DP}$ Bernard Haitink]. [**specificational**]

In (4a), the pre-copular DP (DP1) denotes an individual, and the post-copular DP (DP2) predicates a property of that individual: there is an *x* (Bernard Haitink), and that *x* has the property of being an exquisite musician. Specificational sentences, as the one in (4b), seem to perform a different function: the precopular constituent provides a variable (there is an *x* such that *x* is a main conductor), and the postcopular constituent provides a value for that variable (*x* = Bernard Haitink) (Higgins 1979; Declerck 1988; den Dikken 2001; Mikkelsen 2005). The *value* is new information, or *focus*, and the variable part is old information, *presupposition* (Declerck 1988), or *topic* (Mikkelsen 2005). In that sense, a specificational sentence is akin to question-answer pairs, in that the value provides the answer to the question contained in the variable (Declerck 1988).

In addition to predicational and specificational sentences, another type is relevant for the present discussion:

(5) The *ficus elastica* is the rubber plant.

In the sentence in (5), both DPs seem to be referential, and the referent of DP1 is equated with the referent of DP2. Such sentences are usually called **equatives** or **identity statements** (Higgins 1979; Heggie 1988; Declerck 1988).

It is claimed that the crucial difference between predicational and specificational sentences is in the type of the structural subject (the constituent in Spec,TP), which is referential in predicational, and non-referential in specificational sentences (Higgins 1979; Heggie 1988; Declerck 1988; Mikkelsen 2005). It is uncontroversial that DP1 is referential and DP2 property-denoting in predicational sentences, as in (4a). The situation in specificational sentences is less straightforward. That DP2, usually being a name, is referential, is quite clear, but the semantic type of DP1 is a matter of debate. Mikkelsen (2005) uses various tests to elucidate the difference between predicational and specificational subjects,[1] one of which is the contrast in pronominalization pattern of DP1 in these two sentence types:

(6) a. The tallest girl in the class is Swedish, isn't {**she**/*it}? [**predicational**]
b. The tallest girl in the class is Molly, isn't **it**? [**specificational**]

Specificational subjects (DP1's) are pronominalized with the impersonal pronoun *it* in tag questions, unlike predicational subjects. Mikkelsen thus argues that specificational subjects are properties, of type $< e,t >$. A different view is advocated in Romero 2005: the constituent in Spec,TP in specificational sentences is an individual concept (of type $< s,e >$). Her claim is, among other, based on the same

[1] In this paper, *subject* is used to refer to the constituent in Spec-TP.

pronominalization pattern discussed in Mikkelsen 2005: tag questions in the concealed question in (7b) (which she considers to be individual concepts) and the specificational sentence in (7a) uses the same (inanimate) pronoun *it*:

(7) a. The girl who caused the trouble wasn't Mary. **It**/*She was Jane.
b. John guessed the winner of the Oscar for best actress before I guessed **it**/*her.

The debate about the semantic type of DP1 in specificational sentences is not settled. However, it is clear that it is not a referential DP.

2.2 Information Structure of Copular Sentences

Most authors notice that, unlike predicational sentences, specificational ones have a particular information structure: the variable is the presupposition, old information, or topic, and the value is the focus of the sentence (Higgins 1979; Declerck 1988; Heycock 1994; Mikkelsen 2005). Consider the following question-answer pairs:

(8) a. Who is the winner?
b. The winner is JOHN. (S)
c. JOHN is the winner. (P)

(9) a. What is John?
b. #The WINNER is John. (S)
c. John is the WINNER. (P)

A question about the subject (i.e. a question which focuses the referential DP) can felicitously be answered with either a predicational sentence, or a specificational sentence. A question which requires the non-referential DP to be focused, however, can only be answered with a predicational sentence; a specificational sentences seems to reject focus on the pre-copular DP. Based on examples in (8) and (9), Mikkelsen (2005) (also Heycock 1994) argues that specificational sentences in English have a fixed topic-focus structure: DP1 is obligatorily the topic, and DP2 the focus. No similar requirements are placed on predicational sentences.

Wolof overtly marks information-structural properties: topicalization and focalization are expressed in the morpho-syntax, which makes it an ideal candidate for the study of the universality of claims made in the taxonomy of copular sentences.

3 The Clause Structure and A′-movement in Wolof

Wolof belongs to the Atlantic branch of the Niger-Congo language family, most widely spoken in Senegal, but also in the Gambia and Mauritania. It is an SVO language, as shown in the neutral, affirmative sentence in (10):

(10) Xale yi jox na-ñu Musaa tééré bi.
child the give C_{AFF}-3PL Musa book the
"The children gave Musa the book." [AFFIRMATIVE SENTENCE]

This basic word order is changed in A′-movement structures, such as focus constructions, in which the extracted element is fronted:

(11) Tééré bi l-a xale yi jox Musaa.
book the *l*-C_{WH} child the give Musa
"The children gave [THE BOOK]$_{FOC}$ to Musa." [OBJECT FOCUS]

Aside from word order, (10) and (11) differ in two more ways. First, in both sentences there is another element in the clause, a *sentential particle*, in addition to the subject, the verb, and the object – *na* in the affirmative sentence, and *la* in the object focus sentence. Second, an element which I refer to as the *subject marker* follows the particle *na* in (10) (*ñu*, 3PL), but is absent in (11).

There are about a dozen different sentence particles in Wolof: subject and complement focus particles, imperative, affirmative, obligative and negative imperative/obligative particles, and four different temporal modality particles. Due to their complementary distribution, Dunigan (1994) assumes that all sentential particles occupy a single position in the clause, which she identifies as the Sigma phrase, following Laka (1990). For the present purposes, it is sufficient to know that the particles occupy a projection immediately dominating the TP. Since they are complementizer-like elements, I assume the particles are located in C.

In (10), a subject marker follows the clausal particle *na*, but it is altogether absent in (11). There are two groups of construction with respect to the occurrence of subject markers. In A′-movement structures, the subject markers are in complementary distribution with lexical subjects. (12) shows an object focus sentence, in which the object is fronted to the left of the complementizer, and either the lexical subject or the subject marker are found to the right of the complementizer; they cannot both occur (examples from Dunigan 1994).

(12) a. Modu l-a góór ñi gis
Modu *l*-C_{WH} man the see
"The men saw [MODU]$_{FOC}$."

b. Modu l-a-ñu gis
Modu *l*-C_{WH}-3.PL see
"They saw [MODU]$_{FOC}$."

c. *Modu l-a-ñu góór ñi gis
Modu *l*-C_{WH}-3.PL man the see

The lexical subject and the subject marker can both be present only is if the lexical subject precedes the focused element. In fact, the subject marker is obligatory in that case, suggesting that it is a pronoun resuming a topicalized lexical subject:

(13) a. Góór ñi Modu l-a-ñu gis
man the Modu *l*-C_{WH}-3.PL see
"The men, they saw [MODU]$_{FOC}$."

b. *Góór ñi Modu l-a gis
men the Modu *l*-C_{WH} see

The second type are structures are those in which only the subject marker can follow the sentence particle, and the lexical subject is obligatorily at the left edge of the clause. Consider the examples of neutral affirmative sentences in (14):

(14) a. Lekk na-ñu ceep.
eat C_{AFF}-3.PL rice
"They ate rice."

b. Xale yi lekk na-ñu ceep.
child the eat C_{AFF}-3.PL rice
"The children ate rice."

c. *Lekk na xale yi ceep.
eat C_{AFF} child the rice

d. *Xale yi lekk na ceep.
child the eat C_{AFF} rice

Dunigan (1994) and Russell (2006) consider these lexical subjects to be topicalized and resumed by a pronoun in Spec,TP. Russell (2006) presents evidence to that effect, illustrating that left-dislocated lexical subjects in many ways behave like other topics in Wolof. I follow this analysis.

The examples of A′-movement constructions in (11)-(13) all contain the sentence particle *(l)a*. Most instances of A′-movement (focus constructions, one type of *wh*-questions, comparatives, and all long-distance extraction) require its presence. Building on previous work (Martinović 2013), I analyze *(l)a* as an A′-movement complementizer. An important property of this complementizer is that it exhibits a subject/non-subject asymmetry: it surfaces as *a* in cases of subject extraction, as in (15), and as *la* in cases of non-subject extraction, in (16) (Torrence 2005, 2013a,b; Martinović 2013).

(15) K-an **a** gis Musaa?
CL-*an* C_{WH} see Musa
"Who saw Musa?"

(16) K-an **l-a** Musaa gis?
CL-*an* *l*-C_{WH} Musa see
"Who did Musa see?"

The two discussed phenomena – obligatory left-dislocation of lexical subjects and the syntax of A′-movement – are crucial for understanding the structure and properties of Double-DP copular sentences in Wolof, which are A′-movement constructions, some of which obligatorily left-dislocate their lexical subjects.

4 Double-DP Copular Sentences in Wolof

Double-DP copular sentences do not contain a copula, but they do contain one of the sentence particles: the A′-movement complementizer *(l)a*. They come in two forms, DP DP *la*-SM, or DP-*a* DP, illustrated in (17) and (18), respectively. This paper mostly discusses the first type, which I call *la*-sentences.

(17) Xale yi sacc l-a-ñu.
child the thief *l*-C-3PL
"The children are thieves."

(18) Saamba a di (>Saambai) sacc.
Samba C PRES thief
"Samba is a thief."

The presence of *(l)a* always involves A′-movement of a constituent to its specifier position.[2] The form of the complementizer in (17) tells us that the DP in its specifier, *sacc*, did not move there from Spec,TP, meaning that *xale yi* is the structural subject of the sentence. Furthermore, in the *la-sentence*, the particle is obligatorily followed by a subject marker. We saw that there are structures in Wolof in which the lexical subject is obligatorily left-dislocated, and resumed by a subject marker. It appears that *la*-sentences are another such case.

In the *a-sentence* in (18), the complementizer surfaces as *a*, indicating that the element in its specifier is the structural subject. The predicate DP remains below the particle, and there is no resumption.

One difference between *la*-sentences and *a*-sentences lies in their use: while the former are felicitous in a neutral and out-of-the-blue context, the latter usually require DP1 to be focused. I return to this point briefly in §5. A difference more pertinent to the present discussion is that *la*-sentences restrict the types of DPs that can occur as DP1 and DP2, while *a-sentences* do not. I therefore mostly focus on the properties of *la*-sentences.

A tentative structure of the *la*-sentence and the *a-sentence* from (17) and (18) is presented in (19) and 20, respectively. I assume that the two DPs are start out in a small clause. Since Wolof does not have an overt copula, I do not include a VP node in the representation for sake of simplicity. In (19), DP1 raises to Spec,TP, and either moves to Spec,TopP and is resumed in Spec,TP, or stays in Spec,TP and is co-indexed with a lexical subject base-generated in Spec,TopP. DP2 moves to Spec,CP.[3] In (20), DP1 moves to Spec,TP and then to Spec,CP. DP2 stays in situ.[4]

4.1 DP Types in *la*-sentences

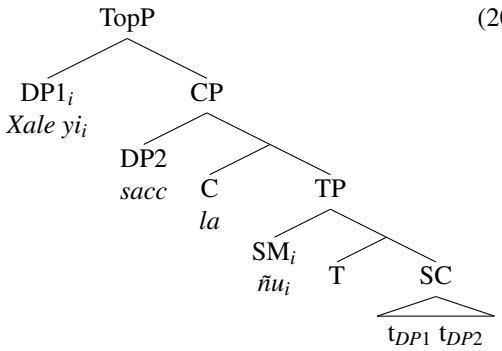
Copular sentences in English differ in terms of the semantic types of DPs that occupy DP1 and DP2 position. Furthermore, we have seen that there seem to be information-structural differences between different types of copular sentences in English. Since Wolof marks information-structural properties in the morpho-

[2] Some authors consider *(l)a* to be a copula (Kihm 1999; Torrence 2005, 2013a,b), due to its occurrence in copular sentence. However, it is not uncommon for elements other than the copula, such as focus markers in African languages (c.f. Hausa, Green 2007) to appear in copular sentences. More importantly, *(l)a* in no way behaves like a verbal element in Wolof: it does not occupy a position inside the VP, but occurs in a projection above the TP, and it is in complementary distribution with all other sentence particles (i.e. complementizer-like elements). For a detailed discussion, see Martinović 2013.

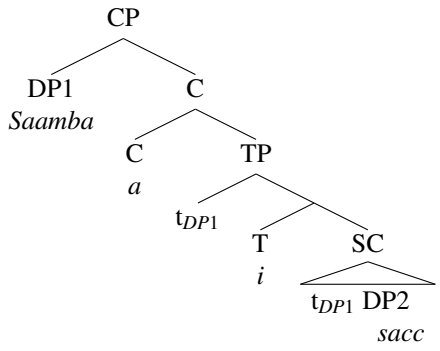
[3] An obvious question to ask is why the predicate DP would obligatorily move to the specifier of the complementizer *(l)a*, which usually occurs in focus constructions, in a neutral copular sentence. While this is an important question, I do not address it here.

[4] Another difference between the two structures is in the obligatory absence of the present tense marker in a *la-sentence*, and its obligatory presence in an *a-sentence*. I leave this issue for further research.

(19)



(20)



syntax, it is a good candidate for investigating the properties of copular sentences that seem to hold for English. In this section, we explore DP types that can occur in Wolof *la*-sentences. Since all types of DPs are allowed in *a*-sentences, I do not address them in detail here.

Both names and definite descriptions are felicitous in DP1 position, with an indefinite DP in DP2 position, corresponding to English predicational sentences:

(21) Saamba sacc l-a-∅.
Samba thief *l*-C-3SG.
"Samba is a thief."

(22) Jangalëkat bi sacc l-a-∅.
teacher the thief *l*-C-∅
"The teacher is a thief."

In English, it is also possible for a definite DP to occupy the post-copular position in this type of a copular sentence:

(23) a. Samba is a thief. b. Samba is the thief.

There are at least two possible interpretations of the sentence *Samba is the thief.* In one scenario, there is a room full of criminals, and we know that only one of them is a thief. The assertion *Samba is the thief* then identifies Samba as being the one who has the property of being a thief. On another reading, there is a particular person (who, for example, was the first to steal the Crown Jewels) and this assertion identifies him as a specific individual, Samba. These two readings are respectively identified as *attributive* and *referential* in Donnellan 1966.

In Wolof, a definite DP is not felicitous as DP2 of a *la-sentence* if it is meant to denote a property. A question such as *What is Samba?* in a context such as the one described above, where Samba is the only thief in a room full of people (so that being a thief is considered Samba's occupation, and is not referring to him as a perpetrator of a specific theft), cannot be answered with the sentence in (24).[5]

[5] The sentence in (24) is felicitous only if Samba is being singled out among a group of individuals as the person who committed a particular theft. I return to this point in §5.

(24) #Saamba sacc bi l-a-∅.
Samba thief the *l*-C-3SG
"Samba is the thief."

It seems that in predicational sentences in Wolof, the DP denoting a property can only be indefinite. This could mean that definite descriptions do not denote properties in Wolof, i.e. that they are not of type $< e,t >$.[6]

A definite DP is acceptable in DP2 position in a context such as the following. A robbery was committed in a village, and the police found a teacher's notebook at the scene of the crime. There is only one teacher in the village, so they conclude that the perpetrator of the robbery is the village teacher. DP2 in this example can felicitously be substituted by a name:

(25) Sacc bi jangalëkat bi l-a-∅.
thief the teacher the *l*-C-3SG
"The thief is the teacher."

(26) Sacc bi Saamba l-a-∅.
thief the Samba *l*-C-3SG
"The thief is Samba."

The constructions in (25) and (26) are like specificational sentences in English: DP1 contains a variable, and DP2 provides the value for it (in Higgins' sense). It is not clear what the semantic type of definite DPs in DP1 position in (25) and (26) is. However, we have seen that a definite DP cannot occupy DP2 position when it would have to denote a property. This could indicate that in Wolof, at least some definite descriptions can not be of type $< e,t >$.

Another possibility is that both DPs in (25) and (26) are of type *e*, and that the examples in (25) and (26) are identity statements, such as *The* ficus elastica *is the rubber plant.* However, example (27) shows that both DPs in a *la-sentence* cannot be referential. Identity statements such as *Osman is Samba* (meaning that the person who introduces himself as Osman is also the person who introduces himself as Samba) cannot be expressed with a *la-sentence*.

(27) *Osmaan Saamba l-a-∅.
Osman Samba *l*-C-3SG
intended: "Osman is Samba."

In *a*-sentences, all DPs are allowed in all positions. As already mentioned, the main difference between *la*-sentences and *a-sentences* is in their use: the former ones are felicitous in neutral, out-of-the-blue contexts, while the latter ones usually require DP1 to be focused. However, in cases in which a particular structure cannot be expressed with a *la-sentence*, such as the ones in (24) and (27), corresponding *a*-sentences are used, regardless of the position of focus.

[6] This phenomenon has been observed in other languages as well. Adger and Ramchand (2003) discuss the case of Scottish Gaelic, in which definite DPs cannot be found in the same type of predicational sentences as indefinite DPs. This also appears to be the case in Salish (Matthewson 1996).

(28) Saamba a di (> Saambaai) sacc bi.
Samba C PRES thief the
"Samba is the thief."

(29) Osmaan a di (> Osmaanai) Saamba.
Osman C PRES Samba
"Osman is Samba."

Table 30 summarizes the discussion on DP types in *la-sentences* in Wolof, and ties them to the known types of copular sentences in Germanic.

(30) DP types in *la*-sentences

	SENTENCE TYPE	DP1	DP2
√	PREDICATIONAL	name, definite DP	indefinite DP, *definite DP
√	SPECIFICATIONAL	definite DP	definite DP, name
*	INDENTITY	name	name

The possibility for all DP types to occupy any position in *a-sentences* shows that such structures are not incompatible with copular sentences in general. This means that there is something about *la*-sentences which makes certain DP combinations, and consequently certain copular sentence types, impossible. In the following section, I propose that *a*-sentences and *la*-sentences differ in information-structural properties, which are the result of their different syntactic structures.

5 The Topic-Comment Structure of *la*-sentences

In section §4, it is shown that *la*-sentences have an informational-structural property which *a*-sentences do not share: they have obligatorily topicalized subjects. This results in a topic-comment structure, which has the purpose of attributing some property (comment) of an already established discourse referent (topic) (Lambrecht 1994). I propose that this syntactic configuration forces the two DPs in copular sentences to be asymmetric: DP2 must contribute information about DP1. For the purposes of the present discussion, we can frame the requirement for DP2 to contribute information about DP1 in another manner: DP1 introduces a question which DP2 (partially) answers. If we think about the two DPs as being in a question-answer relationship, we need to identify possible questions that can be asked. Let us look at two scenarios that capture the structure of the copular sentences investigated in this paper. In the first one, DP1 is a name, and in the second one, DP1 is a definite description.

5.1 DP1 is a Name

In predicational sentences and identity statements, DP1 can be a name. In predicational sentences in English, DP2 can then be an indefinite or a definite DP. Identity

statements can contain either a name or a definite description as DP2, as long as it is referential. We have seen that specificational sentences do not have a name in DP1 position, since that noun phrase cannot be referential.

There are two possible questions that a name can introduce and DP2 can answer:

1. What properties does DP1 have?
2. What is the identity of DP1?

The first question is straightforward, the second, however, is marked in this context, since the use of a proper name normally presupposes that the identity of its bearer is in the common ground.

Let us look at examples of sentence types and see how they satisfy the topic-comment requirement. In a predicational sentence, as in (31), an indefinite DP in DP2 position denotes a property and can answer the first question. In an identity statement, however, both DPs are referential. Since names refer to familiar referents and cannot denote properties, we expect that identity statements would be ungrammatical in *la-constructions*, which is precisely the case, as shown in (32).

(31) Saamba sacc l-a-∅.
Samba thief *l*-C-3SG
"Samba is a thief."

(32) *Osmaan Saamba l-a-∅.
Osman Samba *l*-C-3SG
"Osman is Samba."

In English predicational sentences, DP2 can also be a definite description, as in the sentence (*Samba is the thief*), when *the thief* is used attributively. We have seen, however, that such a structure is infelicitous in Wolof:

(33) #Saamba sacc bi l-a-∅.
Samba thief the *l*-C-3SG
intended: "Samba is the thief."

Why can definite description in Wolof not denote a property? According to Heim (1982), definite descriptions come with a familiarity presupposition. They can only be felicitously used against a common ground in which the discourse referent they presuppose is already defined; in that sense, they are anaphoric. I propose that the example in (33) indicates that definite descriptions in Wolof are under pressure to be interpreted referentially, and cannot be attributive in the sense of Donnellan 1966, which renders them infelicitous as DP2 in predicational sentences. This proposal predicts that definite DPs which cancel familiarity because they presuppose uniqueness should be felicitous as DP2. This prediction is confirmed by example (34):

(34) Yusu Nduur ki gënë siiu ci musicien yi ci Senegal
Youssou N'Dour REL most famous LOC musician the LOC Senegal
l-a-∅.
l-C-3SG
"Youssou N'Dour is the most famous musician in Senegal."

Definite DPs like *the most famous musician in Senegal* in (34) contain more information, which helps establish a unique referent (i.e. we do not need to be familiar with the referent of that DP in advance), which relaxes the familiarity presupposition of the description. I propose that such definites in Wolof do not need to refer to a familiar referent, and can denote properties.

5.2 DP1 is a Definite Description

In Double-DP copular sentences, DP1 can also be a definite description. In a predicational sentence, it can denote an individual, while in a specificational sentence it is proposed to be either property-denoting (Mikkelsen 2005) or an individual concept (Romero 2005). We can again ask two questions about a definite DP in DP1 position:

1. What properties does DP1 have?
2. What is the identity of DP1?

In this situation, the second question is unmarked; we do not presuppose that the identity of the referent of the definite description is known, we just know that there is a familiar referent. Crucially, familiar does not mean identifiable, or even unique.

A predicational sentence with a definite description as DP1 and an indefinite description as DP2 is, as expected, grammatical:

(35) Sacc bi jangalekat l-a-∅.
thief the teacher *l*-C-3SG
"The thief is a teacher."

Specificational sentences, in which DP2 denotes an individual, are also possible *la*-sentences. Crucially, the example in (37) can be understood as satisfying the topic-comment structure if interpreted as an individual concept. In that case, it is a function from possible worlds in W to individuals in D. According to this view, DP2 does indeed contribute information about DP1 – it picks out the individual who is the perpetrator of a particular theft in the real world.

(36) Sacc bi Saamba l-a-∅.
thief the Samba *l*-C-3SG
"The thief is Samba."

(37) Sacc bi jangalekat bi l-a-∅.
thief the teacher the *l*-C-3SG
"The thief is the teacher."

5.3 Rescuing

That the proposed analysis is on the right track is further confirmed by situations in which the requirement for the asymmetry between DP1 and DP2 can be accomplished by some mechanism, allowing one of the DPs to be reinterpreted as a

different type. We already saw one such example, in (34), in which a longer definite description, which contains more information, helps establish a unique referent and thus relaxes the familiarity presupposition of the description. In this section, I present two more examples of rescuing.

In the first one, a sentence in which DP1 is a name and DP2 a definite description is for some speakers ameliorated when DP1 is made more topical. Consider the following context: A theft has occurred, and the perpetrator is unfamiliar, but he is one of the people present in the interrogation room. An eye-witness enters, points at Samba, and utters:[7]

(38) Saamba$_{DEM}$ sacc bi l-a-∅.
Samba thief the *l*-C-3SG
"Samba is the thief."

I propose that pointing is the crucial element that makes (38) acceptable. Namely, by demonstratively picking out the individual denoted by DP1 out of a group of people, DP1 is made more topical then DP2, since demonstratives are higher on the Givenness Hierarchy than definite descriptions (Gundel *et al.* 1993). Furthermore, in this context the identity of the thief is not common ground (even though there is a familiar discourse referent), whereas the identity of Samba is.

The second example of rescuing is a situation in which both DPs are a name, but DP2 can also be understood as denoting a property. I argue that this is precisely the case in (39). *Superman* is not just a name, it evokes a whole set of superpowers that this individual possesses, and can therefore be property-denoting.

(39) Clark Kent Superman l-a-∅.
Clark Kent Superman *l*-C-3SG
"Clark Kent is Superman."

If this analysis proves to be correct, it will question the universality of Mikkelsen's claim that specificational sentences are special in having fixed informational-structural properties, as opposed to predicational sentences.

6 Conclusion

This paper explores the syntax of information structure of Double-DP copular sentences in Wolof, focusing on a structure in which the structural subject is obligatorily left-dislocated, and the second DP is A′-moved to the specifier of the complementizer *(l)a*, which occurs in many focus constructions. I argue that this creates a topic-comment structure, which imposes a particular requirement on the type of DPs that can occupy DP1 and DP2 position in the clause. In particular, I argue that DP2 must contribute new information about DP1. Despite their fixed

[7] Several of my consultants independently gave this scenario, insisting on the pointing gesture.

information-structural profile, both predicational and specificational sentences, argued to crucially differ in terms of their information structure in several Germanic languages, can occur in this syntactic configuration in Wolof. This suggests that particular information-structural profiles are not universally associated with certain copular sentences. The proposed taxonomy of copular sentences therefore needs to be tested in languages which construct copular sentences in different ways, yet still maintain the semantic and pragmatic functions associated with various copular sentence types.

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Language Change as a Social Process: Diffusion Patterns of Lexical Innovations in Twitter

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One of the major concerns of sociolinguists is to better understand and explain the mechanisms driving language change, in particular the process by which innovative variants appear and subsequently spread throughout a population. Questions regarding the diffusion of new variants over time have been explored from a variety of perspectives (most prominently in socio- and historical linguistics), and a consistent finding is that the diffusion of innovative variants through the linguistic system forms an S-shaped curve with respect to time (Labov 2001).

Similar observations are reported from the field of innovation diffusion research, an interdisciplinary area of the social sciences concerned with how, why, and at what rate innovative ideas and technologies spread through social systems. Studies from innovation diffusion research have shown that the rate of diffusion of (non-linguistic) innovations—including medical, agricultural, political, and technological examples—also forms an S-shaped curve with respect to time (Rogers 1995).

The similarities between findings from language change research and innovation diffusion research suggest that language change may be explained by the same mechanisms that govern the social diffusion of non-linguistic innovations. In this paper I apply the theoretical framework of innovation diffusion research to an instance of language change. By approaching the diffusion of linguistic innovations as a social process, I hope to gain insights into the mechanisms of language change from a new perspective.

Section 1 gives a background of the S-curve model of diffusion from both the

sociolinguistic and the innovation diffusion perspectives, highlighting similarities as well as critical differences between the two models. Section 2 introduces the dataset and gives an overview of the research design. Section 3 presents the results of the analysis. Section 4 discusses the implications of the results, in particular how the innovation diffusion model can be used to uncover nuances in the innovation-decision process of language users. Finally, section 5 outlines some conclusions.

1 Background: S-Curves of Diffusion

1.1 Innovation Diffusion Research

Sociologists and anthropologists in the 1920s and 1930s were already investigating the process of innovation diffusion in various domains on the premise that the spread of new ideas and products had to do with social connections and informal communication among people in a society (Katz et al. 1963). A major breakthrough came when Ryan and Gross (1943) reported that the diffusion of innovative agricultural technology formed an S-shaped curve—following a "slow-quick-slow" pattern—with respect to time. Since then, studies in medicine (Coleman et al. 1966), family planning (Rogers and Kincaid 1981), and other areas have provided more evidence that the S-curve pattern of innovation diffusion is generalizable to all different types of socially diffused innovations.

Threshold models (Granovetter and Soong 1988; Valente 1996) have been proposed to explain why diffusion occurs in an S-curve pattern. These models propose that there is a "tipping point," both within individuals and the population as a whole. In the case of an individual, a very low adoption threshold would mean that the individual would only need superficial exposure to the innovation in order to adopt it, whereas a high adoption threshold would require many other members of the individual's social network to adopt before arriving at his or her tipping point. At the level of the population, the threshold refers to the critical mass of overall adoption among the population before the rate of diffusion begins to accelerate.

A related concept is the innovation-decision process (Rogers 1995), which recognizes that an individual's decision to adopt an innovation is not instantaneous, but progresses through five stages: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and 5) confirmation (Rogers 1995). At any point in the innovation-decision process, the individual may reevaluate his or her previous behavior and choose to adopt or reject the innovation.

In spite of the evidence showing that the S-curve is the most typical pattern for innovation diffusion, Rogers (1995) points out that this pattern is only predicted for successful innovations, while in fact a great many innovations never

reach a critical mass of adoption and fail to diffuse widely. Furthermore, even in the case of successful innovations, some diffusion patterns may not form an S-shaped curve due to specific conditions related to the social system or to the innovation itself. The exact shape of the diffusion curve must be empirically determined for each individual innovation; deviations from the prototypical S-shaped curve may be interpreted based on the idiosyncratic conditions of the specific innovation and the specific social system.

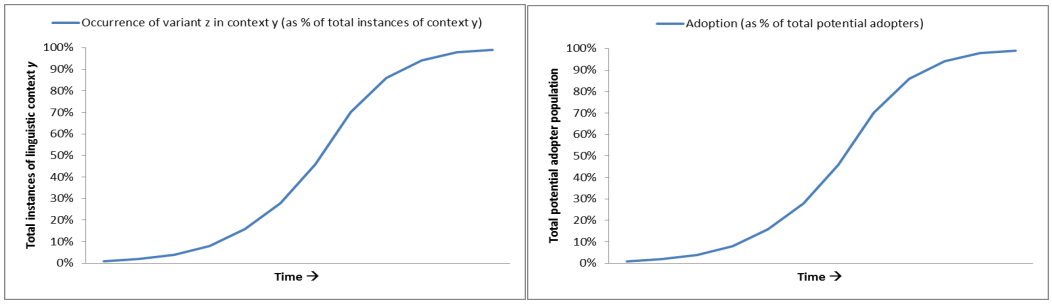
1.2 Sociolinguistic Research

Sociolinguists have classically studied the process of language change by correlating linguistic variation with social factors, such as class (Labov 1964; 1994), gender (Ochs 1992; Bucholtz 1999; Cameron and Kulick 2003), age (Sankoff and Blondeau 2007), ethnicity (Cukor-Avila and Bailey 2001), and social network structure (Labov 1972; Milroy and Milroy 1985; Eckert 2000; Paolillo 2001). The progression of linguistic change over time has typically been analyzed using either the apparent time construct (comparing language use by speakers of different ages at a single point in time) or real time data (comparing language use by matched speakers at different points in time). While these two approaches have indeed spawned advancements in language change theory, the time gaps between cohorts are often too coarsely grained to allow in-depth analysis of the precise diffusion pattern over time.

A parallel stream of language change research has developed that sidesteps the size limitations of the traditional variationist study by employing computer modeling to try to understand language change on a large scale. Landsbergen and Lachlan (2004) use a computer simulation to model the historical semantic shift of English *will* and Dutch *willen*. Nettle (1999) used computer simulations modeled on Social Impact Theory to test various social and network parameters that may influence the spread and adoption of linguistic changes. And Ke, Gong, and Wang (2008) draw from and improve upon Nettle's model by comparing simulations using different types of network structures. The cumulative body of sociolinguistic research, from both the computational modeling and simulation stream and the empirically based real- and apparent time research tradition, consistently reports an S-shaped curve of linguistic diffusion over time (Bailey 1973; Labov 1994, 2001; Denison 2002; Tagliamonte and D'Arcy 2009).

In spite of the superficial similarities between the sociological and sociolinguistic S-curve models of diffusion, however, there is a crucial difference between the two constructs: one measures diffusion through a *linguistic* system, while the other measures diffusion through a *social* system. This difference is illustrated in (1), which shows idealized S-curves of diffusion in the socio-historical linguistic traditions (on the left), as well as in the tradition of sociological diffusion of innovation (on the right).

(1) Diffusion through a *linguistic* system (left) and *social* system (right)



In both graphs the *x*-axis indicates time; the *y*-axes, however, represent different measures. On the left, the *y*-axis represents all occurrences of a particular linguistic context *y*—a context in which evidence of variation of some sort has been identified, and which is the suspected locus of a change in progress. Each point in the curve represents the percentage of all instances of context *y* that are realized as variant *z*, at each point in time (for instance, the percentage of *ne* deletion in negation contexts in Montreal French).

On the right, the *y*-axis represents the population of potential adopters—that is, individuals within the community who could conceivably be exposed to the innovation and might eventually adopt it themselves. Each point in the curve represents the percentage of the total potential adopter population who have adopted the innovation at each point in time.

The distinct *y*-axis labels in both graphs mean that the S-curves of diffusion discussed in sociolinguistics and innovation diffusion in fact measure two entirely different concepts. Socio- and historical linguists too often fail to make this distinction, referring to the increase of a linguistic variant relative to the text data as social diffusion, when in fact social diffusion is measured by the proportion of individual language users who adopt the variant.

2 Data and Research Design

2.1 Twitter Data

The study is based on a 19-million-word corpus collected from the online microblogging service Twitter, consisting of all Twitter posts containing the following community-specific lexical innovations: *tweeps*, *tweeties*, *tweeple*, *tweethearts*, *tweople*, *twerps*, *tweetheads*, *twitterbugs*, *tweebs*, and *twittertwatters*. These variants, henceforth referred to as Twitter People variants, all share the approximate meaning "twitter friends." For example, *tweople* combines "Twitter" and "people" (2), *tweeps* comes from "Twitter peeps" (3), and "Twitter sweethearts" becomes *tweethearts* (4):

(2) How many **Tweople** got hair cut today?

(3) For all you working **tweeps** out there...apparently tweeting at work is a good thing

(4) Time for bed - busy day tomorrow. Goodnight **Tweethearts**! Thanks for the fun and tweet dreams:)

One advantage of using Twitter data to investigate language change stems from the existence of automatically collected digital archives, containing complete records of past Twitter posts (tweets). In most cases, sociolinguistic researchers are able to identify a change in progress only in advanced stages of the diffusion process. Yet using archived collections of historical Twitter data, it is possible to identify variants of interest at later stages of the change in progress, and then subsequently trace the diffusion trajectory backward in time to the earliest appearances of the innovative variants. In this way, the Twitter dataset collected for the present study provides a rare opportunity to examine the early stages of the innovation and diffusion process.

The use of Twitter as a data source also avoids some of the practical limitations encountered by previous research into the diffusion of linguistic innovations over time. Most of the sociolinguistic studies investigating the spread of innovative variants are based on empirical, real-world language data collected from a relatively small number of speakers (e.g. Milroy and Milroy 1985; Eckert 2000), requiring time-consuming methodologies that effectively limit the overall sample size of the study. Another thread of research has begun using computer models to simulate large-scale diffusion of linguistic innovations (Nettle 1999; Ke et al. 2008), utilizing powerful statistical tools to gain insight into aspects of language change that are undetectable on a small scale. The Twitter data capitalize on the advantages of both streams of research described above, combining empirical language data with large quantities of time-stamped data.

2.2 Research Questions

The paper addresses the following research questions: 1) Do the Twitter People variants follow an S-curve pattern of social diffusion? If so, that would suggest that language change shares characteristics with other kinds of social processes, and may be governed by the same mechanisms that shape the social diffusion patterns of non-linguistic innovations. 2) Are the diffusion patterns consistent across all Twitter People variants? If not, are these differences correlated with other factors, such as the relative success/failure of the variant (as measured by overall frequency)? 3) How many times must a user post a Twitter People variant to be considered an adopter? And, 4) is the shape of the diffusion curve affected

by the criteria used to define adoption? (See below for discussion of adopter criteria.)

2.3 Corpus Overview

The Twitter People Corpus consists of all Twitter posts that contained any of the Twitter People variants listed previously, posted from 2006 through 2011. The data collected includes the full text of the tweets, the user name of the author, a timestamp of the publication accurate to the second, and a variety of additional metadata. Table (5) displays the word count, number of tweets, and number of individual users for each Twitter People variant subcorpus.

(5) Twitter People variants—word count, tweet count, and user count

Twitter People variant	Word count	Tweet count	User count
tweeps	13,967,506	824,520	333806
tweeties	2,187,292	150,210	99207
tweeple	1,592,845	100,865	58982
tweethearts	650,927	44,556	26371
tweople	326,934	22,749	13711
twerps	157,387	11,040	9056
tweetheads	38,205	2,692	1669
twitterbugs	31,111	2,137	1363
tweebs	16,936	1,232	913
twittertwatters	193	16	15
Total	**18,969,336**	**1,160,017**	**545,093**

In total the corpus contains close to 19 million words. By far the most popular and most widespread variant of the group is *tweeps*, appearing in more than 800 thousand tweets. At the other extreme is *twittertwatters*, appearing just 16 times throughout the entire time period represented by the corpus.

2.4 Time of Adoption

One possible way to represent the rate of diffusion would be to calculate the raw frequencies of each keyword based on the total number of occurrences in the corpus. However, the diffusion rate of a socially-diffused innovation is more often—and more usefully—measured based on the time at which individuals adopt the innovative term, with no regard to the times of subsequent productions. For the individual Twitter People variant diffusion graphs, time of adoption is defined by the Unix timestamp that corresponds to the earliest tweet of each unique user in each variant subcorpus.

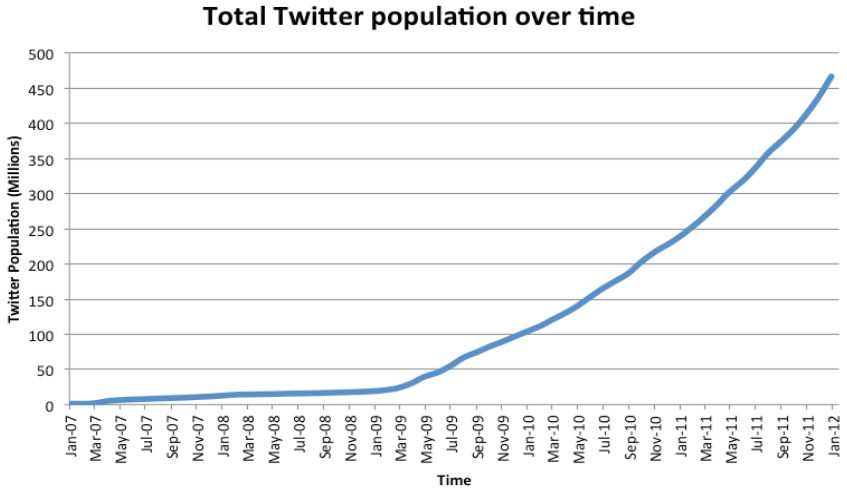
2.5 Accounting for Twitter Population Growth

Traditional mathematical models of innovation diffusion have generally assumed a stable overall population size. This assumption, while convenient conceptually and mathematically, often fails to represent the reality (see Mahajan and Peterson 1978). In the current example, the Twitter population is far from constant; on the contrary, it has increased—and continued to increase—over time, as more and more people continue to sign up for new Twitter accounts.

Twitter has not published official records of its population increase over time, although numerous external observers have calculated the approximate population increased based on a variety of secondary information. In this investigation I used Twitter population data calculated by Pelzer (2012). The data were published in graphical form, but the raw population numbers are not publicly available. I converted the visual Twitter population data into numerical coordinates to reproduce the corresponding population data.

Figure (6) shows the total Twitter population increase in monthly increments, from January 2007 through December 2012 (reanalyzed from Pelzer 2012 visualization). The most dramatic increase in population growth occurred in February 2009, though there is also a noticeable increase in March 2007. The population growth continued to increase through the end of 2011.

(6) Twitter Population over Time, 2007–2011



In order to account for this growing potential adopter population in Twitter, I calculated proportional frequency of adopters over time, rather than using the raw frequency of individual adoption. Proportional adoption rates were calculated by dividing the raw frequency of adopters in each Twitter People variant subcorpus by the number of overall Twitter users, for each point in time along the *x*-axis.

The resulting value represents proportional adoption rates of each variant adjusted for the simultaneous increase in the total population of potential adopters.

2.6 Adopter Criteria Conditions

The question of how to define adoption in the context of Twitter People variants in Twitter is one that must be carefully considered, as it may have significant consequences for the analysis itself and for the interpretations of the results. The simplest and most straightforward definition would be to consider any single use of the variant in question as adoption. However, it is possible that some users adopted a Twitter People variant on a trial basis (as part of the innovation-decision process) process before subsequently rejecting it. In this case, a single post containing the variant would not constitute final adoption. Two adopter criteria conditions, based on number of posts per user (all users vs. multiple-post users only), are assessed in the diffusion analysis.

3 Results

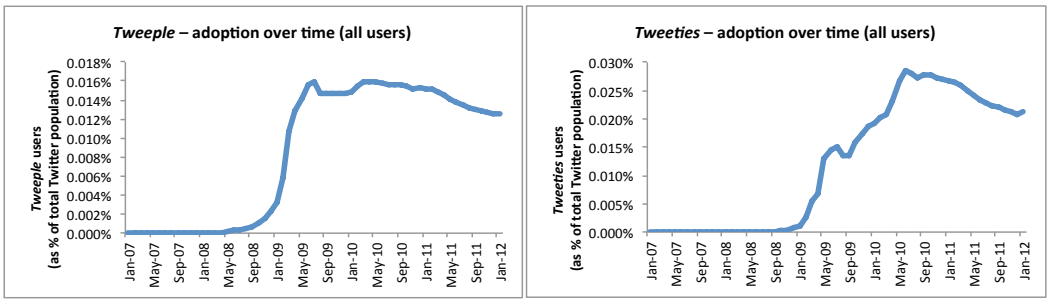
The results of the analysis are displayed using graphical representations of the adoption/diffusion patterns of each Twitter People variant, as well as the entire group of Twitter People terms combined, over the time period represented by the data.

Although the data collection spanned the time range from March 2006 through January 1, 2012, none of the variants appeared prior to 2007. Because of this, all of the diffusion graph results are presented with an *x*-axis time scale of January 2007 until January 2012. The *y*-axis range varies according to the overall frequency of each variant for best visual comparison of the overall trajectories of the diffusion curves.

3.1 Overall Diffusion Patterns

When looking at the diffusion patterns for the Twitter People variants based on all users, two common patterns emerge. The first pattern resembles the prototypical S-curve predicted by both the sociolinguistic and the innovation diffusion literature. Examples of this pattern are shown in (8). The theoretical S-curve model measures cumulative frequency of the innovation over time, which would mean that the *y*-value can never decrease over time. However, because the diffusion curves of this study are based on proportional frequency relative to a simultaneously increasing Twitter population, it is possible for the number of potential adopters to increase more rapidly over time than the number of cumulative adopters, as seen in (7).

(7) S-Curve Diffusion Pattern (All Users)



Examples of non-S-curve diffusion patterns are shown in (8). These diffusion curves are stepwise or near-linear in pattern, and are characterized by continuous increase over time, in some cases interspersed with periods of stable proportional frequency.

(8) Non–S-Curve Diffusion Pattern (All Users)

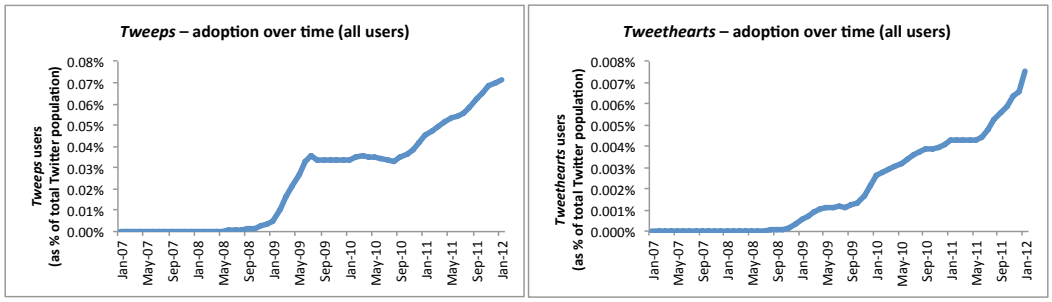


Table (9) shows the distribution of diffusion patterns for all variants.

(9) S-curve Summary of Twitter People Variants (All Users)

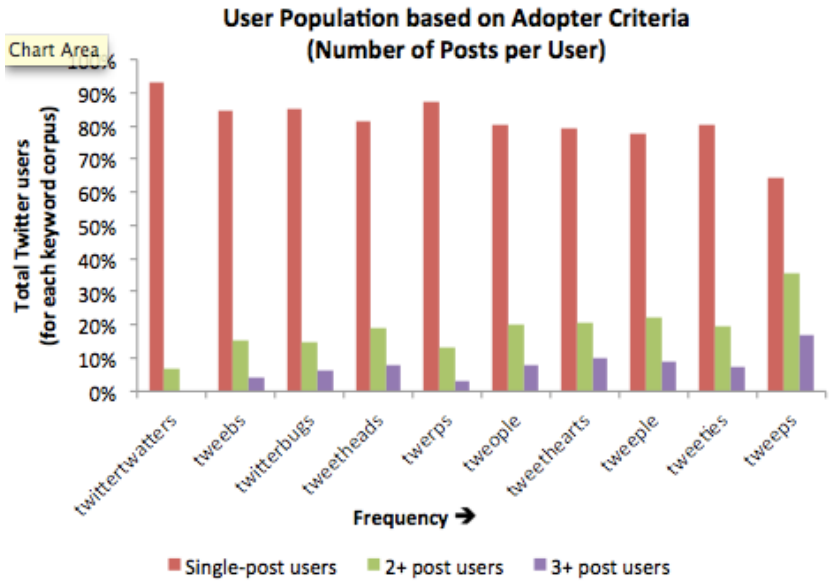
All Users	
Frequency (low to high)	**S-curve**
twittertwatters	x
tweebs	
twitterbugs	x
tweetheads	
twerps	
tweople	x
tweethearts	
tweeple	x
tweeties	x
tweeps	

3.2 Adopter Criteria

As discussed in Section 2, the criteria used to determine whether a Twitter user is, in fact, an adopter of the Twitter People variants may be adjusted based on the total number of posts per user. Over 70 percent of users posted only once, while less than 14 percent posted three or more times.

Figure (10) shows the proportion of adopter type (based on total posts per user) in each Twitter People variant subcorpus, arranged in order of overall frequency from left to right. The graph shows a positive correlation between overall frequency of the variant (indicating relative success of diffusion) and the percentage of users with multiple posts (2+ and 3+ post users), and a negative correlation between overall frequency of the variant and the percentage of users who posted only a single time throughout the period represented in the corpus.

(10) User Population by Adopter Criteria



3.3 Diffusion Patterns—Users with Multiple Posts

When the adopter criteria are limited to include only those users who posted multiple times (2+ and 3+ users), the resulting diffusion curves are altered. More of the Twitter People variants exhibited S-shaped diffusion curves under the multiple-posts-per-user condition than in the all-users condition. Figure (11) shows the diffusion curves for *tweeps* and *tweethearts* for users with three or more posts each. The same variants that did not produce S-shaped diffusion curves in the all-user filter (8) now follow the "slow-quick-slow" S-curves under the multiple-posts-per-user filter.

(11) S-curve Pattern (3+ Post Users)

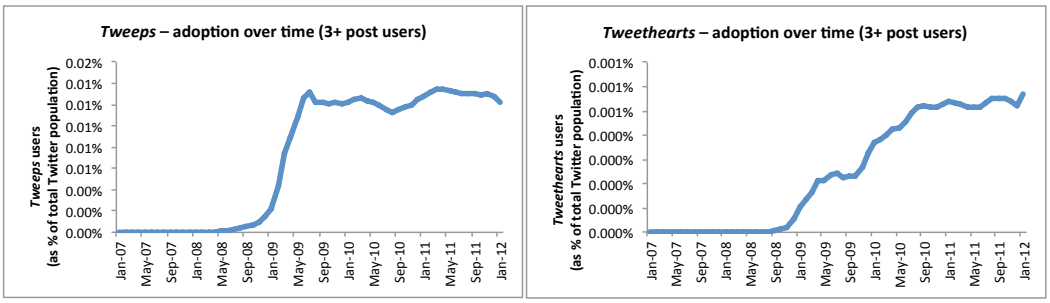


Figure (12) summarizes the diffusion patterns for Twitter People variants in the multiple-posts-per-user filter. (*Twittertwatters* was excluded because there are not enough data points for multiple-post users to produce a diffusion curve for that variant.) The only variant that does not follow an S-curve is *tweetheads*.

(12) Diffusion Pattern Summary, Multiple-post Users Only

3+ Post Users Only	
Frequency (low to high)	**S-curve**
twittertwatters	N/A
tweebs	x
twitterbugs	x
tweetheads	
twerps	x
tweople	x
tweethearts	x
tweeple	x
tweeties	x
tweeps	x

4 Discussion

In this section I discuss the significance of the main findings for the diffusion analysis, beginning with the S-shaped diffusion patterns for the all-user adopter criteria exemplified in (7) and (8), and summarized in (9). Although Rogers (1995) claims that the S-curve pattern occurs only in cases of successful diffusion, the results show an even distribution of S-curve versus non–S-curve diffusion patterns across the range of frequencies of the variants. I found no significant difference between the likelihood of a popular slang term (e.g. *tweeps*) vs. an unpopular slang term (e.g. *twittertwatters*) to diffuse in an S-shaped pattern.

While it is not a trivial finding that five out of ten of the Twitter People variants follow the S-curve pattern of diffusion—this at least partially confirms the hypothesis that language change may diffuse socially via the same mechanisms as non-linguistic innovations—neither is it overwhelmingly

conclusive. With the introduction of the varying adopter criteria, however, the results become much more telling.

The clear majority of all Twitter users in the corpus only authored a single post employing the Twitter People variant. In other words, most of the Twitter users tried out the new slang term once, but never fully integrated it into their permanent lexicon. This raises the question of the degree of perceived *trialability*—the ability to try out an innovation on a trial basis without making a commitment—of Twitter People variants. This allows the individual to judge the merits and/or consequences of the innovation under real conditions. In this case, a Twitter user can try out one of the innovative Twitter People variants one time with a minimum of risk or inconvenience. The attribute of trialability is positively correlated with rate of adoption (Rogers 1995), meaning the Twitter People variants (and likely for the same reasons, other innovations within Twitter and on the Internet as a whole) are predicted to diffuse rapidly.

The relationship found between the number of posts per user and overall frequency of the variant (10) also supports the interpretation that single-post users were engaging in a trial period before deciding whether or not to adopt the innovation. The more popular variants retained more adopters after the trial period than did the less popular variants, thus the more successful variant subcorpora have a higher proportion of repeat posters than the less successful variants.

The innovation-diffusion process (Rogers 1995), briefly described in Section 1, conceptualizes the act of adoption as a five-stage process. The first stage is knowledge, or exposure to the innovation, followed by persuasion, when the individual forms an initial favorable or unfavorable attitude toward the innovation. The third stage is the decision stage, and it is here that the trialability of an innovation comes into play. The first time a Twitter user tries out a Twitter People variant (or any other innovative element), he or she is engaged in a decision-stage activity with the purpose of informing the decision to adopt or reject the innovation. If at this point the individual decides to adopt the innovation, this stage is followed by implementation (with possible re-invention) and confirmation. Rejection can occur at any stage in the innovation-diffusion process.

The minimum requirement for an individual to be considered an adopter is the implementation (post-trial) stage; in the Twitter People data, this can be defined as a user's second post using the same Twitter People variant. We can be even more confident of the adopter classification, however, if the individual has advanced through the confirmation stage—signaled by a user's third post. Following this model, single-post users should not be considered adopters.

A comparison of (8) and (11) illustrates the effect of altering the adopter criteria to exclude non-adopter single-post trial users from the diffusion data. The most dramatic transformation occurred for the most successfully diffused variant in the corpus, *tweeps*. The summary of diffusion patterns for Twitter People variants using the multiple-posts-per-user adopter criteria (12) reveals that all but

one variant—*tweetheads*—followed the S-curve "slow-quick-slow" pattern of diffusion. A look inside the *tweetheads* corpus quickly uncovers the reason for its exception: the "Twitter People" meaning of *tweethead* is overshadowed by the posts and references to public persona @tweethead. As such, it is to be expected that the *tweetheads* corpus not follow the typical pattern of innovation diffusion, since the primary context of *tweethead* is not as an innovative lexical item but rather as a personal and/or shared culture referent.

5 Conclusion

The results of the Twitter People diffusion analysis lend support to the view that language change is a socially driven process, and can be successfully analyzed using methods and theoretical frameworks from social science disciplines beyond linguistics. While some of the details of the Twitter People analysis varied from specific assumptions of the innovation diffusion theoretical framework (for instance, the failed Twitter People variants were as likely as successful ones to follow an S-curve pattern of diffusion), the major tendencies found across innovation diffusion studies held true for the Twitter People variants. The established concepts of the innovation-decision process and innovation attributes (in particular the notion of trialability) also provided a cohesive framework and valuable explanations for interpreting the results.

Applying classic innovation diffusion research methods to the study of language change gives sociolinguists a powerful tool for verifying and interpreting the results of both theoretical simulations of large-scale linguistic diffusion and in-depth empirical research investigating real-world language change on a smaller scale. Although some quantitative methods were used, this has remained essentially a qualitative study of diffusion over time. In the future, a fully quantitative research design may be able to more precisely compare the diffusion patterns than was possible here. The intersection between innovation diffusion and language change is a relatively unexplored area, which will benefit from the analysis of new data sources, as well as further theoretical development. As a whole, this study represents the successful application of a new (to linguistics) approach that can add another dimension to the study of the mechanisms of language change as a social process.

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Roadblocks in the Grammaticalization Highway: When Phonology Gets in the Way[1]

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1 Introduction

In his famous characterization of syntactic change, Langacker likens languages to "gigantic expression compacting machines" (1977:106). He writes,

> The machine does whatever it can to wear down the expressions fed into it. … It attacks expressions of all kinds by phonetic erosion. It bleaches lexical items of their semantic content and forces them into service as grammatical markers. It chips away at the boundaries between elements and crushes them together into smaller units. The machine has a voracious appetite. (Langacker 1977:106)

When a lexical item is fed into the machine, the resulting formative is only a fraction of the original in both form (by phonetic erosion) and meaning (by semantic bleaching). In a well-known case, the Old English noun **līc* meaning 'body' was fed into the machine and, over centuries of use, the machine bleached its semantic content, wore down its phonetic form, and compacted it with the adjective that preceded it. These processes worked together to create a vaguely reminiscent adverbial suffix *-ly* in present day English (Lehmann 1995). This coupling of semantic, morphosyntactic, and phonetic processes in a single

[1] Thanks to Marianne Mithun and the audience at the 39th Annual Berkeley Linguistics Society Meeting for helpful feedback on this paper. All mistakes are my own.

machine has been a foundational principle in studies of grammaticalization and has been rigorously demonstrated in studies like Heine and Reh (1984) and Bybee, Perkins, and Pagliuca (1994). Furthermore, observed trends in language after language have given strong support to a related hypothesis of unidirectionality, which states that the concomitant changes subsumed under grammaticalization move in one direction. In particular, the unidirectionality hypothesis has been robustly exemplified on the formal dimension of grammaticalization with the cline: lexical item > clitic > affix (Haspelmath 2004).

However, a number of studies have pointed out examples of changes in the opposite direction, where grammatical elements have become more autonomous (i.e., infinitival markers in English (Fischer 2000)), gained semantic content (i.e., modal to full verb in Pennsylvania German (Burridge 1998)), or developed from suffixes to clitics (i.e., English *s*-genitive clitic from genitive case suffix (Norde 2009). Although examples of degrammaticalization have not derailed notions of unidirectionality in grammaticalization, they have revealed that changes in one area of a linguistic system can have an unpredictable effect on the grammaticalization process in another. For example, it was the loss of case in Old English that led to the reanalysis of *-s* as a clitic.

What is more interesting is the case presented by Bisang (2004), who shows that grammaticalization in the geographic regions of East and Southeast Asia need not include these concomitant processes of semantic generalization and phonetic reduction. Bisang proposes, '[a]lthough the coevolution of form and meaning in terms of Bybee (1985) and C. Lehmann (1995) works for a large number of languages, it does not seem to be universal as we can see from the perspective of East and mainland Southeast Asian languages…' (2004: 109). In a similar vein, Schiering proposes that phonetic erosion 'is not universally associated with grammaticalization' and that cross-linguistic evidence suggests that stress-based as opposed to syllable-based languages show higher degrees of phonetic erosion (2010:74-75). Schiering demonstrates that a stress-based language (German) undergoes more phonetic reduction diachronically than a syllable-based language (Turkish).

In light of these more recent proposals that question the unidirectionality of grammaticalization and the necessity of phonetic erosion (or more broadly autonomy), the third person pronominal suffix *-nye* in Besemah, a little-known Malay language of southwest Sumatra, presents an interesting puzzle. In the majority of constructions *-nye* attaches directly to the root and has undergone phonetic erosion (i.e., *-nye* > *-e*): *anak-**nye*** > *anak-**e*** 'their child'. In deverbal noun constructions suffixed with *-an*, or circumfixed with *peN- -an,* however, the *-nye* is separated from the root and surfaces as a separate phonological word (i.e., *-nye* > *anye*): *langkah-an**-nye*** > *langkah-an **anye*** 'his stride' (from the root *langkah* 'to step'). One might expect that the most phonetically robust and prosodically independent form (*anye*) is the oldest, but there is strong evidence going back to Proto-Austronesian that it is not. Therefore, what do we make of a case where a suffix by all other accounts is grammaticalizing, but in some

constructions is phonetically strengthened and phonologically less bound (i.e., suffix > word)? Arguably, such a case should be added to the growing list of examples of degrammaticalization because *-nye* is apparently climbing up the cline. However, what is more interesting than this taxonomy is determining the conditions, pressures, and/or motivations by which this change emerged. It turns out that this unexpected alternation between *-e, -nye,* and *anye* can be attributed to a morphophonological (or more specifically *morpho-prosodic*) preference in Besemah for no more than one suffix per word. This preference alongside restrictions on phonological words and routinization has resulted in a number of unusual patterns, most importantly the alternations resulting from the suffix *-nye* attaching to other suffixes.

The discussion here proceeds as follows. Section 2 presents an overview of relevant aspects of the phonological and morphological systems of Besemah. Section 3 presents the synchronic description and diachronic development of *-nye* > *anye*, including the morphosyntactic distribution, semantics, morphophonemics, and etymology of *-nye*. Section 4 then provides the diachronic explanation for *-nye* > *anye*, drawing on evidence from a corpus of naturalistic speech. Section 5 describes other cases in the language where previously dependent forms become autonomous, and section 6 presents a possible grammaticalization pathway for these changes. Section 7 concludes the study.

2 Overview of Besemah

Besemah is a Malay language spoken in the remote highlands of southwest Sumatra by approximately 400,000 people. Aside from work in the early 20th century, including a dictionary, short text collection, and basic grammar sketch (Helfrich 1904), little recent linguistic work has been done on the language. Besemah is similar to well known varieties of Malay, namely Standard Malay-Indonesian, but it differs in interesting ways. For example, Besemah has roughly the same consonant inventory with the addition of voiced velar fricative /ɣ/, but it has a much more conservative vowel inventory (i.e., /a, i, u, ə/) because the language never developed mid vowels /e, o/ (McDonnell 2008).

Morphologically, Besemah has a slightly reduced inventory of grammatical morphemes. Prefixes include the active voice *N-*, passive voice *di-*, non-volitional *te-,* middle voice *be-*, and agent nominalizer *peN-*.[2] The suffixes include the nominalizer *-an*, causative/applicative *-kah*, and the locative applicative *-i*. The circumfixes include the locative nominalizer *peN- -an*. Other morphemes only occur as fossilized forms in a small set of words (i.e., nominalizing circumfixes *ke- -an* and *per- -an*). The majority of these morphemes do not co-occur on the same word, with the exception of the voice prefixes and applicative suffixes.

Besemah has a slightly reduced set of pronominal affixes with only two forms: the first person *=ku* and third person *-nye*. These morphemes have

[2] The *N-* represents an underspecified nasal that is homoroganic to the first consonant of the root.

traditionally been referred to as enclitics, but to my knowledge this position has never been actively defended. Although there is some evidence that the first person *=ku* is an enclitic, there is little evidence that *-nye* in Besemah should be characterized as an enclitic (see section 3 below). What is important to note about these pronominal formatives is that both forms occur freely after nominal roots, but after verbs only the third person *-nye* occurs with several syntactic restrictions. However, the following sections will demonstrate that the pronominal formatives behave erratically when attached to morphologically complex forms.

Lastly, it is useful in Besemah to distinguish between phonological and grammatical words (cf. Dixon and Aikhenvald 2003); only the former is discussed here. Lexical items in Besemah are largely disyllabic. There are a small number of lexical items that are monosyllabic, but these are typically borrowed words and consist of closed (CVC) syllables. Besemah words that are larger than two syllables have a number of restrictions. By and large any prepenultimate syllable is reduced to schwa, a historical process that occurred in all of the Malay languages of Sumatra (Adelaar 1992). In Besemah, this process did not apply to vowel sequences, so there are high vowels /i, u/ in the prepenultimate syllable in words like *siamang* [sijamaŋ] 'gibbon.' There are some marginal examples of lexical items that are longer including *mataghi* [mataɣi] 'sun.' However, this case is quite clearly a fused compound, *mate* [matə] 'eye' and *aghi* [aɣi] 'day'. As in many Malay languages, word-level stress in Besemah is not entirely clear, but it appears that stress falls on the final syllable of the word (McDonnell 2013). If a root is suffixed, stress shifts to that suffix (i.e., the final syllable of the word).

3 The Form, Function, and Origin of *-nye*

The *-nye* suffix in Besemah is cognate with the well-documented enclitic/suffix *-nya* in Standard Malay-Indonesian (Macdonald 1976: 71-74, 126-127, Cumming 1991: 25-28, Ewing 1995: 237-238). As with its cognates in other Malay varieties, the meaning/function of the Besemah *-nye* is difficult to pin down. Nevertheless, it occurs primarily as the patient in an active transitive construction (1), the agent in a passive construction (2), and the possessor of an NP (3).

(1) Aku gale jiku (m)-masuk-i-**nye**,
1SG all say.1SG AV-enter-APPL-**3**
'I alone, I said, entered **them** into the group,'

(2) Dide di-ruruh-i-**nye** agi li Tabran.
NEG UV-take.care-APPL-**3** again by T.
'(It) is not taken care anymore **by him**, by Tabran'

(3) Sape dame-**nye**?
who name-**3**
'What was **his** name?'

However, it is important to note that the distribution of cognate forms of *-nya* in Malay languages is not uniform. For example, Ewing (1995: 237) reports that *-nya* in Colloquial Indonesian marks definiteness, (associative) possession, and gerunds. Similarly, Engelbretson (2003) reports that *-nya* acts as a possessive marker, identifiability marker, nominalizer, pronominal marker, and adverbial marker (153-171). For definiteness, *-nya* marks NPs that are identifiable in the discourse. For possession, *-nya* acts a ligature between the possessed and possessor (i.e., POSSESSED-*nya* POSSESSOR).[3] For nominalization, *-nya* forms gerunds from verbal elements. In Besemah, however, *-nye* does not mark this type of (associative) possession nor does it form gerunds; it does appear to mark definiteness, which is demonstrated in (4).

(4) Puntung dindak mbagal **sumpit**.
firewood not.want av-hit picher.bug
'The firewood didn't want to hit **a pincher bug**.'
…
Njadi puntung tadi,
so firewood just.now
'So, the firewood just now,'
.. ude kate-nye mane sumpit**-(ny)e**?
whatever say-3 where pincher.bug-**3**
'.. that's it, he said, where's **the** pincher bug?'

This example from a narrative shows that *sumpit* 'pincher bug', suffixed with *-nye* (in the third line) has already been introduced earlier in the narrative (in the first line) and is thus clearly identifiable.

From the examples above, it is fairly evident that this Malay suffix has undergone semantic generalization. To my knowledge, however, no one has proposed a specific grammaticalization pathway for the Malay *-nya*, and to do so here would be beyond the scope of this study. What is clear is that the Malay *-nya* began as a third person genitive pronoun (see below) and underwent a number of semantic and morphosyntactic changes. The remainder of the study will focus on the morphological and phonological structure of *-nye* from synchronic and diachronic perspectives. The semantics and pragmatics of *-nye* are not affected by the alternation of *-nye* and *anye*; rather the alternation results primarily from morphophonemic and prosodic factors. It is important to note, however, that *-nye* has undergone considerable grammaticalization with its multitude of meanings, pragmatic functions, and syntactic distributions.

Unlike its cognates in other well-known Malay languages, the Besemah suffix *-nye* [ɲə] is phonologically conditioned; if the root to which the *-nye* is attached

[3] In other varieties of Malay-Indonesian (including Besemah), nominal possession is simply marked by the juxtaposition of the possessed NP before the possessor NP.

ends in a consonant, the initial palatal nasal [ɲ] is lost as in (5a), but if the root ends in a vowel, the initial full form is realized as in (5b).

(5) a. *batak* [bataʔ] + *-nye* [ɲə] → *batake* [bataʔʔə] 'brought by them'
b. *baju* [baʤu] + *-nye* [ɲə] → *bajunye* [baʤuɲə] 'their clothes'

Aside from the obvious reduction, when the root ends in a consonant as in example (5a), the final consonant undergoes gemination, a process that occurs with other vowel initial suffixes, such as the locative applicative *-i* and the nominalizer *-an*. Gemination most likely occurs across syllable boundaries to preserve the syllable structure of the root (i.e., the final closed syllable). In the examples written orthographically below, gemination is omitted.

The reduction of *-nye* > *-e* described thus far is not too surprising for two reasons. The first reason is that similar processes occur in other Malay varieties of Sumatra: Southern Barisan Malay (personal knowledge), Tanjung Raden Malay and Mudung Darat Malay in Jambi in central eastern Sumatra (Yanti 2010: 507-510), and Minangkabau in western Sumatra (Moussay 1981). However, because the Malay languages of western Indonesia have not received much description, little is known about the extent and nature of these processes. Second, from a grammaticalization perspective, these data are not surprising because the loss of the initial segment of the suffix allows the root and suffix to form a tighter bond. This becomes even clearer in the next subsection once the etymology of *-nye* in Proto-Malayic and Proto-Austronesian is outlined, which demonstrates that this morphophonemic process is in fact phonetic erosion in progress.

When *-nye* occurs after the suffix *-an* or circumfix *peN- -an*, a third form surfaces. Consider the example in (6) below.

(6)	a. *langkah-an*	[laŋkahhan]	'stride'
	langkahan anye	[(laŋkahhan)$_{\omega}$ (aɲə)$_{\omega}$]	'her stride'
	b. *pe-langkah-an*	[pəlaŋkahhan]	'threshold'
	pe-langkah-an anye	[(pəlaŋkahhan)$_{\omega}$ (aɲə)$_{\omega}$]	'their bathing place'

In (6a), the nominalizer *-an* is suffixed to the root *langkah* 'to step', which results in the noun *langkah-an* 'stride'. From the example above one might expect that *-e* will surface, resulting in the form *langkah-an-e* [laŋkahhannə] 'her stride', but the form *anye* surfaces instead, exemplified in the second line of (6a). What might be even more unexpected is the fact that *anye* appears to be a phonological word in its own right, denoted by the (…)$_{\omega}$ surrounding each phonological word. The same pattern occurs with the locative nominalizing circumfix *peN- -an*, which means something like 'the place of [verb]'. In (6b), the same root combines with the circumfix, resulting in *pe-langkah-an* 'threshold.' Subsequently, when the third person formative attaches to *pe-langkah-an,* the resulting form of *-nye* is *anye*.

From the data presented thus far, one might postulate that the internally reconstructed form of the third person suffix is **anye*. The synchronic description of *-nye*, then, would simply state that there is a suffix~word alternation in the third person suffix in Besemah. This process, of course, is common (i.e., English *will/-'ll*, *him/-(ə)m, them/-(ə)m*). However, reconstructions of this form in Proto-Malayic (PM), Proto-Malayo-Polynesian (PMP), and Proto-Austronesian (PAn) show that this is not the case. It is clear from reconstructions by Adelaar (1992) for PM, Blust (1977a) and Ross (2006) for PMP and PAn that *anye* is not the older form. The etymology of the Besemah *-nye* is presented in (7) below.

(7) Besemah *-nye* < PM **-ña* < PMP *ni-a (*niya) < PAn **n(i)-ia* or **ni-a*

Working from the Besemah reflex *-nye*, the PM form **-ña* was reconstructed straightforwardly by Adelaar (1992: 125) on the basis of six Malayic isolects from Java, Sumatra, and Borneo. Adelaar proposes that **-ña* results from the merger of **n* and **i* in the PMP form **niya*, which was reconstructed by Blust (1977: 10-11) and Ross (2006: 530-531, 536-537). This etymology is controversial only at the level of PAn, where Blust (1977) reconstructed the genitive phrase marker **ni-* and the third person pronoun **-a*, and Ross (2006) reconstructed the genitive phrase marker **n(i)-* with the third person pronoun **-ia*. However, this does not affect the analysis of *-nye* here. What is most important is the fact that there is no possible etymology for **anye*. How then can the change from *-nye* to *anye* be explained? The unexpected answer is that Besemah has a one-suffix-per-word preference, which is motivation for *-nye* to make the leap from a dependent formative to an independent word. The next section further explains this claim, providing evidence for the unlikely change *-nye* > *anye*.

4 A Diachronic Explanation

A survey of probable explanations of the unexpected shift from *-nye* > *anye* leads nowhere. For example, one expected source would be the fusion of *-nye* with another meaningful formative *a-* (or something even more phonetically robust). Although it is difficult to argue for the absence of a morpheme, such a formative does not appear to exist in the history of Malay(ic) languages. Furthermore, it is also unlikely that any element would intervene between the suffix *-an* and the third person suffix, which does not appear to occur in any Malay(ic) language that I am aware of. Another explanation may be a synchronic phonological account. That is, the morphophonemics of *-nye* above show that there is a dispreference for consonant-nasal sequences across morpheme boundaries. In the case of (7) above, the *a-* would serve as an epenthetic vowel to break up a consonant-nasal sequence. Again this is implausible for two reasons. First, in Besemah, it is schwa and not /a/ that is used to break up clusters of consonants. Second, this explanation would not explain why *anye* appears to occur as a separate phonological word (see discussion below). With no straightforward explanation

for the *-nye/anye* alternation, there is a rather unexpected explanation: *Besemah prefers one suffix per word*. The remainder of this section defends this admittedly unusual assertion drawing on data from a corpus of spontaneous speech.

4.1 The Prosodic Status of *anye*

Thus far, *anye* has been assumed to be an independent phonological word. However, in order to provide clear evidence in support of the one-suffix-per-word preference, it is necessary to show that *anye* is a prosodic word in its own right. From the outset, *anye* is suspicious as a suffix for a number of reasons. First, *anye* is disyllabic, and no other bound affix/clitic in Besemah is disyllabic. In fact, *anye* is homophonous with a word that is clearly phonologically independent, namely the adversative *anye* 'but' (cf. Standard Indonesian *hanya* 'only'). Second, as was mentioned briefly in section 3, vowel-initial suffixes trigger gemination of the consonants preceding them, but in this construction the final /n/ in the suffix *-an* does not geminate before *anye*. The best evidence for the prosodic status of *anye* should come from stress patterns in Besemah. However, stress in Besemah is not straightforward. Preliminary evidence suggests that stress falls on the final syllable and is cued by intensity and less reliably pitch (McDonnell 2013). Impressionistic judgments support the recognition of *anye* as a separate phonological word based on the stress patterns demonstrated in (8).

(8)	a. *tulis*	[tuˈlɪs]	'write'
	b. *tulisan*	[tulɪsˈsan]	'writing'
	c. *tulisan anye*	[tulɪsˈsan aˈɲə]	'her writing'

As noted in section 2, stress falls on the final syllable of words whether they contain a suffix or not. So, in (8a) stress appears to fall on the final syllable of the monomorphemic word, and in (8b) on the final syllable of the suffixed root. However, when *anye* follows the affixed root in (8c), both the final syllable of *anye* and *tulisan* are stressed. It is important to note, however, that *anye* is still a grammatical formative that is syntactically bound to the deverbal noun that precedes it. As such, it is hard to imagine cases where it would receive additional prosodic prominence, such as contrastive focus. This also means that *anye* does not occur in a separate intonational unit from the noun before it.

4.2 The *-nye/anye* Alternation in Discourse

From the morphophemic, morphosyntactic, and prosodic properties of *anye* described thus far, it may or may not be surprising that in spontaneous speech speakers do not produce *anye* one hundred percent of the time. Instead speakers occasionally produce the *-e* form after the suffix *-an*. In a 60,000-word corpus of conversations and narratives in Besemah, there were a total of 51 occurrences of *-nye* after roots with the suffix *-an* or the circumfix *peN- -an*. In only eight

cases did the form *-e* surface. In the remaining 43 cases, *anye* surfaced. Of the 15 speakers who used a form of *-nye* after *-an* or *peN- -an*, only six speakers used *-e*; the other nine speakers exclusively used *anye*. Interestingly, five of these six speakers who used *-e* were younger than 30 years old, which suggests that *anye* may be disappearing with the younger generation. These data show that, although both *-e* and *anye* occur after an affixed word, the best predictor of variation is age and not some other morphosyntactic, pragmatic, or phonological phenomenon.

4.3 Diachronic motivations for *-nye > anye*

What is particularly strange about the change *-nye* > *anye* is the addition of phonetic material *(a-)*, which has no clear origin in other formatives (as was shown above) and no clear pragmatic or syntactic motivation from the corpus. Without any other motivating factors, can the one-suffix-per-word preference in Besemah adequately account for the change *-nye* > *anye*?

If such a preference exists in Besemah, one might expect a number of possible consequences. One might expect speakers to use the full third person pronoun *die* instead of the suffix *-nye*. In the same corpus of spontaneous speech, only one possible example of this was found, shown here in (9).

(9) Anu die tu nak n-damping-i peng-gawih-an **die**,
uhm 3 that FUT AV-close-APPL NMLZR-work-NMLZR **3**
'Uhm they wanted to be close to **(their)** work,'

In Besemah, as in many Malay languages, possession can be marked either by bound enclitics/suffixes (*=ku, -nye*) or by free pronouns (*aku, die*) immediately following the possessed NP (e.g., NP=*ku* or NP *aku*). It is possible then that the *die* at the end of the example in (9) is the possessor. However, this example is in fact ambiguous; *die* could also be considered an echoed subject of the active voice clause, a fairly common phenomenon in spontaneous speech in Besemah. One reason that speakers may not choose this option is because the free pronoun *die* is only available for possession and not definiteness.

While the third person does not rely on this strategy, there is evidence from the first person enclitic~word alternation *=ku/aku,* which does not suffer from the same semantic incompatibility that *die* and *anye* do. The evidence suggests that speakers do in fact use the strategy discussed above by employing the full pronoun *aku* after an already suffixed word. This is a useful diagnostic for the one-suffix-per-word preference in Besemah, which would predict that *=ku* does not occur after an already suffixed word. In the same corpus, the first person possessive occurred after a root suffixed with *-an* or circumfixed with *peN- -an* a total of 27 times, while it occurred after unsuffixed words 96 times.

The table in (10) presents the number of occurrences of the free form *aku* and the bound form *=ku*. It is readily apparent that speakers prefer *=ku* after unsuffixed forms and *aku* after roots that are already suffixed or circumfixed.

(10)

	aku	***=ku***		***aku***	***=ku***
Unsuffixed	8	88	**Suffixed**	23	4

From this pattern, it appears that Besemah speakers avoid the clitic pronoun when the lexical item is already suffixed. However, the third person free form *die* is not semantically similar enough to *-nye* to be an appropriate substitute. Therefore, it is probable that the one-suffix-per-word preference is met because *anye* is a separate prosodic word, just as in the case of *aku*. This provides good evidence for the one-suffix-per-word preference and, even further, it provides motivation for the change of *-nye* from a bound suffix to free form. Now that there is a motivating force behind the development of a bound form (*-nye*) to an autonomous form (*anye*), the question becomes: what motivates the epenthesis of *a-* in *anye*?

Under pressure from the one-suffix-per-word preference, it is likely that the motivation to append *a-* to *-nye* was to meet a bimoraic minimal word requirement (see section 2). Cross-linguistically, this is a quite common synchronic process. Applebaum and Gordon (2010) lay out a typology of languages that use processes such as consonant epenthesis (i.e., Cupeño), vowel lengthening (i.e., Northern Sámi), and most importantly here, vowel epenthesis (i.e., Minto) to meet minimal word requirements. It is then conceivable that historically, *-nye* did not satisfy the minimal word requirement, which was then resolved by the epenthetic vowel *a-*. Where, then, does the *a-* come from? One might posit that this vowel epenthesizes on analogy from the first person singular *aku*. The similar phonological shape of *anye* and *aku*, and the fact that they are pronouns with a reduced and full form provide motivation for this analysis.

Without historical records, it is impossible to provide undeniable evidence of this diachronic process. However, there is clear evidence from (1) the distribution of *anye* and *aku* after suffixed words in the corpus and (2) the prosodic requirements of phonological words to motivate the change *-nye* > *anye*. Therefore, the driving force behind this unusual change is the preference in Besemah for one suffix per word. As it turns out, the one-suffix-per-word preference that motivates this unusual change actually surfaces in other constructions in the language.

5 The Causative Suffix *-kah* and the One-Suffix-Per-Word Preference

Aside from the examples where the Besemah pronominal formatives attach to deverbal nouns, *-nye* attaches to verbs as either agents in the passive voice (1) or patients in the active transitive voice (2). In these two constructions, *-nye* can occur after either the causative/applicative suffix *-kah* or the locative-applicative

suffix *-i*. When *-nye* occurs after the locative-applicative suffix *-i*, it forms a single phonological word with the root, suffix *-i*, and *-nye* shown in (11).

(11) a. *di-batak-i* [(dibataʔʔi)$_{\omega}$] '(it) was brought (somewhere)'
b. *di-batak-i-nye* [(dibataʔʔiɲə)$_{\omega}$] '(it) was brought (somewhere) by her'

In (11a), the root *batak* 'bring' attaches to the passive prefix *di-* and the applicative suffix *-i*. This is uncontroversially a phonological word in Besemah. This is also true of the example in (11b), where *-nye* is suffixed after *-i*. Consequently, the prosodic status of *dibatakinye* in (11b) challenges the one-suffix-per-word preference presented thus far. However, there may be good reason that speakers allow (11b) to be a phonological word. First, *-i* is phonologically 'light' as a high vowel with no onset or coda. Secondly, *-i* is historically older than suffixes like *-kah* and is therefore more closely bound to the root. This is precisely why the one-suffix-per-word preference is best considered a preference rather than a constraint or a rule.

What is more interesting is the causative/applicative construction. When *-nye* follows the causative/applicative suffix *-kah* in (12), it patterns quite differently.

(12) a. *di-batak-kah* [(dibataʔkah)$_{\omega}$]
'(it) was brought (for someone)'
b. *di-batak-kah-nye* [(dibataʔ)$_{\omega}$ (kaɲə)$_{\omega}$]
'(it) was brought (for someone) by her'

In (12a), *batak* 'bring' combines with the passive prefix *di-* and the suffix *-kah,* resulting in *dibatakkah* 'bring for', which again is uncontroversially a phonological word. When the agentive *-nye* is suffixed in (12b), one might expect from the morphophonemic patterns in section 3, either *-e* after the word-final consonant /h/ or *anye* after the suffix *-kah*, resulting in *batakahe* [(bataʔkahə)$_{\omega}$] or *batakah anye* [(bataʔkah)$_{\omega}$ (aɲə)$_{\omega}$]. Instead, the suffixes *-kah* and *-nye* fuse together to form an autonomous phonological word, *kanye*. This shift from two bound suffixes to a single autonomous prosodic unit is quite unexpected, but as in the case of *anye* can be motivated by the one-suffix-per-word preference in Besemah. That is, section 4 showed that *-nye* cannot be suffixed to an already suffixed root. This, in turn, forced *-nye* to occur on its own, resulting in the autonomous form *anye*. In the case of *kanye*, instead of the suffix *-nye* being forced to occur on its own, the one-suffix-per-word preference and the minimal word constraint are satisfied by the combination of the two suffixes. In both cases the one-suffix-per-word preference is resolved. Even though the same motivating force is at work, the development of *kanye* is actually quite different from that of *anye*. Most importantly, *kanye* developed from the fusion of two suffixes, while *anye* developed from the epenthesis of *a-* to fulfill prosodic word requirements.

The history of *-kah* is more controversial than that of *-nye* presented in section 3, with two potential sources. According to Adelaar (1992: 149), the two probable

sources for *-kah* in Besemah are either the preposition **ka* 'to' or the preposition **akan* 'about, concerning'. There are a number of reasons for adopting either etymology, and neither etymology has more explanatory power than the other for *kanye*. Let us first consider **akan*. While the change **akan* > *-kan* is found in many Malay varieties, including Standard Indonesian, the change from *-kan* > *-kah* is motivated by a number other instances of *-n* > *-h*. This change occurred in Besemah, but not Standard Indonesian (e.g., **dengan* 'companion' in Old Malay > *dengah* 2SG in Besemah, *dengan* 'with' in Standard Indonesian). Alternatively, it is possible that the suffix *-kah* in Besemah is derived from the PM allative preposition **ka*. The only issue that needs to be motivated is *h*-epenthesis to *-kah* in Besemah. Incidentally, this type of process occurs with modern borrowings from other varieties of Malay-Indonesian, where *-h* is appended to a word that ends in *-a*. For example, the Indonesian word *desa* is appended with a word-final *-h* to preserve the final *-a*. The *-a* is preserved because all other cases of word-final *-a* went to *-ə* in Besemah (i.e., **-a* > *-ə*, Tadmor 2002). The choice of either of these etymologies has an interesting impact on the analysis of *kanye*, which is discussed in the next section.

6 Possible Pathways of Change

Thus far, there has been good evidence to support the notion that the one-suffix-per-word preference in Besemah led to two unexpected developments in Besemah, *anye* < *-nye* and *kanye* < **akan* + *-nye* or < **ka* + *-nye*. Both cases involve what might be deemed degrammaticalization, where autonomous forms appear to have developed from previously bound forms. Even though it is not possible to trace these changes through history, it is worth discussing probable and improbable grammaticalization pathways, focusing on areas where the one-suffix-per-word preference *blocked* the grammaticalization processes. It is likely that *anye* developed directly from *-nye* (or PM **-nya*) and not from *-e*. As PM **-nya* became more and more tightly bound to the root in Besemah, it is likely that the one-suffix-per-word preference disallowed the *-nye* from attaching. The minimal word requirement was then resolved by epenthesis of *a-*. This means that while *-nye* was in the process of becoming a bound suffix, *anye* most likely developed from *-nye* when it was still an enclitic. It is improbable that *anye* developed from the tightly bound form *-e*. From this diachronic perspective, the leap from bound to autonomous form was not so big (i.e., enclitic > word). One probable explanation for this change is that it resulted from two competing pressures: (1) the grammaticalization pressure to compact enclitics into suffixes and (2) the language specific pressure to prefer only one suffix per word.

In the case of the fused causative/applicative *-kah* and third person *-nye* suffixes (i.e., *kanye*), the grammaticaliztion pathway in many ways depends on the reconstruction of *-kah*. If **akan* is the reconstructed form, the expected cline is **akan* > **-kan* > *-kah*. If this were the case, the fusion of *-nye* to *-kah* most

likely came after *-kah* had already become a causative suffix. The grammaticalization pathway of *kanye* is shown in (13) below.

(13) ROOT-*ka{h,n}-nye* > ROOT-*kanye* (or ROOT-*ka({h,n})-nye*) > ROOT *kanye*

However, if the source of *-kah* is the allative pronoun **ka*, it is possible that *-nye* fused with **ka* prior to *-h* epenthesis (i.e., ROOT *ka-nye* > ROOT *kanye*) and prior to it attaching to the root (i.e., ROOT *ka* > ROOT-*kah*). Thus, it is likely that *-nye* first attached to the autonomous preposition **ka*. Subsequently, **ka* became dependent on the root and appended *-h*. If this is indeed the case, the one-suffix-per-word preference in Besemah prevented *kanye* from attaching to the root. It0 may also be the case that the one-suffix-per-word preference did not interfere here, but *kanye* was already a frozen form, when *-kah* developed into a suffix.

This discussion demonstrates a number of important points concerning these apparent cases of degrammaticalization in Besemah. First, language specific constraints or preferences can impact the gradual processes of grammaticalization. For example, the development of *anye* resulted from the one-suffix-per-word preference as *-nye* was steadily moving down the grammaticalization cline. Second, what are on the surface seemingly drastic cases of degrammaticalization may emerge from 'roadblocks' in the grammaticalization cline that result from more minor changes.

7 Conclusion

This study of the suffix *-nye* in Besemah has focused on explaining rather than categorizing the unusual development of phonologically autonomous forms from previously bound forms. Although many of the debates over examples of degrammaticalization have focused on challenging the unidirectionality hypothesis, the present study demonstrates that these cases of apparent degrammaticalization can be accounted for by combining language specific characteristics and the principles of grammaticalization. As Heine (2003) notes 'most of the counterexamples [to unidirectionality] … can be described as being "idiosyncratic" in the sense that they do not allow for cross-linguistic generalizations on the directionality in the rise and development of grammatical categories' (582). He goes on to say that cases of degrammaticalization are also idiosyncratic language internally in the sense that 'it involves isolated instances within a given language' (582). This does not mean, however, that cases of degrammaticalization are uninteresting. On the contrary, the unusual changes in Besemah point to an interesting characteristic of the language, a preference that allows only one suffix per word. It also points to an interesting interaction between grammaticalization and other language internal processes.

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Large-scale Vocabulary Surveys as a Tool for Linguistic Stratigraphy: A California Case Study

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As early as the 19th century, linguists have sought to classify California's hundred-odd languages and dialects, with view to understanding the area's prehistory. Early linguists were quick to recognize shallower genetic groups, but later studies have made relatively little further headway in understanding the historical connections between the area's diverse languages. Very few higher subgroups are universally accepted, and the largest subgrouping proposals, the Penutian and Hokan hypotheses, remain uncertain and controversial a century after they were first proposed (Dixon and Kroeber 1913a, 1913b).

Deeper subgrouping hypotheses have commonly been proposed on the basis of lexical lookalikes between languages, which on further study might turn out to be cognates. If a set of languages are related at a great time depth, few cognates will be available to be compared, and if more recent contact affected those languages, later loanwords may outnumber the cognates. For a linguistically complex area such as California, the history of later language contact must be well-understood before deeper relationships can be established with confidence. Moreover, loanword studies may reveal prehistorical contacts, and if relatively recent, may be more easily apparent in the data.

Lexical surveys, in California and elsewhere, have typically concentrated on basic vocabulary, the part of the vocabulary most resistant to replacement through either internal change or borrowing. Such surveys highlight genetic over contact relationships. To detect borrowings, a complementary type of survey is called for, one covering words which are more prone to borrowing.[1]

[1]Heggarty (2010) is a related statistical approach, which separately considers conservative and

Few studies of borrowing patterns in California exist. Some are confined to particular languages or families, and aim at detecting vocabulary borrowed from neighboring languages (Klar 1977, for Chumashan; Whistler 1977, for Wintuan; Turner 1983, for Salinan; Loether 1998, for Mono, Sierra Miwok, and Yokuts). Such studies are valuable, but by concentrating on only a small number of languages, they risk mistaking widely diffused words for local borrowings.

Other studies have studied lexical diffusion over a broad range of languages, but considreing only a few lexical items at a time (Nichols 1998, for the word for 'mountain lion'; Golla 2011:227–229, for words for six animal species, the bow and arrow, and some numerals). The wanderwörter identified in these studies are too few to recognize regular patterns in their distributions.

Some wide-ranging lexical items have been noted for California and beyond, in the context of evaluating deep subgrouping hypotheses. Campbell (1997) mentions some widely occurring words, arguing against their use as evidence for particular subgroupings (e.g. 'nose' and 'mouth' in the context of Hokan, p. 294, and 'goose' in the context of Coahuiltecan, p. 298). However, he does not attempt a systematic survey of such widespread forms.

Bowern et al. (2011) quantify the degree of lexical borrowing in several linguistically complex areas. In California, this study surveys 46 languages, using a standard list of 204 words, and presents statistics for the rate of borrowing in each language. Since the wordlist is selected from basic vocabulary items, the observed rate of borrowing is less than would be expected for more borrowable vocabulary, such as words for areally restricted flora and fauna. The only recurrent pattern in California mentioned in that study is heavy borrowing from Yokuts into Bankalachi/Toloim, a neighboring Uto-Aztecan language.

This paper presents the results of a comprehensive search for lookalikes among words for plants and animals in California languages. Words in this domain are typically more prone to borrowing than basic vocabulary, especially when speakers of a language move and encounter different species. A survey of such vocabulary is especially suited to identifying and highlighting old language contact. Since a language may be spoken far away from where its ancestor was once in contact with another language, and since words may spread far from their source through intermediate languages, this study does not exclude any languages in the area from being ultimately interconnected though old contact events.

1 Sources and Methods

This study is based on the vocabularies of C. Hart Merriam, naturalist, ethnographer, and amateur linguist, who between 1902 and 1938 conducted an exhaustive lexical survey of languages throughout California. As part of his

borrowable vocabulary to distinguish genetic connection from contact, in the case of Quechua and Aymara.

survey, Merriam used a standard form listing about 420 species of plants and animals, to which he often added additional ones by hand. He collected 156 such vocabularies, representing languages and dialectal varieties from throughout California and the neighboring Great Basin and the Arizona desert.[2]

This work employs a subset of Merriam's vocabularies, edited and published by Robert Heizer (Merriam 1979). Although less complete than the manuscript version, the published version could be digitized more easily and rapidly. The published edition was scanned, the scanned images converted to text through a commercial optical character recognition program, and the resulting text files edited and corrected by hand using the published edition as a guide. Additional species, which Merriam added as necessary to his forms, are not used here. The collected vocabularies were then imported into a database program for easy retrieval by either species or language.[3] In total, the database includes some 16,000 lexical items in 122 languages and dialects, representing 420 species of animals and plants. Of these, about 250 species are represented in enough languages to be useful for the comparative purposes of this work.

Merriam was not a trained linguist, and insisted on using a transcription system of his own, loosely based on that used for transcribing pronunciation in English dictionaries. His transcriptions were neither accurate nor consistent, and ignored some phonetic distinctions. Nevertheless, they are usually adequate for this study, which does not attempt to obtain exact sound correspondences.

This vocabulary database was arranged by species and printed out, and the comparisons carried manually. Similar words within each species were noted, as were words for closely related species. Phonetic similarities were judged subjectively and marked as 'likely', 'possible', or 'farfetched'. In this paper, only lookalikes marked 'likely' are used. In general, very short forms were disfavored, as were pairs of words with unexplained mismatching segments. While this procedure leaves out what may later turn out to be related words, it is necessary for reducing chance resemblances.

This subjective comparison not ideal. The search for lookalikes has missed some candidates which were found on later inspection, and others are no doubt still unnoticed. A reliable automatic cognate detection algorithm, if one is devised, would provide a more objective and complete collection of potential historically related words.

As a final step, the sets of lookalikes—each set corresponding to a species—were compared, and recurring patterns of forms shared between languages were noted. Again, this is a process that may eventually be automated, for the sake of

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[2]Merriam's vocabulary manuscripts are kept at the Bancroft Library in Berkeley. Digital images of the vocabularies are available online, through the Internet Archive (http://www.archive.org). Merriam also procured vocabularies in non–natural history domains; those are not utilized here.

[3]All the materials used for this study will be posted on website of the Survey of California and Other Indian Languages, at Berkeley (http://linguistics.berkeley.edu/Survey).

demonstrable objectivity.

The following section discusses some of the recurring patterns of vocabulary sharing between disparate language families, noted in Merriam's vocabulary database.

2 Results

As mentioned above, Merriam used an idiosyncratic and inconsistent transcription system. His system rarely marks phonemic distinctions not present in English, such as glottalization and the /q/-/k/ distinction. He does often transcribes /x/ with a distinctive sign (<ch̲>), but at other times uses <k> or <h> for /x/; he often notes retroflex stops (for example using <tr> for /ṭ/). For ease of reading, I use here my interpretations of his forms, rather than quote them verbatim.

Some languages and families are represented in the database by a large number of closely related dialects: 16 Yokuts varieties, 6 of Patwin, 7 of Palaihnihan, etc. This enables a more fine-grained view of the distribution of particular words, and helps guard against relying on any one informant as a representative of a language as a whole.

In the examples given below, each common taxon name is followed by its number in the published edition.

2.1 General patterns

The similarity judgments used in this study are subjective. As mentioned above, some effort was made to reduce chance similarities. It is reassuring to see that not all language groups are represented equally in non-genetic lookalike lists, suggesting that chance lookalikes are not a significant part of the sets. Roughly, Coast Range languages (Athabascan, Algic, Yuki, Costanoan, Salinan, Chumash) and Yuman languages share relatively few words with external groups. Central Valley languages (Yokuts, Miwokan, Wintuan) share relatively more with their neighbors. This is consistent with previous studies, and with the observation that more mobility and therefore language contact would be expected in the Central Valley than in more isolated mountainous areas.

Onomatopoeias and other sound-symbolic words are often considered unreliable for hypothesis formation when comparing vocabularies, since similar sound-symbolic motivation can independently produce similar words in disparate languages. In the present database, onomatopoeias occur as words for many animal species, especially birds. Nevertheless, with enough attention to formal detail, many of these word sets convey useful information. For example, 'osprey' (76) is represented in 75 vocabularies, including the following words, arranged by family and language, which could all plausibly be of sound-symbolic origin:

(1)	Athabascan:	Mattole	saki
	Algic:	Wiyot	tsaktsakw
	Yukian:	Coast Yuki	čučuka
		Wappo	tsuku
	Shastan:	Shasta	čuču
		Konomihu	čuču
	Palaihnihan:	Apwurakeyi	toktokisi
		Atsugewi	toktokisi
	Yana:	Yana	čiči
	Maiduan:	Chico Maidu	tsitsi
		N. Maidu	čawtata
	Wintuan:	Patwin (5 varieties)	tuktuk
	Miwokan:	N. Sierra Miwok	tuktuku
		Lake Miwok	tuktuk
	Yokutsan:	Chukchansi	šošu
		Gashowu	šošu
		Choinimini	šukšu
		Nutunutu	saksux
		Tachi	soksox
		Chunut	soxsu
	Numic:	Wobonuch Mono	soksok
		Entimbich Mono	šokšo
		Waksachi Mono	šokšu

While all these forms are broadly similar, they are generally more similar within families than across them. Among cross-family lookalikes, the Yokutsan-Monache similarities parallel those of many other lookalike sets, which are interpreted here as loans from Yokutsan languages into various Western Mono varieties, as also noted by Loether (1998). Likewise, the Patwin forms are identical with those of Lake Miwok but altogether different from that of their nearest relative, Wintu /kule/, suggesting a loan from Miwok into Patwin. Other such loans were noted by Whistler (1977), as discussed further below.

2.2 Bankalachi

Bankalachi, or Toloim, is a dialect of Tübatulabal (Uto-Aztecan), spoken around Deer Creek, in the foothills of the southernmost Sierra Nevada. Jane Hill (in Bowern et al. 2011) has previously noted a high rate of borrowing into Bankalachi, amounting to about 20% of the basic vocabulary, and attributes it to ongoing language shift. In the vocabularies studied here, which consist of the more borrowable natural history terms, some 80% of the Bankalachi words are borrowed from Yokuts languages.

Nearly all the borrowings match most closely the form in Yawlamni ('Yawelmani'), a Valley Yokuts language. Historical Yawlamni territory, however, is where the Kern River enters the Central Valley, some 50 km to the south. This suggests that the contact between Yawlamni and Bankalachi was not recent, but occurred at a time when the groups lived closer to each other.

Three words have a Yokuts source other than Yawlamni:

(2) 'toad' (245)

Bankalachi	koyetwuk
Nutunutu	koyotawuk
Yawlamni	okoko

(3) 'scorpion' (276)

Bankalachi	itetiš
Nutunutu	itatit
Yawlamni	petetič

(4) 'sycamore' (308)

Bankalachi	kolek
Palewyami	kolak
Yawlamni	kočik
other Yokuts	kotik / koṭik / kotsik

Palewyami was spoken along Poso Creek, 30 km to the south of Bankalachi territory. Nutunutu was spoken north of Tulare Lake, 80 km to the northwest. The evidence of loanwords in Bankalachi indicates a complex linguistic history in the San Joaquin Valley.

2.3 Pomoan-Yokutsan

The Pomoan languages belong to the coastal ranges north of San Francisco Bay. Pomoan is one of the branches of the putative Hokan language family, though no language family has been clearly demonstrated to be related to it. Surprisingly, in Merriam's vocabularies, several lookalikes are shared between Pomoan and Yokuts languages and no others, except for obvious later local loans. Yokuts is one of the proposed branches of Penutian, but genetically unrelated to Pomoan. Several geographical barriers and hundreds of kilometers separate the two families:

(5) 'flying squirrel' (51)

N. Pomo	keple
E. Pomo	kepla
Choinimni, Wikchamni	kapalala

(6) 'kingbird' (132)

N.E. Pomo	tapičoroka
Yawlamni	tapičlela
Chunut	tapičlala

(7) 'mallard' (194)

S. Pomo	watata
C. Pomo	wadawada ('merganser', 193)
Chukchansi, Choinimni, Telamni	watwat

(8) 'spider' (274)

N. Pomo (Tabate)	mča
N. Pomo (Kayaw)	misa
Chukchansi, Gashowu, Telamni	meča
Tachi	metsa
Wikchamni	muča

(9) 'yerba santa' (364)

C. Pomo, E. Pomo	tekale (< -q^{h}ale 'tree'?)
Yawlamni (Tinlini)	taxal

To my knowledge, there is no claim that these two language families or their ancestors were ever near each other. A less obvious historical scenario will be needed to explain these sets, if they are confirmed to not be accidental.

This example demonstrates the utility of using broad surveys of borrowing-prone words for detecting unexpected relationships in an area of a complex linguistic history. Linguistic surveys based on basic vocabulary, aimed at detecting genetic relationships, might not show enough borrowed vocabulary to detect this relationship.

2.4 Patwin borrowings

Patwin belongs to the Wintuan language family, located along the western side of the Sacramento Valley. Whistler (1977) reconstructed words for flora and fauna in Proto-Wintuan, and used these to show that its homeland was near the California-Oregon border. Patwin, the southernmost of the Wintuan languages, is located at the southern end of the valley, and borders Miwok territories. Whistler

proposes a number of borrowings from Miwokan languages into Patwin, and thus argues that the Patwin entered the southern Sacramento Valley after Miwokan speakers had already been established there.

While I agree with Whistler's conclusions, a few of his proposed etyma turn out to have a more complex history. I demonstrate this with the following three species. For each one, I show Whistler's (1977:162) proposed etymology, followed by Merriam's data:

(10) 'incense cedar' (290) / 'juniper' (292).

W77 Proto Miwok *mo·n 'cedar'	: Patwin mon 'juniper'
Yana	muniyi ('juniper')
Nomlaki	mun ('juniper')
Patwin	mun / munmun / mon ('juniper')
S. Maidu	monimča ('cedar')
Konkow (Huncut Creek)	monimča ('cedar')
N. Maidu	manimča ('cedar')
N. Sierra Miwok	monogo ('cedar')

Whistler proposes that this word was borrowed from a Miwokan language into Patwin. Its wider distribution argues against that scenario. The word seems to have started its spread somewhere to the north, entered the Wintuan languages Nomlaki and Patwin, the Maiduan languages, and finally Miwokan.

(11) 'condor' (81). W77 Patwin mo·lok : Proto Sierra Miwok *mol·ok

Wintu	moluk
Nomlaki	molok
Patwin (6 varieties)	molok / moluk
N. Sierra Miwok	moluko
Coast/Lake/Plains Miwok	moluk
Maiduan (5 languages)	moluk / molok / moluko / moloko

The word is present in all branches of Wintuan, and is not merely a loan from Miwokan into Patwin. The connection with Maiduan is less clear, but I surmise that the word was borrowed into Maiduan from a Wintuan language, or that both borrowed it from some other common source.

The word also appears as N.E. Pomo moluk, probably a Patwin borrowing, and as Telamni Yokuts limik, perhaps a S. Sierra Miwok loan, with metathesis.

(12) 'fly' (265). W77 River Patwin homo·tay : Proto E. Miwok *homo·-

Hammawi	hamomuma
Maidu (2 varieties)	hamelulu / emalula
Konkow (2 varieties)	emelulu-m / hemelulu
Patwin (Colusa)	homotai
N. Sierra Miwok	homomiyu
Plains Miwok	homomiye

This widespread species has forms akin to homo- in one Patwin dialect and in Miwokan, as in Whistler, but also in Maiduan and in Hammawi (a Palaihnihan variety close to Achumawi), but nowhere else in the collection. A Palaihnihan language could be a source for the word, though the path from it to Miwokan and Maiduan languages is still to be elucidated.

2.5 Pomoan and Palaihnihan

A number of words in the database are shared between Pomoan and Pit River languages, and no others:

(13) 'grizzly bear' (1)

Apwarukeyi, Atsugewi	piriki
E., N.E., S.E. Pomo	puraka

(14) 'red fox' (10)

Apwarukeyi, Atsugewi	kwaw
N.E. Pomo	kawka
N. Pomo, C. Pomo	kaw
E. Pomo	kakaw

(15) 'wolf' (14)

Astakiwi, Atwamwi, Achumawi	tsimu
Hammawi, Mahdesi	čimu
N.E. Pomo	čomeka
N. Pomo	tsimeya / čimyu / smewa
C. Pomo	smewa
S. Pomo	tsemyuwa
E. Pomo	čemu
S.E. Pomo	sumu

(16) ‘cottontail’ (63) / ‘snowshoe rabbit’ (64) / ‘black-tail jackrabbit’ (65)

Achumawi	kalak (‘snowshoe rabbit’)
N.E. Pomo	takalika (‘cottontail’), makalakaka (‘jackrabbit’)
N. Pomo, C. Pomo	makala (‘jackrabbit’);
(note also:) Nomlaki	takalal (‘cottontail’ < Pomo?)

(17) ‘western tanager’ (130)

Apwarukeyi, Atsugewi	waswosa
S. Pomo	wašwaš

(18) ‘yellow-breasted chat’ (131)

Mahdesi	waswasa
N. Pomo	waswas

(19) ‘ruddy duck’ (201)

Hammawi, Atsugewi	tanana
N., E. Pomo	tana

(20) ‘trout’ (248)

Achumawi	selepi
Hammawi, Astakiwi, Atwamwi, Mahdesi	salepi
N. Pomo	šalobi

(21) ‘centipede’ (277)

Mahdesi	hustoyi
N. Pomo	hošutil

(22) ‘gray pine’ (283)

Hammawi	tutsxale
Atwamwi	tutsxalo
Achumawi	totsxalo
Mahdesi	tuxale
N.E. Pomo	tutekale
N. Pomo	kotekale / ketexale
E. Pomo	kotexale

(23) ‘sugar pine’ (282)

Achumawi	asawyo
Apwarukeyi	atsowo
N. Pomo	šuye

The Pomoan languages are spoken in the Coast Range, at the southwest corner of the Sacramento valley. The Palaihnihan languages are spoken in the Pit River basin, at the northeast corner of the valley, some 250 km away. The lookalikes given here, if confirmed, can be explained only through a genetic relationship, or through old contact.

The Pomoan and Palaihnihan languages have in the past been hypothesized to be related, as members of the putative Hokan family; but, to my knowledge, no one has ever proposed linking the two groups in a closer relationship than Hokan as a whole. In contrast, the data here shows a close relationship between the two groups, since no comparably large set of lookalikes has been found containing members of the two languages and some additional ones.

Gursky (1974) is the largest published comparative list of potential Hokan etymologies.[4] Out of the 30 sets in Gursky's list which refer to basic (non–natural history) vocabulary and which contain Palaihnihan and Pomoan words, 12 do not contain examples from other language families. That would normally be a strong argument for a genetic connection between the two groups, assuming that the forms were plausibly related. However, that set is suspect. Although Gursky used both Achumawi and Atsugewi dictionaries to construct his lists, all of the exclusive Pomoan-Palaihnihan sets contain Achumawi examples, and none contain Atsugewi, although these two branches of Palaihnihan are fairly closely related. The explanation for that is apparently that Gursky used Olmsted's (1966) Achumawi dictionary as his source. As Nevin (1998:10) notes, and as Gursky later recognized, Olmsted's dictionary has inadvertently mingled Pomoan lexical materials among the Achumawi ones; and in fact, the exclusive Pomo-Achumawi matches in Gursky's list all show a suspiciously near-exact phonetic match. I conclude that there is no close genetic connection between Palaihnihan and Pomoan, and that the lookalikes in Merriam's lists indicate borrowing.

A more detailed analysis of the data should be able to show the direction of borrowing, and perhaps offer clues as to where the borrowing took place. For now, a reasonable hypothesis is that languages belonging to either or both of these families were spoken in the Sacramento Valley, in what is now Wintuan territory.

3 Conclusion

Although much work in California and elsewhere in North America has been directed at finding genetic groupings, searches for old language contact have been few and localized. This study aims at detecting prehistoric language contact in California by systematically searching for loanwords in lists of natural history words, a semantic domain particularly prone to borrowing.

This paper presents some representative results of this study. In the case of Bankalachi and Patwin, it confirms and elaborates observations made by earlier

[4]Gursky has published several addenda to his original publication, which were not used here.

researchers. For Bankalachi, several Yokuts varieties are identified as sources of borrowing, not all contiguous with it in historical times. For Patwin, Miwokan is confirmed as the source of some loanwords, as first shown by Whistler (1977), but some connections with Maiduan, Yana and Palaihnihan are identified as well.

Two new contact situations have been identified here, one between Yokuts and Pomoan, the other between Pomoan and Palaihnihan. In both cases, the language families are now far apart; these results therefore provide new clues to ancient population movements.

This study has been exploratory, and is far from exhausting the potential of the method and of the existing materials. Future work should include augmenting Merriam's vocabularies by transcribing the ones not in Heizer's compilation, and adding other published and unpublished materials; in particular, ethnobotanical studies are rich in detailed plant vocabularies, and will add names for species not compared here. More accurate transcriptions from other sources will help distinguish accidental lookalikes from significant ones. With detailed knowledge of the languages involved and with more accurate data, there is a great potential for discovering loan translations as well. The study area can and should be extended to languages further north.

The method illustrated here should be applicable in any linguistically diverse area, and similar studies elsewhere should be likewise fruitful in uncovering old language contact.

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The Curious Case of Archi's *father*[*]

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1 Introduction

The phenomenon of (morphological) suppletion refers to the situation where a single lexical item is associated with two phonologically unrelated forms, and the choice of form depends on the morphosyntactic context. Although suppletion is rare in absolute terms, it is frequently observed across languages (Hippisley et al. 2004). That is to say, whereas it is usually a (very) small number of lexical items within a language that display suppletion, most languages do have such a small set. To illustrate the phenomenon, compare the (non-suppletive) adjective-comparative-superlative paradigm *smart-smarter-smartest* with the familiar example of the suppletive *good-better-best* paradigm.

In particular, in the case of *smart-smarter-smartest* we observe that the root remains the same throughout the paradigm, viz. *smart*. In contrast, in the case of *good-better-best* we see that the root in the adjective surfaces as *good*, whereas in the context of the comparative and superlative we observe *be(tt)*. Specifically, suppletion refers to a phonologically distinct realisation of a particular item in a particular context (see Corbett 2007 on specific criteria for canonical suppletion). In this case, the root of the lexical item GOOD is realised as *good* when it is the adjectival form but surfaces as *be(tt)* in the context of the comparative (and superlative).

When we look at nouns, we observe that languages can display suppletion for number (#). Consider data from Ket (spoken in the Krasnoyarsk region). First

[*] Many thanks to Jonathan Bobaljik, Andrea Calabrese, Peter Smith and the audience at BLS 39 and GLOW 36 for feedback and discussion on the ideas expressed here. All errors are mine.

consider regular nouns, which display a nasal suffix in the plural (data from the Surrey Suppletion Database):

(1)

SINGULAR	PLURAL	
am	ama-ŋ	'mother'
doʔn	doʔna-ŋ	'knife'
kyl	kyle-n	'crow'

Now, consider the nouns below in (2), which display root suppletion in the context of number (Werner 1997). For instance, the root for 'tree' in the singular corresponds to *oˈks'* while in the plural it surfaces as *aˀq*.[1]

(2)

SINGULAR	PLURAL	
oˈks'	aˀq	'tree'
dɨˈl'	kʌˀt	'child'
kɛˀt	dɛˀ-ŋ	'man'

Indeed, when we look at various languages, it is not rare to find a (small) group of nouns that displays suppletion in the context of number. In (3), 18 genetically diverse languages are listed that show suppletion in the presence of number:[2]

(3) Languages that display noun suppletion in the context of number

language	*family*
!Xóõ*	Khoisan
Afrikaans	Indo-European
Arapesh*	Torricelli
Archi*	North Caucasian
Eastern Pomo	Pomoan
Hebrew*	Afro-Asiatic
Hua*	Trans-New Guinea
Ket*	Yeniseian
Komi*	Uralic
Lango	Nilo-Saharan(?)
Lavukaleve	Central Solomons
Russian*	Indo-European
Tariana*	Arawak
Tiwi	isolate

[1] Note that the form 'man' actually displays both a suppletive root as well as an exponent of the regular plural suffix.

[2] An asterisk '*' means that they are also listed in the Surrey Suppletion Database (which can be found online at http://www.smg.surrey.ac.uk/Suppletion/explore.aspx), in which 34 genetically diverse languages were investigated for suppletion.

Turkana*	Nilo-Saharan
Khakass*	Turkic
Yimas*	Sepik-Ramu
Zulu	Niger-Congo

Curiously, although root suppletion in nouns in the context of number is clearly observed, root suppletion in nouns in the context of case (K) seems to be largely unattested (Bybee 1985) (apparent counterexamples are discussed in section 5).[3]

The central goal of this paper is to account for the discrepancy between, on the one hand, regularly observed root-suppletion in lexical nouns in the context of number, and, on the other hand, the lack of root-suppletion in lexical nouns in the context of case. In particular, to explain the lack of case-driven root-suppletion, I draw on the structural representation of nouns and combine that with locality claims as proposed in the framework of Distributed Morphology (DM; Halle and Marantz 1993).

In the following, I first introduce the framework adopted here (section 2) and introduce the key assumptions to derive the ban on case-driven root-suppletion in nouns, cyclic locality in particular. After discussing some examples of suppletion patterns that we observe in nouns (section 3), and a short aside on portmanteau morphology (section 4), I discuss apparent counter-examples to the claims suggested here in section 5, offering an analysis in line with the proposal advocated here. Section 6 offers some final remarks.

2 Cyclicity

As briefly touched upon above, I draw on hierarchical structure to limit the possibilities of suppletion, and, as such, I assume the framework of Distributed Morphology (DM; Halle and Marantz 1993) in order to derive the different behaviour of lexical nouns in the context of number and in the context of case. DM crucially incorporates hierarchical structure into the morphology; essentially, it assumes the input to morphology to be syntactic structure. Features (or feature bundles) are distributed over nodes, which in turn are subject to Vocabulary Insertion (VI).

[3] Note that I exclude 'surface' suppletion such as *kýr* 'cow' and *ær* 'sheep' in Old Icelandic:

(4)

NOM	kýr	'cow'	NOM	ær	'sheep'
ACC	kú		ACC	á	
DAT	kú		DAT	á	
GEN	kýr		GEN	ær	

Even though the accusative and dative forms seem to have different roots, these actually result from a phonological (readjustment) rule, which causes the vowel before *r* to front (i-umlaut). As such, they do not qualify as instances of root suppletion as intended here; see also note 5.

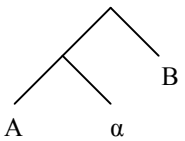
Furthermore, VI proceeds cyclically from the lowest element in the structure outwards.[4]

Suppletion is modelled as contextual allomorphy; that is, although a particular feature bundle has a corresponding exponent as a context-free default, an exponent specified for a more specific context can take precedence (per the Elsewhere principle; Kiparsky 1973). Consider again the *good-better-best* paradigm; whereas its regular (context-free) exponent is *good*, in the context of the comparative (and superlative) it corresponds to the exponent *be(tt)*:[5]

(5) √GOOD ⇔ be(tt) / _ COMPARATIVE
√GOOD ⇔ good

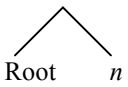
A central research topic within DM is the identification of locality restrictions regarding what is accessible as a potential context for a vocabulary insertion rule such as (5). Minimally, locality approaches in DM assume the cyclicity hypothesis, which entails that accessibility to structure is domain-dependent. That is to say, certain nodes in the structure function as domain delimiters and morphological processes are confined to operate within this domain. An implementation of domains (and their delimiters) would be phases (and phase heads) (Chomsky 2000, 2001). A simple approach would be that phasal heads induce spellout of their sister. Consider the following structure:

(6)



If *α* is a phasal head, then it forces the spellout of its sister A. On the assumption that spellout freezes a string, B and A cannot interact across *α* (Embick 2010, Bobaljik 2012; see Scheer 2010 for an overview). A natural choice of domain delimiters would be category heads (Embick 2010). Now, consider a standard representation of a noun in DM in (7). Crucially, the root, which does not bear an inherent specification for its category, is followed by a category-defining node *n*.

(7)

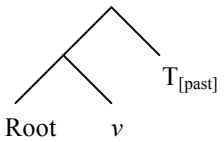


[4] Contra Embick (2010), I assume that roots are subject to VI; for discussion on this point, see Bonet & Harbour (2010).

[5] An important question concerns what does and what does not count as a suppletive root. As mentioned above, Corbett (2007) discusses criteria for canonical suppletion, and, while certainly valid concerns, these matters cannot be resolved in the current paper. In particular, the criterion for noun suppletion here is singular-plural pairs identified as suppletive in prior literature, where these are strongly suppletive, i.e., not plausibly related by (possibly idiosyncratic) phonological (readjustment) rules.

On the assumption that category heads are phasal heads that spell out their sister, this would result in *n* causing spellout of the root. Now, if it were the case the case that spellout and accessibility to govern suppletion lined up perfectly, no allomorphy would ever cross a category-defining node, since the root would always be closed off. However, as Embick (2010) notes, this theory would be too restrictive. Vocabulary insertion must have access to at least a small amount of structure above the domain-defining head. As an example of suppletion across a category-defining node, consider certain forms of the past tense in English (Embick 2010). First off, the structure of a past tense form is given below:

(8)



Now, in the case of the *go* - *wen-t* alternation we see that the past tense governs the (suppletive) form of the verbal root. Similarly, just as the form of the verb root may be governed by tense (*tell* - *tol-d*), the verb root in turn may influence allomorphy of tense (*spell* - *spelt*, cf. *fell* - *felled*). Clearly, this happens across the category-defining node *v*, and, as such, the root cannot be entirely closed-off from material outside of the spellout domain.

Specifically, I assume that both the phasal node and 'the next node up' are *accessible* as a context for insertion; as such, in (6), although only A is subject to spellout, both (phasal) *α* as well as B are *accessible* to condition VI (and suppletion) of A.[6]

(9) Accessibility domain: For vocabulary insertion at the root, accessible nodes are: the first category-defining node above the root; and one node above that.
(where accessibility means: if node *n* is accessible to a root A, then *n* may condition allomorphy, including suppletion, at A)

The motivation for this approach can be thought of as 'morphological subjacency', where a morphological dependency may span no more than one node (cf. the (syntactic) subjacency condition, Chomsky 1973).[7] That is to say, a node *n* may condition allomorphy of the root iff no more than one phasal node intervenes between *n* and the root (see also Embick 2010). Below, I suggest that the node

[6] Embick (2010) and Bobaljik (2012) also propose similar theories of accessibility of material for purposes of VI; due to space limitations I refer the reader to Moskal (2013) for discussion of how the current formulation of the accessibility domain relates to Embick's and Bobaljik's proposals.

[7] Note that this condition holds with regard to an outwards dependency, i.e., where the root is dependent on an affix. However, it arguably does not hold with regard to an inwards dependency, as case affixes may show allomorphy for root classes. I thank Andrea Calabrese for bringing this point to my attention.

immediately above the category-defining node *n* hosts the complex of *φ*-features; if we assume that this *φ*-node is phasal (cf. Sauerland 2008), then it may condition allomorphy of the root, since in that configuration *n* is the intervening phasal node and the node hosting *φ* is the next phasal node.[8] However, for expository reasons, I henceforth use (7) as the formulation of the locality restriction operating on Vocabulary Insertion.

To repeat, for vocabulary insertion at a node A (e.g. the root) the domain of accessible nodes is limited to the first category-defining node above A and one node above that. Due to space limitations, I refer the reader to Moskal (2013, to appear) for more discussion on the proposal of accessibility domain in these terms.

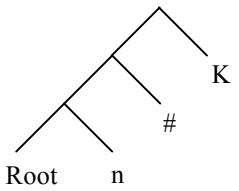
3 Nouns

Fleshing out the representation of nouns from (7) above, I propose the following structure for nouns. In addition to a root and a category-defining node *n*, I will use a projection labelled 'case' (K) as an umbrella term for what is realised as the case morpheme.[9] Similarly, I collapse the *φ*-features into a single projection, and for expository reasons I equate *φ* with its internal constituents, in particular with the number node (#). Furthermore, in accordance with Greenberg's (1963) universal, case is assumed to be located higher than number (and all other *φ*-features).

(10) <u>Universal 39</u> (Greenberg 1963:95): Where morphemes of both number and case are present and both follow or both precede the noun base, the expression of number always comes between the noun base and the expression of case.

This gives an abstract representation for a noun as in (11):

(11)



Furthermore, as mentioned above, vocabulary insertion proceeds cyclically from the root outwards (Bobaljik 2000, Embick 2010). As such, we start at the root. Next we reach the category node *n*, which triggers spellout of its comple-

[8] It should be noted that this is a simplification; in Moskal (2013) a variety of locality conditions are considered and I argue for an alternative which does not require that the complex of *φ*-features are phasal - but in the interests of space, the condition in (9) will suffice.

[9] For more articulated representations see e.g. Caha (2009), Radkevich (2010) and Pesetsky (2013).

ment, the root. However, *per* the above in (9), the accessible nodes that can condition allomorphy (Vocabulary Insertion) at the root will include the category-defining node *n* as well 'one node up', viz. #.

As for practical application, the VI rules for languages that display a suppletive form in the plural will take the following form, where α is the default form and β is the suppletive variant:

(12) √ROOT ⇔ β / _ PL
√ROOT ⇔ α

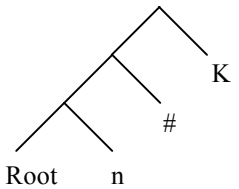
As an actual example, consider again the suppletive forms in Ket given in (2) above. The VI entries for *child* in Ket would correspond to the following:[10]

(13) √CHILD ⇔ kʌˀt / _ PL
√CHILD ⇔ dɨˈl'

To repeat, by virtue of the elsewhere principle the more specific VI rule (√CHILD ⇔ kʌˀt /_PL) is chosen if the context for it is met. Furthermore, the content of the number node (i.e., PL) is available to condition root suppletion since when the root is sent to spellout (i.e., undergoes VI) the number node, which carries plural, is sufficiently local by virtue of being one node up from phasal *n*.

However, the root cannot access information about case, since at the point that the root is being spelled out (subject to VI) only the category-defining node *n* and number are accessible to govern its potential suppletion. In contrast, K is located too far away to govern root-suppletion.

(14)



It is important to note that it is cyclic locality that prevents the root from accessing case information. That is, there is nothing that prevents the formulation of a hypothetical VI entry making reference to case such as (15); rather, (15) is *inaccessible* due to locality.

(15) √CHILD ⇔ gu: /_ K

[10] Here I put aside the question of when the plural morpheme is the regular plural exponent or a zero, an issue that arises in English past tense (*run-ran* vs. *tell-told*) and comparatives (*bett-er*, vs. *worse*) as well.

In sum, whilst number-driven root-suppletion is possible, case-driven suppletion in excluded by cyclic locality. Thus we derive the lack of case-driven root-suppletion in lexical nouns.[11]

4 Aside: Portmanteaux

At this point, a note on portmanteaux is in order. Consider languages in which number and case are collapsed into a single morpheme (a 'portmanteau'), such as Serbian:

(16)

	SINGULAR	PLURAL	
NOM	ruk-a	ruk-e	'arm'
ACC	ruk-u	ruk-e	

In (16), both number and case information are pronounced in a single vowel, e.g. the nominative singular has a single exponent *-a*.

Indeed, Radkevich (2010) and Bobaljik (2012) have argued that portmanteaux extend locality domains. In effect, they serve to make the node that dominates the elements within a portmanteau the focal point; that is to say, whether by pre-VI fusion of morphosyntactic nodes or VI-insertion at nonterminal nodes, the relevant node at which VI (and as such sensitivity to suppletive contexts) applies is higher than the VI-targeted nodes prior to the portmanteau. Applying this to the case at hand, when case and # form a portmanteau, this would at first blush provide an opportunity for case-driven suppletion. As seen in (17), a portmanteau would results in a configuration where K would be sister to the category node, and, as such, it would be sufficiently local to condition root-suppletion.

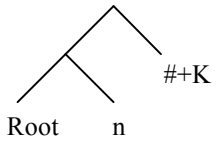
[11] Contrast this to the situation with pronouns, which regularly display suppletion for number as well as case. Consider the paradigm for German first person, which displays suppletion of pronouns for number as well as case (no claims are made about any internal regularities within the pronoun paradigm, just that there is suppletion for case in at least some of the cells in (17).

(17)

	SINGULAR	PLURAL
NOM	ich	wir
DAT	mir	uns
ACC	mich	uns

Indeed, it is widely assumed that pronouns have less structure than lexical nouns (Postal 1969, Longobardi 1994, Déchaine and Wiltschko 2002). The key difference between nouns and pronouns is that pronouns are functional (D) - they crucially lack a root and a (lexical-)category-defining node (*n*). The absence of *n* means that even the deepest node in the pronoun will be in the same cyclic domain as K, and thus potentially subject to allomorphy (i.e., suppletion) conditioned by K. Due to space limitations, the reader is referred to Moskal (2013) for a discussion on the difference between suppletion patterns in lexical nouns and pronouns.

(17)



However, this creates a dangerous situation. Indeed we predict that in (the numerous) languages which fuse number and case into a single portmanteau morpheme we should see cases of case-driven root-suppletion. However, this is not the case; even in languages that display root-suppletion in the context of a fused number and case morpheme, the suppletion is driven by the number specification:

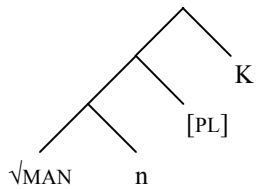
(18)

	SINGULAR	PLURAL	
NOM	čovek	ljud-i	'man'
ACC	čovek-a	ljud-e	

In (18), the noun suppletes for all plurals and the suppletion pattern is not governed by case. As such, portmanteaux as represented in (17) seem to overgenerate.

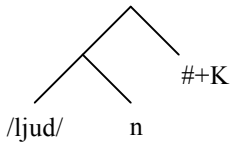
However, if we assume that portmanteaux are formed only at the point that their sub-components are subject to spellout, we see that a [#-K] portmanteau would be formed at the point that (at least) # is in a spellout domain, and, as such, subject to VI. Crucially, such a 'late' view on portmanteaux keeps the morpho-syntactic structure intact up to the point of Vocabulary Insertion of (at least one of) the elements of the portmanteau. Applied to the case at hand, given that the domain of spellout is the root, it is at that point entirely irrelevant whether the number node, which though accessible is not subject to spellout, is part of a portmanteau or not.

(19)



In (19), at the point that the root √MAN undergoes VI, it has access to number information ensuring that suppletive *ljud-* will be inserted. However, it has no information as to whether the number exponent is part of a portmanteau or not. This information becomes accessible at the point that (at least) number is subject to VI, at which point the root has been frozen for further interaction.

(20)



That is, it is irrelevant whether number morphology is expressed separately or as part of a portmanteau; either way, the locality restrictions hold and case-governed suppletion is still banned.

In sum, whilst number-driven root-suppletion is possible in lexical nouns, case-driven root-suppletion is prohibited by virtue of locality. Indeed, in total, 18 languages from the survey were found to display some item(s) that supplete in the presence of the plural (see Appendix A). In contrast, only four items (in two languages) display root-suppletion that is conditioned by case. Indeed, the formulation in terms of accessibility of the phasal node plus one node up blocks case-driven root-suppletion in a structure as in (11), which represents a canonical lexical noun consisting of a root, *n*, number and case. However, it allows for a possible class of exceptions: K may be close enough to the root just in case the number node is missing. Indeed, in the next section I argue that the three apparent counter-examples may be analyzed in exactly this way.

5 Case-driven root-suppletion

The three instances of root-suppletion in the context of case come from two Northeast Caucasian languages. In the following, I will argue that these can be analysed as lacking a number node in certain contexts, which opens the door to case-driven root-suppletion.

5.1 Archi's 'father'

The first two counter-examples come from Archi, a language spoken in Southern Daghestan. One item will be discussed in this section and I return to the second item in section 5.3 below. First consider some 'regular' root-suppletion in the presence of number (Archi Dictionary).

(21)

	SINGULAR	PLURAL	
ABS	úłdu	łːwat	'shepherd'
ERG	úł-li	łːwa-čaj	
ABS	bič'ní	boždó	'corner of a sack'
ERG	bič'ní-li	boždó-rčaj	
ABS	łːonnól	χom	'woman'
ERG	łːanná	χam-aj	
ABS	χʕon	bucː'i	'cow'
ERG	χʕiní	búcː'i-li	

The data above are a clear case of root-suppletion caused by number. However, the forms for 'father' and 'child' in Archi displays suppletion for case. Leav-

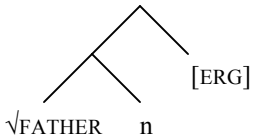
ing the case of Archi's 'child' aside for the moment (see section 5.3), consider the paradigm for Archi's 'father' (Archi Dictionary):

(22)

	SINGULAR	PLURAL	
ABS	ábt:u	---	'father'
ERG	úmmu	---	

Intriguingly, though, this form is listed as a *singulare tantum* and as such the form does not have a corresponding plural. I argue that Archi's 'father' is defective in that it lacks number.[12] Indeed, the absence of number opens up the door for case-driven root-suppletion; in the case of Archi's 'father' we see that the (ergative) case node is sufficiently local to the root. That is, it is *accessible* as a context that can affect the choice of exponent of the root, since it is immediately adjacent ('one node up') to the category-defining node *n*:

(23)



5.2 Lezgian

The next case comes from Lezgian; consider the forms for 'water' and 'son', which display suppletion in the context of non-absolutive (oblique) case in the singular (Haspelmath 1993:80):[13]

(24)

	SINGULAR	PLURAL	
ABS	jad	jat-ar	'water'
OBL	c-i	jat-ar-i	
ABS	xwa	ruxwa-jar	'son'
OBL	xc-i	ruxwa-jr-i	

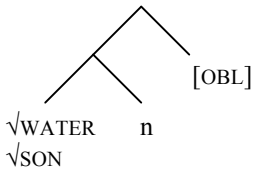
Clearly, at first blush these patterns seem to contradict the hypothesis advanced here; however, although there is an overt plural, I will argue that in these cases what we see is what we get: in the forms for 'water' and 'son' the singular is absent and, as such, as we saw in the case of Archi's 'father', the door is opened for (oblique) case to govern suppletion. That is to say, rather than the

[12] As to singular nature of the *singulare tantum*, I assume that default agreement is required (Preminger 2011). Furthermore, it has been suggested that absent features would be realised by the unmarked value (e.g. Smith 2013), and Bale et al. (2011), a.o., argue that singular is the morphologically unmarked value for number.

[13] Thanks to Martin Haspelmath (p.c.) for providing the oblique plural forms for 'water' and 'son'.

structure in (11), in the suppletive forms in (25) the number node is missing and, as such, K is sufficiently local to govern root-suppletion.

(25)



In order to show this, we need to take a closer look at the structure of the oblique stems. As can be seen even from the data above, the absolutive singular has no exponent. In contrast, the oblique suffix in the suppletive (singular) forms in (24) corresponds to *-i*. I argue that this suffix *-i* is the exponent of (the oblique) case exclusively (and does not include number information).

First, consider the formation of (non-suppletive) oblique plural forms in Lezgian (Haspelmath 1993:75); these are formed by adding *-i* to their non-oblique (absolutive) plural stem.[14] In particular, the absolutive plural exponent corresponds to *-(C)ar*.[15] The plural of the oblique, then, is formed by observing the plural *-(C)ar* (with syncope) followed by *-i*.

(26)

ABS PL	OBL PL	
balk'an-ar	balk'án-r-i	'horse'
buba-jar	bubá-jr-i	'father'
dağ-lar	dağ-lár-i	'mountain'

This suggests the following structure for e.g. 'mountain-PL-OBL':

(27)

dağ	-lar	-i
mountain	-PL	-OBL

Turning to the singular forms, (Haspelmath 1993:74ff) lists the following eight additional realisations of the 'oblique stem affix':

(28)

-di	-a	-Adi	-rA
-Uni	-A	-U	-ci/-c'i/-či/-č'i/-ži

[14] The only exception are items that take *-bur* as a plural, in which case we observe *-u* instead of *-i* (e.g. *jarú-bur-u* 'red one-PL-OBL'); I take this to be a case of underlying *-i* undergoing vowel harmony (which is independently observed in Lezgian).

[15] I abstract away from some additional allomorphy of the plural since it does not bear directly on the argument here.

The default oblique stem suffix *-di* I argue is actually decomposable into two morphemes *-d-i* corresponding to '-SG-OBL'. This leads to the following (subset of) Vocabulary Insertion rules for Lezgian:

(29) [SG] ⇔ -d /_K[16]
[PL] ⇔ -(C)ar
[OBL] ⇔ -i

Furthermore, I assume that Haspelmath's 'oblique stem affixes' *-Ad-i* (30a), *-Un-i* (30b) and *-c-i/-c'-i/-c-i/-c'-i/-ž-i* (30c) are examples of allomorphy of the singular in the context of the root followed by the oblique suffix.[17]

(30)	a.	nek'	-éd	-i
		milk	-SG	-OBL
	b.	kam	-ún	-i
		trap	-SG	-OBL
	c.	par	-c	-i
		load	-SG	-OBL

This leaves us with the following 'oblique stem affixes': *-a, -rA, -A* and *-U*. Strikingly, all these suffixes end in a vowel; as such, I suggest that most of the above-listed exponents are allomorphic realisations of the singular node but that the resulting configuration of *V-i* is phonologically dispreferred. Indeed, Lezgian only has two long vowels (/æ:/ and /a:/), which have a marginal status: they result from compensatory lengthening after the loss of ʁ in (combinations of different preverbs with the verb) *jağun* 'hit' (Haspelmath 1993:32).

As such, I suggest that in the situation where the singular allomorph and the oblique result in vowel hiatus this is resolved by virtue of deleting the high vowel /i/, resulting in a surface situation in which the 'oblique stem affix' does not include (morphological) *-i*: *-a* (31a), *-rA* (31b), *-A* (31c) and *-U* (31d).

Finally, the remaining realisation of the 'oblique stem affix' is a 'bare' *-i*.[18] Interestingly, (some of) the nouns that take a 'bare' oblique marker *-i* are suggested to be "former *pluralia tantum* which have been reanalyzed as singulars" (Haspelmath 1993:75). Indeed, *pluralia tantum* have been argued to have a lexical number specification, which would exempt them from projecting a number node (Smith to appear).

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[16] The exponent of the singular in (31) is the default realisation; I assume it applies when all other more specific (and lexically restricted) VI rules for the singular (such as, in (32), [SG] ⇔ -ed / _K {nek', ...}) have applied.

[17] The variants *-c-i/-c'-i/-c-i/-c'-i/-ž-i* result from Affricate Assimilation, see Haspelmath (1993:63, section 5.13).

[18] Another realisation of the 'oblique stem affix' is a stressed *-í*; however, I assume that this again involves a singular exponent (stressed) *-í* followed by ergative *-i*, which is resolved as *-í*.

(31)	a.	apaj	-a	-i	>	apaja
		father-in-law	-SG	-OBL		
	b.	lam	-ra	-i	>	lamra
		donkey	-SG	-OBL		
	c.	luw	-a	-i	>	luwá
		wing	-SG	-OBL		
	d.	čarx	-u	-i	>	čarxú
		rock	-SG	-OBL		

At long last, we can return to the suppletive nouns in the table in (24) above; indeed, I suggest that in the case of 'water' and 'son', the singular is pruned (i.e., deleted) by a specific rule, targeting these two items. As such, the oblique case node becomes sufficiently local to the root, thus allowing it to condition root-suppletion, as depicted in (25) above.

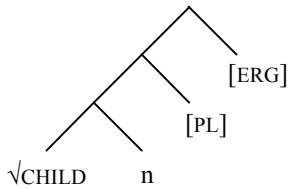
5.3 Archi's 'child'

Returning to Archi, the second case of case-driven suppletion in Archi we observe is that of the ergative singular of the item 'child', which displays (case-driven) suppletion:

(32)		SINGULAR	PLURAL	
	ABS	lo	ló-bur	'child'
	ERG	lahá	ló-bur-čaj	

However, as in Lezgian, we observe the same two interesting aspects here: (i) the plural morpheme (*-bur*) blocks the suppletive root from surfacing (we observe *ló-bur-caj* rather than **lahá-bur-caj*), and (ii) there is no overt suffix on the ergative singular form. The fact that the regular root surfaces in the ergative plural supports an analysis analogous to the analysis of Lezgian proposed here, since the presence of the plural morpheme intervenes between the root and the ergative, thus preventing root suppletion.

(33)

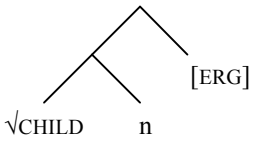


Secondly, the ergative singular form is missing a case suffix. Indeed, the missing singular ergative suffix allows for an analysis of the item 'child' where the singular is absent in the context of the ergative.[19] As such, as was the case in

[19] Presumably, as in the case of Archi's 'father' the singular character results from default agree-

Lezgian, this configuration opens up the door for (ergative) case to be sufficiently local to the root to govern suppletion. The corresponding structure for Archi's 'child' is given in (34) (cf. the structure for the suppletive forms in Lezgian in (25) above).

(34)



6 Final remarks

In the above, I have argued that a minimal approach to locality, which crucially draws on syntactic hierarchical structure as the input to morphology, is sufficient to account for the observation that in lexical nouns suppletion driven by number is regularly observed, whereas suppletion driven by case is virtually unattested. In particular, lexical nouns contain a category-defining node which induces a spellout domain, which, combined with the notion of *accessibility* as the first category-defining node above the root and one node above that, prohibits case-driven root-suppletion in canonical lexical nouns. The three apparent counterexamples follow from this assumption about locality restrictions on accessibility, as their particular circumstances motivate a structure where the K projection is located closer to the root than usual.

Furthermore, given the locality restrictions discussed here certain blocking effects are expected. As we saw in the case of Lezgian and Archi's 'child', a plural exponent prevented the suppletive root from surfacing. Specifically, an additional restriction on allomorphy is expected from the structure proposed here for lexical nouns: an (overt) element between the category node *n* and number should block number-driven root-suppletion, since in that configuration number is no longer one node up from the spellout domain. This prediction seems to be borne out: in Slavic the diminutive is located closer to the root than number and indeed blocks number-driven root suppletion; however, due to space limitations I refer to Moskal (2013, to appear) for details.

To conclude, it is argued here that a minimal approach to locality is sufficient to explain the patterns identified in a study that looked at suppletion in nouns across some 80 languages. The results from this study bear on the discussion of the formalisation of locality domains as employed in DM. Indeed, the hypothesis advocated here relies on (morpho)syntactic structure playing a crucial role in the decision of whether material is accessible to govern suppletion patterns, which, as such, raises the question whether these observations can be captured in frame-

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ment (see note 12). Note, though, that I have to postulate a null (ergative) case suffix in the singular (*lahá-∅* 'child-ERG') to condition the suppletion of the root in the context of the ergative.

works that deny that hierarchical syntactic structure plays a role in the morphology, such as Word and Paradigm approaches (e.g. Anderson 1992, Stump 2001).

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Re-thinking Compositionality in Persian Complex Predicates*

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Introduction

Persian Complex Predicates (CPs) have been a focus of interest during the last two decades. Their formation (i.e. morphological/lexical vs. phrasal/syntactic) and their interpretation (compositional vs. idiomatic) have been thoroughly investigated and various analyses have been proposed to account for their seemingly contradictory properties. In this paper, we revisit the issue of the compositionality of Persian CPs, focusing on Noun-Verb combinations, and provide a Construction-based approach which allows to overcome the apparent contradiction between their idiomatic and compositional properties, and offers a new insight into their productivity.

The number of simplex verbs in Persian is limited to around 250, only half of which are currently used by the speech community[1]. The verbal lexicon is thus mainly formed of syntactic combinations, including a verb and a non-verbal element, a noun, e.g. *qadam zadan* 'to walk' (Lit. 'step hit'), an adjective, e.g. *derāz kešidan* 'to lay down' (Lit. 'long pull'), a particle, e.g. *bar dāštan* 'to take' (Lit. 'PARTICLE have'), or a prepositional phrase, e.g. *be kār bordan* 'to use' (Lit. 'to work take'). These combinations are generally referred to as Complex Predicates

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[1] Sadeghi (1993)'s estimation is 252 (115 commonly used) and Khanlari (1986) provides a list of 279 simplex verbs.

(CPs), Compound Verbs or Light Verb Constructions (LVCs). New "verbal concepts" are regularly coined as CPs rather than simplex verbs, e.g. *yonize kardan* 'to ionize' (Lit. 'ionized do') instead of *yonidan*. Although morphological lexeme formation process outputting verbs from nouns, e.g. *xāb* 'sleep' > *xāb-idan* 'to sleep' is available, it has ceased to be productive and is used only in a marginal way.

Their productivity, their syntactic formation, along with a certain degree of semantic transparency have favored a compositional view of Persian CPs. Although their idiomatic properties have been generally acknowledged, they have nevertheless been overlooked or minored by the studies adopting a compositional approach. The latter almost uncontroversially admit that at least the argument structure and the eventive properties, if not the lexical meaning, of these combinations can be compositionally derived, on the basis of a consistent contribution of the verb and the non-verbal element. In this paper, we argue against this consensus. After briefly introducing the generalizations stated by the most recent compositional studies, we show their empirical inconsistency and conclude that Persian CPs are multiword expressions with a conventional meaning, and thus need to be stored. We furthermore claim that a compositional approach is nevertheless possible provided compositionality is defined *a posteriori*, in the sense of Nunberg *et al.* (1994). We then outline a Construction-based approach illustrating these points.

1. Previous Compositional Approachs

Two main arguments have been invoked in favor of a compositional analysis of Persian CPs: a) The predictability of their argument and event structure; b) The predictability of their lexical (referential) meaning.

In the examples below, the referential meaning of the CP and the roles assigned to the event participants is determined by the nominal element, since the semantic participants of the CP, ex. (1b), are identical to those of the noun within the NP it projects, ex. (1a). The verb on the other hand determines the argument mapping, since the substitution of the verb by another one entails a change in the mapping between the participants and the grammatical functions, ex. (1b) and (1c).

(1) a. ***sili***=*e* *Sārā be Omid*
slap=EZ Sara to Omid
'Sara's slap to Omid'[2]

b. *Sārā be Omid* ***sili zad***
Sara to Omid slap hit
'Sara slapped Omid.'

c. *Omid az* *Sārā* ***sili xord***
Omid from Sara slap stroke
'Omid was slapped by Sara.'

On the basis of comparable data, several studies have attempted to outline a compositional analysis of Persian CPs. Despite substantial variations in their accounts, they all rely on the assumption that the contribution of the verb and the

[2] Abbreviations: CLP: Clitic pronoun, DOM: Differential Object Marker, EZ: Ezāfe.

non-verbal element is defined *a priori* and remains consistent through all their combinations to form a CP. Folli *et al.* (2005) and Megerdoomian (2002, 2012) are recent examples of such approaches. Adopting Hale and Keyser (2002)'s "constructionalist" theory of argument structure, the authors claim that the syntactic and the semantic properties of the CP are derived from the abstract syntactic structure in which the components of the CP are inserted.

For Folli *et al.* (2005) and Megerdoomian (2002), the verb realizes the verbal head *v* and determines whether an external argument (i.e. Agent) is projected[3], regardless of the properties of the non-verbal element[4]. This explains the differences in argument mapping between (1b) and (1c) above. The verb furthermore determines the event type and the aspectual properties of the CP, i.e. durative vs. non-durative and eventive vs. stative: "(...) normally the eventiveness of a complex predicate depends on the light verb involved and not on the non-verbal element (Folli *et al.* 2005, p. 1379)". This in turn explains the contrast between *be yād dāštan* (Lit. 'to have in one's memory') and *be yād āvardan* (Lit. 'to bring to one's memory'). Both CPs mean 'to remember', however the first one has a stative reading while the second one denotes an event.

The non-verbal element, on the other hand, determines the telicity[5] and the referential properties (i.e. the lexical meaning) of the CP. CPs formed with adjectives, PPs, particles and eventive nouns are telic, while those formed with a non-eventive noun are atelic (Folli *et al.* 2005, p. 1386).

2. Problems Faced by Compositional Accounts

Whatever their differences, "radical" compositional approaches all face the same set of problems, since they build on the wrong assumption that the respective contribution of the CP components is consistent through all their combinations and can be defined *a priori*. However, as will be shown in this section, the same verb can give rise to different types of CPs with respect to their agentivity and eventive properties. Likewise, the non-verbal element's contribution can vary through its combinations with different verbs.

2.1. The Non-consistent Contribution of the CP Components

Contrary to what has been claimed in the above-mentioned studies, a given verb can form both agentive and non-agentive, as well as stative and eventive predicates. For instance, the verb *zadan* 'to hit' is generally considered as agentive and eventive. However, it can also give rise to "unaccusative" (or passive-like) CPs, like *yax zadan* 'to freeze' (Lit. 'ice hit') or *zang zadan* 'to go rusty' (Lit. 'rust hit'). The

[3] "(...) the Agent-selecting properties of any given light verb are consistent across all Complex Predicates formed with a given LV." (Folli *et al.* 2005, p. 1376)

[4] "(...) it is clear that agentivity is a property of the LV in the CPr, and never depends on the nature of the NV element selected." (Folli *et al.* 2005, p. 1377)

[5] "(...) the telicity of the CPr is dependent on the non verbal element involved, in a very transparent fashion." (Folli *et al.* 2005, p. 1374)

same holds for *gereftan* 'to take' and *kardan* 'to do', which, apart from agentive CPs, e.g. *duš gereftan* 'to take a shower' (Lit. 'shower take') and *kār kardan* 'to work' (Lit. 'work do'), also form "unaccusative" CPs, such as *ātaš gereftan* 'to take fire' (Lit. 'fire take'), *ādat kardan* 'to get used to' (Lit. 'habit do') and *dard kardan* 'to ache' (Lit. 'pain do').

It should be noted at this point that the only criterion to which Folli *et al.* (2005) resort in order to verify the agentivity of Persian CPs is a semantic one, namely their compatibility with the adverb *amdan* 'intentionally': Agentive CPs are compatible with *amdan*, while non-agentive ones exclude it. The following examples show the contrast between CPs formed with *zadan* 'to hit' and *gereftan* 'to take' with respect to *amdan* and thus illustrate the fact that the same verb can give rise to both agentive and non-agentive CPs.

(2) a. *Maryam amdan harf zad*
Maryam intentionally speech hit
'Maryam talked intentionally.'

b. * *Āb amdan yax zad*
water intentionally ice hit
(Lit.) 'The water froze intentionally.'

(3) a. *Maryam amdan az Omid aks gereft*
Maryam intentionally from Omid picture took
'Maryam took pictures of Omid intentionally.'

b. * *Dast=am amdan dard gereft*
hand=CLP.1S intentionally ache took
(Lit.) 'My hand ached intentionally.'

However, Hale and Keyser (2002) define agentivity on syntactic grounds only. The Agent is the argument occupying the position of the Specifier of *v*, i.e. the external argument. Under this assumption, typical agentive properties such as volitionality and animacy are merely canonical interpretative properties associated to a syntactic position and consequently, all external arguments do not necessarily display these properties. Given the fact that Folli *et al.* (2005)'s criterion only singles out volitional external arguments, additional syntactic criteria are required. As shown by Samvelian (2006), the most reliable criterion to identify non-agentive CPs is their incompatibility with *=rā*, the definite/specific DO-marker in Persian[6]. The nominal element in "agentive" CPs can be *rā*-marked under certain circumstances, but never in non-agentive CPs. The examples (4) and (5) illustrate the contrast between *harf zadan* 'to talk' and *aks gereftan* 'to take pictures', agentive CPs, on one hand and *yax zadan* 'to freeze' and *dard gereftan* 'to ache', non-agentive CPs, on the other hand with respect to *rā*-marking. Thus, regardless of the criterion one resorts to, *yax zadan* and *dard gereftan* are univocally identified as non-agentive CPs.

[6] For details on Differentiel Object Marking in Persian, which is realized by the enclitic *=rā*, see Lazard (1982) et Meunier and Samvelian (1997).

This shows the impossibility to determine *a priori* what kind of predicates a verb forms with respect to agentivity.

(4) a. *Maryam in harf=rā zad*
Maryam this talk=DOM hit
'Maryam told this.'

b. * *āb in yax=rā zad*
water this ice=DOM hit

(5) a. *Maryam in aks=rā az Omid gereft*
Maryam this picture=DOM from Omid took
'Maryam took this picture of Omid.'

b. * *Dast=am in dard=rā gereft*
hand=CLP.1S this ache=DOM took

The verbal contribution is not consistent either with respect to the eventive properties of the CP. Again, the same verb can give rise to both stative and eventive (dynamic) CPs. For instance, contrary to what is claimed by Folli *et al.* (2005, p. 1378), the verb *dāštan* 'to have' is not invariably stative and can produce eventive (dynamic) predicates such as *ersāl dāštan* 'to send' (Lit. 'sending have'), *taqdim dāštan* 'to offer' (Lit. 'offering have') and *e'lām dāštan* 'to announce' (Lit. 'announcing have')[7]. Table 6 illustrates the diversity of CPs formed with the same verb with respect to both agentive and eventive properties. Each line corresponds to a different verb.

(6) Diversity of CPs formed with the same verb

Subject agentivity		**Event type**	
Agentive	Non-agentive	Processive	Stative
varaq zadan 'to browse'	*kapak zadan* 'to go mouldy'	*rang zadan* 'to paint'	*barq zadan* 'to sparkle'
farmān dādan 'to order'	*bu dādan* 'to smell'	*anjām dādan* 'to accomplish'	*ma'ni dādan* 'to mean'
jāru kardan 'to broom'	*rošd kardan* 'to grow'	*ta'mir kardan* 'to repair'	*dard kardan* 'to ache'
tasmim gereftan 'to decide'	*anjām gereftan* 'to be done'	*aks gereftan* 'to take a photo'	——
qasam xordan 'to swear'	*kotak xordan* 'to be beaten'	*xanjar xordan* 'to be stabbed'	*be dard xordan* 'to be useful'

[7] Note that the examples discussed in this section are by no means isolated. For thorough examples illustrating the non-consistency of the verbal contribution to the agentive and eventive properties of Persian CPs, see Samvelian (2012, pp. 114–130).

As mentioned previously, Folli *et al.* (2005) consider the non-verbal element to be responsible for the telicity of the CP. Adjectives, PPs, particles and eventive nouns are claimed to form telic CPs, while non-eventive nouns give rise to atelic CPs. However, the contribution of the non-verbal element also turns out to be inconsistent. For instance, adjectives and PPs can as well form atelic CPs, e.g. *lāzem dāštan* 'to need' (Lit. 'necessary have'), *penhān dāštan* 'to keep hidden' (Lit. 'hidden have'), *be masxare gereftan* 'to make fun of' (Lit. 'to mockery take'). Inversely, non-eventive nouns can give rise to telic CPs, *pust andāxtan* 'to slough off' (Lit. 'skin throw').

(7) a. *Maryam sāl-hā pul lāzem dāšt*
Maryam year-PL money necessary had
'Maryam needed money for years.'

b. # *Maryam dar panj daqiqe pul lāzem dāšt*
Maryam in five minute money necessary had
(Lit.) 'Maryam needed money in five minutes.'

(8) a. *Maryam sāl-hā Omid=rā be masxare gereft*
Maryam year-PL Omid=DOM to funny took
'Maryam made fun of Omid for years.'

b. # *Maryam dar panj daqiqe Omid=rā be masxare gereft*
Maryam in five minute Omid=DOM to funny took
(Lit.) 'Maryam made fun of Omid in five minutes.'

(9) a. # *Mār do ruz pust andāxt*
snake two day skin threw
(Lit.) 'The snake sloughed off for two days.'

b. *Mār dar do ruz pust andāxt*
snake in two day skin threw
'The snake sloughed off in two days.'

To conclude, *none* of the empirical generalizations stated by Folli *et al.* (2005) hold when a larger range of data is taken into account.

2.2. The Non-Predictable Semantic Content of the CP

The non-predictability of the meaning of the CP is another significant impediment to fully compositional approaches. In order for the latter to work, the meaning of the CP must be derivable on the basis of the meaning of its components. However, as mentioned in several studies (Goldberg 1996, Karimi-Doostan 1997, Family 2006, Bonami and Samvelian 2010, Samvelian 2012, Samvelian and Faghiri 2013, inter alia), numerous Persian CPs are semantically opaque. Moreover, as shown by Samvelian (2012) and Bonami and Samvelian (2010), even in cases where a CP is semantically transparent, it is barely ever the case that its meaning is fully predictable from the meaning of its component parts.

In some cases, the CP meaning is a specialization of the predictable meaning of the combination, e.g. *čâqu zadan* 'to stab' (Lit. 'knife hit'), *dast dâdan* 'to shake hands' (Lit. 'hand give'), *âb dâdan* 'to water' (Lit. 'water give'), *šir dâdan* 'to breastfeed' (Lit. 'milk give'). Although the link between the literal and the specialized meaning is perceptible in each case, the latter cannot be straightforwardly derived from the former.

In other examples, semantic drift has taken place, either by metaphor, metonymy or ellipsis. The meaning of *gand zadan* 'to screw up' (Lit. 'dirt hit'), *guš kardan* 'to listen' (Lit. 'ear do') and *zanjir zadan* 'to flagellate' (Lit. 'chain hit') can be derived via metaphor, metonymy and ellipsis respectively. Even though the meaning of these CPs is recoverable by speakers in synchrony once they learn the conventional meaning associated to them, it is not predictable *a priori* and must be learned. Moreover, in numerous other cases, the initial link is no more perceivable by speakers. For instance, *ru gereftan* 'to become cheeky' (Lit. 'face take') and *dast andâxtan* 'to mock' (Lit. 'hand throw') constitute opaque sequences in synchrony.

These facts show that the meaning of Persian CPs, even the transparent ones, is conventional in many cases and consequently has to be learned, in the same way as one has to learn the meaning of the simplex verbs in English, for instance.

3. Compositionality Revisited: A Construction-Based Approach

Relying on the observations presented in section (2), we claim that Persian CPs, at least the lexicalized ones, must be stored, exactly as lexemes are.

We nevertheless argue that the need for an inventory is not contradictory with a compositional approach, provided compositionality is defined *a posteriori*, like in Idiomatically Combining Expressions, in the sense of Nunberg *et al.* (1994). This view of Persian CPs can be developed into a Construction-based approach: 1) Each CP corresponds to a Construction. 2) CPs can be grouped in classes according to their semantic and syntactic properties and each class can be represented by a partially fixed Construction. 3) Constructions can be structured in networks, thus accounting for different semantic and syntactic relations between CPs[8].

3.1. Persian CPs as Idiomatically Combining Expressions

With respect to their compositionality, Persian CPs are comparable to Idiomatically Combining Expressions, that is, "idioms whose parts carry identifiable parts of their idiomatic meanings" (Nunberg *et al.* 1994, p. 496). This means that the verb and the non-verbal element of a CP can be assigned a meaning in the context of their combination. Thus, the CP is compositional, in the sense that the meaning of the CP can be distributed to its components, and yet it is idiomatic, in the sense that the contribution of each member cannot be determined out of the context of its combination with the other one. This is the line of argumentation developed by

[8] See Samvelian (2012) for an application of this analysis to the CPs formed with *zadan* 'to hit'. See also Müller (2010) for a partially comparable approach within the HPSG framework.

Nunberg *et al.* (1994) to support a compositional view of expressions such as *spill the beans*. Table 10 illustrates this point for a set of CPs formed with *zadan* 'to hit'. Each line contains examples of CPs where the verb can be assigned a meaning comparable to that of a lexical verb in English.

(10) Meanings of *zadan* in the context of its CPs

CPs formed with *zadan* (N + *zadan*)	**The meaning of *zadan***
kare – 'to butter', *lāk* – 'to varnish', *rang* – 'to paint', *šāmpu* – 'to shampoo' *vāks* – 'to polish'...	'to apply'
adviye – 'to put spice', *felfel* – 'to pepper', *namak* – 'to salt'...	'to add','to incorporate'
barčasb – 'to label', *dastband* – 'to handcuff', *lejām* – 'to bridle', *mangane* – 'to staple', *tambr* – 'to stamp'...	'to put'
eynak – 'to wear glasses', *kerāvāt* – 'to wear a tie', *māsk* – 'to wear a mask'...	'to wear'
javâne – 'to bud', *juš* – 'to sprout', *kapak* – 'to go mouldy', *šabnam* – 'to dew', *šokufe* – 'to bloom', *tabxâl* – 'to develop coldsore', *tâval* – 'to blister', *zang* – 'to rust', *pine* – 'to become calloused'...	'to develop', 'to form'
pol – 'to build a bridge', *jādde* – 'to build a road', *sad* – 'to build a dam', *saqf* – 'to build a ceiling'...	'to build'
čādor – 'to set up a tent', *dārbast* – 'to erect a scaffolding', *ordu* – 'to set a camp', *pašeband* – 'to put up a fly sheet'...	'to set up'
arbade – 'to yell', *dād* – 'to shout', *faryād* – 'to shout', *jiq* – 'to scream'...	'to emit (a cry)'
ar – 'to bray', *čahăhe* – 'to sing (bird)', *jik* – 'to chirp', *šeyhe* – 'to neigh'...	'to emit (an animal cry)'

Given the meaning assigned to *zadan* and the meaning of the CP as a whole, new combinations can be produced and interpreted. For instance, *tag zadan* 'to tag' (Lit. 'tag hit'), formed with the loanword *tag*, is created on the basis of *barčasb zadan* 'to label' (Lit. 'label hit'), *tambr zadan* 'to stamp' (Lit. 'stamp hit'), etc.

3.2. Persian CPs as Constructions

A Construction, in the sense of Goldberg (1995) and Kay and Fillmore (1999), is a conventional association between a form and a meaning. Given that Persian CPs have a conventional meaning, they each correspond to a Construction, and are

thus comparable to lexemes. Constructions can be of various levels of abstractness and can be organized hierarchically, going from the most specific ones to the more abstract ones. Samvelian (2012) applies this approach to a set of CPs formed with the verb *zadan* 'to hit' and a nominal element. The latter are grouped in semantic classes, with various degrees of coherence. Each class corresponds to a partially fixed Construction. Here are examples of these Constructions:

(11) Spreading-*zadan* Construction

N0	*(be) N1*	*N*	*V*
Agent	Ground	Figure	

'N0 applies N on N1' or 'N0 covers the surface of N1 with N'

(12) Instrument-*zadan* Construction

N0	*(be) N1*	*N*	*V*
Agent	Patient	Instrument	

'N0 accomplishes the typical action for which N is used (on N1)'

(13) Forming-*zadan* Construction

N0	*N*	*V*
Location	Theme	

'N is formed on N0'

(14) Slandering-*zadan* Construction

N0	*be N1*	*N*	*V*
Slanderer	Slanderee	Slander	

'N0 accuses N1 of N2'

In each Construction notation: a) The first line gives the label of the Construction. The fact that *zadan* is specified in the label implies that the Construction is partially fixed. b) The second line gives the valency (subcategorization frame) and the syntactic construction of the minimal sentence including the CP. The formalism is inspired by M. Gross (1975)'s Lexicon-Grammar notation. c) The third line provides the mapping between the semantic roles and the grammatical functions. d) The last line indicates the abstract meaning associated to the Construction as a whole. Here are examples of CPs associated to each Construction:

(15) Spreading-*zadan* Cons: *āb* – 'to wet', *āhār* – 'to starch', *kare* – 'to butter', *rang* – 'to paint', *vāks* – 'to polish'...

(16) Instrument-*zadan* Cons: *jāru* – 'to broom', *mesvāk* – 'to brush one's teeth', *otu* – 'to iron', *šāne* – 'to comb'...

(17) Forming-*zadan* Cons: *javāne* – 'to blossom', *juš* – 'to sprout', *kapak* – 'to mouldy', *tāval* – 'to blister', *zang* – 'to go rusty'...

(18) Slandering-*zadan* Cons: *ang* –, *bohtān* –, *ettehām* –, *tohmat* – 'to slander'...

3.3. Networks of Constructions

Constructions can be structured in networks, reflecting different relationships such as hyponymy/hyperonymy (subtypes vs. supertypes), synonymy and valency alternations.

Subclasses and Superclasses

Some semantic classes can be grouped together into a more abstract class. In this case, the Construction associated to them is the subtype of a less specific Construction. For instance, the Spreading-*zadan* Construction in (11) can be considered as a subtype of Locatum Construction. Locatum verbs (Clark and Clark 1979), e.g. *paint*, *salt*, incorporate a Figure (i.e. the noun to which the verb is morphologically related) and have a Ground argument realized as an NP or a PP: 'to paint sth' = 'to put paint (Figure) on sth (Ground). In the case of Persian Locatum CPs, the Figure is the nominal element of the CP:

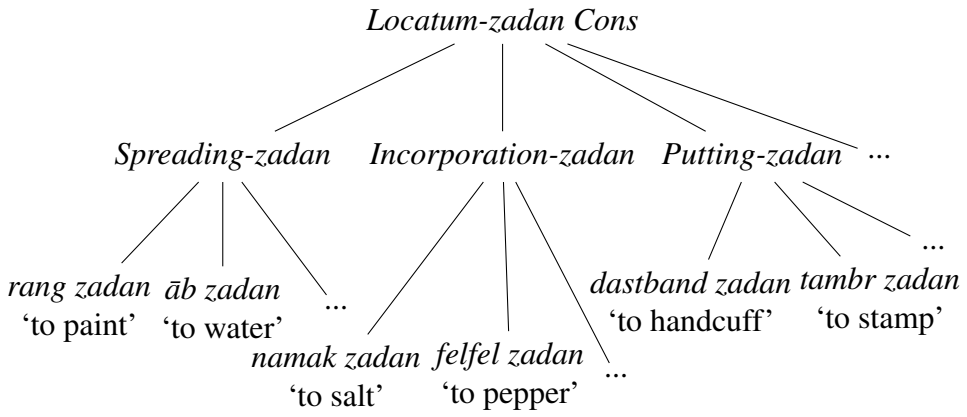
(19) **Locatum-*zadan* Construction**

N0	*(be) N1*	*N*	*zadan*
Agent	Ground	Figure	

'N0 puts/incoporates N on/into N1'

The subtypes of the Locatum-*zadan* Construction, i.e. the Spreading-*zadan* Construction, the Incorporation-*zadan* Construction and the Putting-*zadan* Construction (cf. Table 20), all have an Agent and a Ground argument; the nominal element of the CP is the Figure. They diverge in the manner that the Figure is placed on or inside the Ground argument. In the predicates realizing the Spreading-*zadan* Construction, the Figure is spread or applied on the surface of the Ground. The verb *zadan* in these predicates can generally alternate with the lexical verb *mālidan* 'to apply', 'to spread'. In the CPs corresponding to the Incorporation-*zadan* Construction, the Figure is incorporated into the ground. The verb *zadan* is then synonymous to *rixtan* 'to pour'. Finally, in Putting-*zadan* Construction, the Figure is placed on the Ground. These differences may entail further ontological distinctions. For instance, at the end of the event denoted by a CP which is an instance of the Incorporation-*zadan* Construction, the Figure can be confounded with the Ground or absorbed by it.

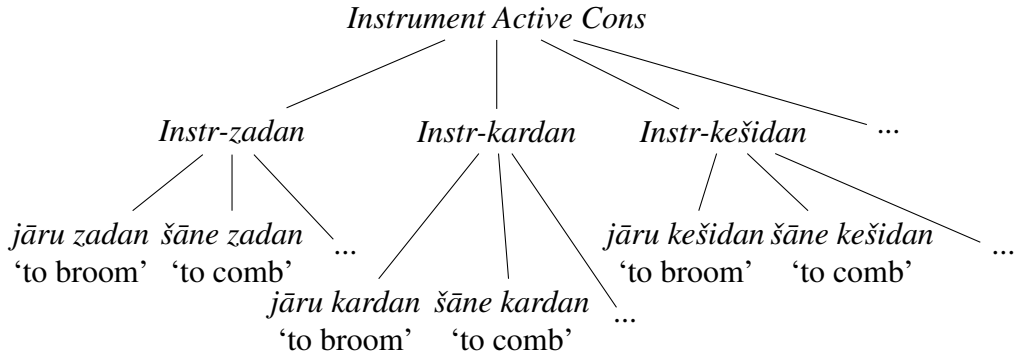
(20) Subtypes of Locatum-*zadan* Construction



Synonymous Constructions

The same Construction can be realized by different verbs, e.g. *kardan* 'to do' and *kešidan* 'to pull' also form Instrumental predicates, e.g. *jâru kardan* and *jâru kešidan* 'to broom'. So, along with the Instrument-*zadan* Construction, there are also the Instrument-*kešidan* Construction and the Instrument-*kardan* Construction. These three partially fixed Constructions are subtypes of a more abstract Construction, with no lexically fixed element, i.e. the Instrument Construction. Synonymy rises when the same noun occurs in the same Construction realized by different verbs.

(21) Different verbs realizing the Instrument Construction



Valency Alternating Constructions

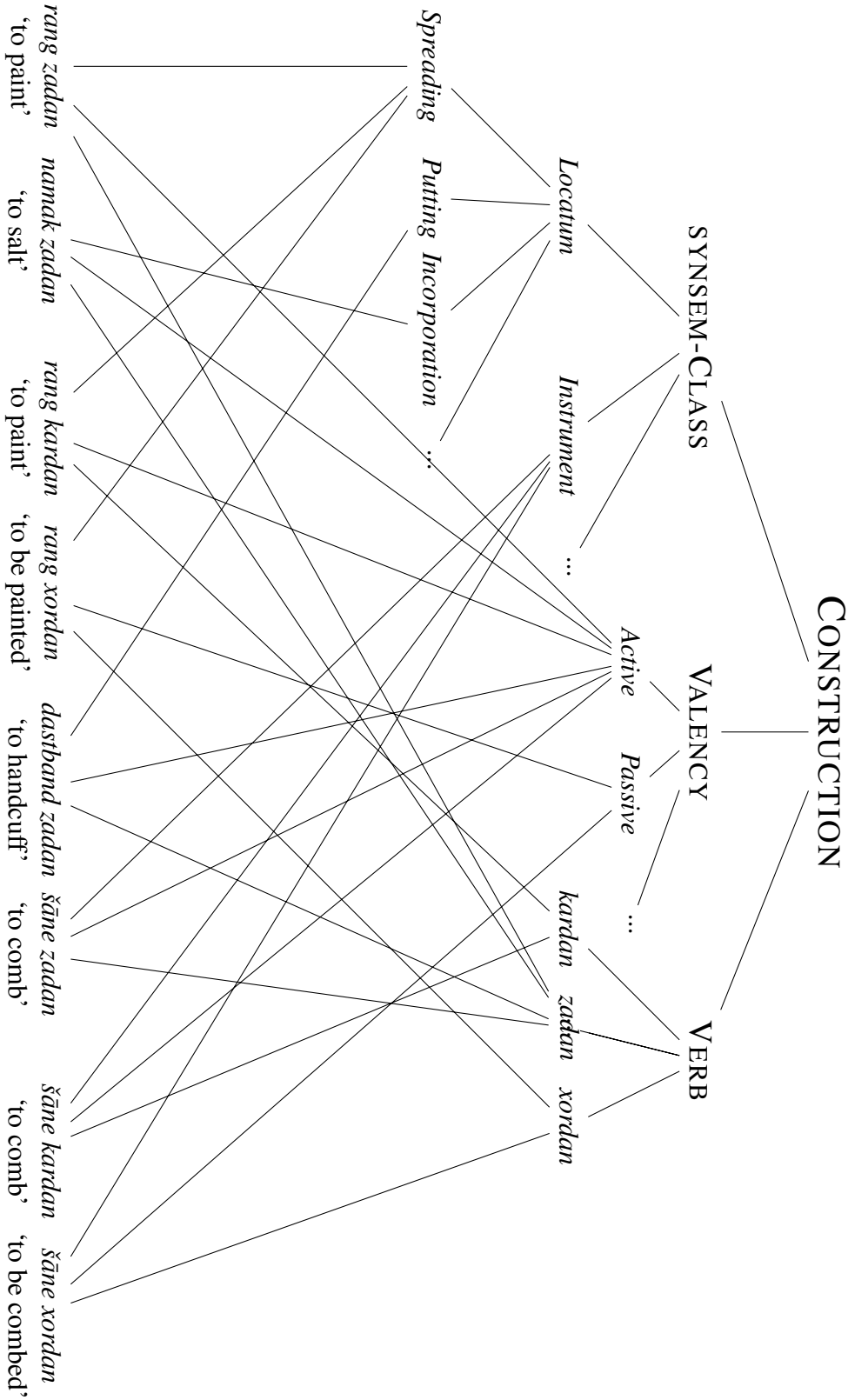
The same Construction can display valency alternations. For instance, in an Instrument Construction, the Agent can be mapped to the grammatical subject and the Patient to the grammatical object, which gives rise to an "active" Instrument Construction, or the Patient can be mapped to the grammatical subject, forming a "passive" or "unaccusative" Instrument Construction. Valency alternations in CPs are often realized by the choice of the verb: *otu zadan* 'to iron' vs. *otu xordan* 'to be ironed (Lit. 'iron collide'); *âtaš zadan* 'to set fire', *âtaš gereftan* 'to take fire' (Lit. 'fire take').

These relations can be structured in a network using multiple inheritance hierarchies. For a partial hierarchy of Persian CPs see Figure 22.

4. Class Coherence, Size and Productivity

In our approach, the productivity of the Persian CPs is accounted for via the analogical extension of the existing classes. It can be compositionality-based or not. In the first case, new combinations are created on the basis of the meaning assigned to the Construction as a whole and to its components (cf. Table 10). However, we want to defend the idea that productivity is not always compositionality-based and that non-compositional Constructions (or classes) can also be productive. The Communicating-*zadan* Construction, e.g. *telefon zadan* 'to phone' (Lit. 'phone

(22) Partial hierarchy of Persian CPs



hit'), *telegrāf zadan* 'to send a telegraph' (Lit. 'telegraph hit'), *bisim zadan* 'to walkie-talkie', 'to communicate by means of a walkie-talkie' (Lit. 'walkie-talkie hit'), illustrates this situation. While it is impossible to assign a meaning to *zadan* in these combinations, recent combinations such as *imeyl zadan* 'to email' or *es-emes zadan* 'to text', to sms' are nevertheless created by analogical extension. We furthermore hypothesize that the productivity of Persian CPs is also related to other parameters such as the coherence of the classes and their size.

The Construction associated to each class is an abstraction based on the most salient and regularly shared properties of its members. Classes vary in their coherence and the meaning associated to the Construction can be more or less abstract or specific. In some classes, the meaning of each CP can be straightforwardly derived from the meaning associated to the Construction. This is the case in the Spreading-*zadan* Construction: For each member the paraphrase 'N0 applies N on N1' provides its meaning and its syntactic properties. This situation yields a fully compositional class, where the verb is comparable to a semi-lexical or lexical verb and the relation between the verb and the nominal element is comparable to the semantic selection of an argument by a verb. One could even consider the creation of a lexical entry for the verb *zadan* with the meaning of 'to apply', especially with respect to the fact that *zadan* alternates with *mālidan* 'to apply' in these combinations. Consequently the class is highly productive and listing all potential combinations, apart from lexicalized ones, is impossible.

Some other groupings are based on more abstract properties. For instance, CPs corresponding to the Forming Construction denote heterogeneous processes implying the eruption, the forming or the transformation of an entity, e.g. *kapak zadan* 'to go mouldy' (Lit. 'mould hit'), *tāval zadan* 'to blister' (Lit. 'blister hit'), *yax zadan* 'to freeze' (Lit. 'ice hit'), *zang zadan* 'to go rusty' (Lit. 'rust hit'). Contrary to the previous case, the nominal element is not exclusively selected via its conceptual properties and the link between the components is more collocational: Compare *javāne zadan* 'to blossom' (Lit. 'blossom hit') vs. *gol dādan* 'to flower' (Lit. 'flower give') and not *gol zadan*. Consequently, one can assume that the productivity of this class is not comparable to that of the previous one.

Classes also vary with respect to their size. It is expected that fully compositional classes should be large, since new combinations can regularly enrich the class. This is indeed the case with the Spreading-*zadan* Construction, for instance, which constitutes one of the largest classes of CPs formed with *zadan*. However, some compositional classes are nevertheless restricted due to the small number of nouns that could fit in the Construction. For instance, the Scream Emission Construction corresponds to only about twenty CPs, which is not surprising, given the number of nouns denoting a cry in Persian.

Finally, the issue of the productivity cannot be investigated without integrating the concurrent possibilities, i.e. in the case of CPs, the competing verbs to form a CP. Various verbs can be used with the same non-verbal element to realize the same "verbal concept". This gives rise to the existence of synonymous CPs. This situa-

tion is reminiscent of construction morphology, e.g. the choice between competing affixes to form a new word.

5. Conclusion

In this paper, in line with Goldberg (1996) and Family (2006), we argued that Persian CPs must be listed since they correspond to conventional pairings of forms and meanings. However, we defended the idea that there is no contradiction between storage and a compositional account of these combinations, provided compositionality is defined *a posteriori*, in the sense of Nunberg *et al.* (1994) for idiomatically combining expressions.

Our approach goes against the majority of the previous studies on Persian complex predicates, which adopt a radically compositional perspective, built on the wrong assumption that the contribution of the CP components can be defined *a priori* and is consistent through all their combinations to form CPs. We showed that not only the lexical meaning of Persian CPs is barely ever fully predictable from the meaning of its component parts, but also that even more abstract properties, such as the argument and event structure, cannot be determined *a priori*, on the basis of solely one component of the CP regardless of the other one and the combination as a whole.

The Construction-based approach we then proposed is based on the assumption that despite their idiomaticity, Persian CPs can be grouped upon their syntactic and semantic similarities. Productivity results in this account from the possibility to analogically extend the existing classes and can be compositionality-based or not.

However, the issue of the productivity of Persian CPs cannot be adequately investigated without taking into account data from usage and without resorting to quantitative methods comparable to those used in morphology, which we intend to undertake in future work.

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On the Cross-Linguistic Rarity of Endoclisis*

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1 Introduction

This paper discusses the phenomenon of endoclisis and why it is so rarely found across languages. Endoclisis refers to the situation where a clitic appears neither as a proclitic at the beginning of a word nor an enclitic at the end, but in fact appears internal to the word itself. As a phenomenon, it is found in remarkably few languages around the world. In fact, as Harris (2002) points out, in various frameworks it is considered to be impossible. However, as further shown by Harris, there do exist cases where it seems undeniable that clitics appear internal to a word. Harris makes this claim based on data from Udi (Northeast Caucasian) and she goes through in detail that the relevant elements under consideration are in fact clitics, and moreover that they clearly appear word internally. Consider for instance the following two examples. In (1a), the clitic *ne,* expressing 3rd singular agreement with the subject, appears internal to the monomorphemic verb *beγ* 'look', causing the verb to be discontinuous (as indicated by subscripting on the gloss). In (1b), the clitic *q'un*, this time expressing 3rd plural agreement with the subject, appears in a complex verb construction. Here, it lies in between the light verb *b* 'do' and the noun *lašk'o* 'wedding,' which is incorporated by the light verb (in the examples, and henceforth in the paper, the clitic will be indicated by underlining):

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(1) a. pasčaγ-un γar-en gölö be-ne-γ-sa met'a-laxo
king-GEN boy-ERG much look$_1$-3SG-look$_2$-PRES this.GEN-on
'The prince looks at this for a long time.'
b. pasčaγ-on γar-muγ-on lašk'o-q'un-b-esa
king-GEN boy-PL-ERG wedding-3PL-DO-PRES
'The king's son's married.'

Once we bite the bullet and recognize that Udi shows a clear instance of a clitic appearing inside another word, and further still another morpheme (though this in itself is not without objection - see Luís & Spencer 2006), then a host of questions remain to be explained. Firstly, how do we best capture this phenomenon? The obvious parallel to link endoclisis to is infixation (see Yu 2007 for a comprehensive overview of infixation), the well known instance of an affix appearing internal to a root instead of being either a prefix or a suffix. If it can be shown that endoclisis and infixation show the same patterns, then there is strong evidence that there is one mechanism that underlies each of them, and the handful of cases of endoclisis that we see in the literature and all future ones ought to be conflated under whatever mechanism underlies infixation. In fact, there already exists a number of analyses of infixation encompassing different theoretical frameworks, for instance Prince & Smolensky (1993), McCarthy & Prince (1995) in Optimality Theory (OT), Halle (2001) in Distributed Morphology (DM), Yu (2007) in Sign Based Morphology, etc. Supposing it were to be the case that endoclisis showed the same distribution as infixation, then pending counterexamples, we face no problem. However, if there are differences between the two that can't *a priori* be handled by independent properties of clitics vs affixes, for instance (non)-categorial selection, then we need to see how far these differences go.

The second question that needs to be addressed is: why is endoclisis so rare? Yu (2007) notes that infixation, even though it is attested in over 100 languages, is rare in comparison to prefixation and suffixation. Now, this may reflect functional pressures in keeping the integrity of morphemes intact (Anderson 2005), but it still remains the case that infixation is possible and allowed by Universal Grammar. Supposing that infixation and endoclisis come from the same mechanism, then we reasonably expect a comparable rate of endoclisis to arise. However, as will be discussed, there are strikingly few cases of endoclisis that we know of, and only a handful of clear ones. This may of course represent oversight, misanalysis or fuzzy cases being analyzed as something else, but the point remains that in comparison to infixation, the paucity of endoclitics worldwide should give us pause before admitting it as an operation of UG.

This paper attempts to answer both of these questions. I will propose that endoclisis is not a *direct* operation of UG, but can arise *indirectly* due to morphological readjustments. Much of the discussion centers around the most robust case of endoclisis that is present in the literature, that of Udi. I will show that the endo-

clitics that we see in this language are not endoclitics in any deep sense, but that they are forced into their surface position by the morphotactic requirements of Udi. This analysis opens the door for an answer to the second question, that of why endoclitics are so rarely found. The answer that will be offered is that it takes a confluence of factors for endoclisis to arise. The analysis of Udi is augmented by discussion of other cases of endoclisis that have been claimed in various places to exist.

2 Subject clitics in Udi

The clitics which will be of interest to us are subject marker clitics in Udi. These clitics mark the agreement features of the subject, which can be seen in (2) below:

(2) a. q'ačaγ-γ-on bez tänginax bašq'al-q'un
thief-PL-ERG my money.DAT steal-FUTII-3PL
'Thieves will steal my money.'

b. nana k'wa-ne
mother.ABS house.DAT-3SG
'Mother is at the house.'

Harris (2000, 2002) shows that the distribution of these clitics is extremely complex. Their presence in the sentence is obligatory, yet they appear in a wide variety of positions. Harris shows that these positions can be described by a system of seven hierarchically ranked rules, given below:

(3) Rule 1: Subject clitics (SCs) are final in the V*x*[1] if the verb is in the future II, the subjunctive I, the subjunctive II, or the imperative.
Rule 2: SCs occur enclitic to a focused constituent.
Rule 3: In clauses with zero copulas, SCs are enclitic to predicate nominals.
Rule 4: SCs are endoclitic in a complex verbstem, occurring between the Incorporated element (IncE) and the light verb or verb root.
Rule 5: For verbstems of class M, in the intransitive, SCs are endoclitic occurring between the verbstem and the present tense marker.
Rule 6: With verbs forms of category A and category B, SCs are enclitic to the entire verb form.
Rule 7: SCs are endocliticized immediately before the final consonant in monomorphemic verbstems.

[1] Harris uses the notation V*x* to mean the complex consisting of the verb and negative.

For reasons of space I do not wish to give a comprehensive review of the arguments that these elements are clitics as opposed to affixes. Harris goes through this in great detail in Harris (2000, 2002) and I refer the reader to these works for the full arguments. The most obvious of these that can be seen from the data used in this paper is that they have freedom of attachment to various syntactic categories, but Harris goes through a wealth of tests that show their clitic status.

If we look at the distribution of the clitics in the rules, we can see that there is an interesting alternation; in some rules the clitic appears as an enclitic and at other times it appears as an endoclitic. The cases that will be the major focus of this work will be rules 4 through 7. Here we can see that the clitic sometimes appears inside a word, and at other times it appears at the end. The concept of 'word' is traditionally quite hard to define (for some frameworks more than others), and I do not wish to commit to anything here, or offer any thoughts of my own. The important parts about the clitics in Udi is that even though cross-linguistically we see clitics at peripheral positions, in Udi, they are clearly non-peripheral. What I will take to be the thing of interest about Udi is that the clitics can appear at a non-peripheral position in a complex head. In what follows, I will loosely use the term 'word', to mean multiple elements that are spelled out together as part of a complex head.

We can see this in the case of Rule 4, where the clitic is positioned between an incorporated element, and the incorporating light verb. This gives the structure of complex verbs that we see in (4), and some real examples seen in (5):

(4) IncE-(PM)-light verb-TAM suffix

(5) a. äyel kala-ne-bak-e
child.ABS big-3SG-BECOME-AORII
'The child grew up.'

b. nana-n tur-ex oc'-ne-k'-e
mother-ERG foot-DAT wash-3SG-LV-AORII
'Mother washed her foot.'

The other case of endoclisis that we see in Udi comes from cases where the clitic appears internal to a monomorphemic verb. These are the cases that Harris captures under her Rule 7. In these instances, the subject clitics move before the final consonant of the verb. This produces a discontinuous verbal root. In the glosses I follow Harris by indicating this with subscripting:

(6) a. kaγuz-ax a-z-q'-e
letter-DAT receive$_1$-1SG-receive$_2$-AORII
'I received the letter.'

b. q'ačaγ-γ-on bez tänginax baš-q'un-q'-e
thief-PL-ERG my money.DAT steal$_1$-3PL-steal$_2$-AORII
'Thieves stole my money.'

Rule 6 refers to simplex verbs as well, and this rule can be seen as an exception to the general pattern of clitic placement with respect to simplex verbs, that of Rule 7. In these cases the clitic appears at the end of the verb, outside of the affix which expresses tense-aspect-mood (TAM):

(7) a. b-esa-ne
make-PRES-3SG
'She makes.'

b. bi-esa-zu
die-PRES-1SG
'I am dying.'

If we compare the cases of simplex verbs, we can see that the difference between the two is the phonological shape of the verb root. If the root consists of a single consonant, or a CV syllable, then the clitic will not appear internal to to root, but outside the TAM suffix. If however, the clitic minimally consists of or ends in a closed syllable, then the clitic can appear inside the final consonant. Below, I will provide an account of this phonological sensitivity.

The final rules Harris gives consist of cases where the clitic will surface as an enclitic if certain elements are present in the sentence. Rule 1 states that wherever the verb is in the future II, subjunctive I, subjunctive II or imperative form, the clitic will appear at the end:

(8) q'ačaγ-γ-on bez tänginax bašq'al-q'un
thief-PL-ERG my money.DAT steal-FUTII-3PL
'Thieves will steal my money.'

Where none of these forms are relevant, the clitic will be enclitic to a constituent that is in focus:

(9) täzä k'oǰ-q'un biq'-e išq'ar-muγ-on
new house-3PL build-AORII man-PL-ERG
'The men build a new house.'

Finally, where there is a zero copula in the sentence, the clitic will appear enclitic to the predicate nominal:

(10) nana k'wa-ne
mother.ABS house.DAT-3SG
'Mother is at the house.'

Postponing discussion of Rule 5 to footnote 3, once we look at the above distribution of the subject clitic, we can notice two things. Firstly, it is an extremely complex system of clitic placement, which in itself warrants attention, even without the fact that it apparently contains endoclitics. Secondly, we note that endoclitics only arise in the absence of any other rules, suggesting that if a clitic would have any kind of inherent specification, it would be to appear non-peripherally. The categories that can be seen as 'attracting' subject clitics - certain TAM suffixes, focus, predicate nominals - all then force the clitic to appear enclitic to the entire form.

Finally, we may need to recognize two separate types of endoclisis. Firstly, there are cases where the clitic appears word internally, but its position is intermorphemic, in the sense that it appears in between individual morphemes. Secondly, there is also cases where we are dealing with intramorphemic placement of clitics, where the clitic is splitting up a single morpheme. As we will see in section 4, Udi is perhaps unique in the world's language in having a case of intramorphemic clitics.

3 Two possible analyses

In this section I discuss two possible analyses of the Udi facts. Firstly I discuss representational approaches to the problem, such as Harris' own, and Yu's (2007) claim that his analysis of infixation is consistent with the Udi data. Secondly, I present my own analysis, which is derivational in nature and couched within Distributed Morphology (Halle & Marantz 1993). I show that this analysis is able to catch the same data, but crucially is able to capture all the cases of endoclisis together. This analysis leads us to further question the Udi data and how much of a reflection of UG it really is. This question will be further discussed in section 4.

3.1 A Representational Approach

Harris explains the position of the clitic through Optimality Theoretic (OT) alignment constraints. She proposes that in order to account for the full paradigm of clitic placement, we must appeal to different constraints that apply depending on what is in the sentence. Harris proposes the following constraint system, with the rankings below:

(11) <u>Align-PM-*al/a*</u>[2]
Align (PM,L,-*al/-a*,R)
Read as: "align left edge of the person marker to right edge of -*al/-a*"

[2] Whilst Harris writes the constraint in terms of phonetic content, she does so for parsimony. *al/a* are the usual exponents of future II, subjunctive I, subjunctive II and imperative.

(12) Align-PM-FocC
Align (PM,L,FocC,R)

(13) Align-PM-IncE
Align (PM,L,IncE,R)

(14) Align-PM-Verbstem
Align(PM,R,Verbstem,R)

(15) Align-PM-*al/a* ≫ Align-PM-FocC ≫ Align-PM-IncE ≫ Align-PM-Verbstem
(TAM) (focus) (complex verbs) (simplex verbs)

The above constraints work in parallel and ensure that the place of the clitic adheres to the descriptive rules given above. Since the constraint that refers to aligning the clitic to the Future II and other specific TAM suffixes is ranked highest among them all, this ensures that the output that best satisfies this will be picked, i.e. the left edge of the clitic will align with the right edge of the TAM suffix. Therefore, the clitic will be enclitic to the entire verb forms when they are in these conjugations. Similarly with when the clitic is attached to focus, this is because the higher ranked constraint, which pertains to the TAM suffixes, is irrelevant without them being in the sentence. So, the sentence where the clitic is placed on focus 'wins'.

The constraint which is truly interesting for our current purposes is that given in (14). This is the one that places the clitic inside the verbal root (Harris labels it verbstem, but the terminology doesn't matter much). This constraint forces the right edge of the clitic to be aligned with the right edge of the verbal root. Now, there isn't any way to fully satisfy this constraint, so the minimal violation will be placing the clitic as close to the right edge as possible.

The constraints do indeed place the clitic correctly; however, they are uninsightful in that they merely restate the descriptive rules and offer little in the way of explanation for why the clitic shows such a complicated distribution. Moreover, in taking the tack that she does, Harris essentially encodes into UG the possibility that a clitic is placed by the syntax inside another morpheme. Harris argues that it must be the case that clitic placement is syntactic, since the placement of the clitic is sensitive to the elements of the entire sentence, instead of simply being about which elements are in a particular word. It hardly needs pointing out that this is an extremely powerful device to allow into the toolkit of UG, and it is something that is impossible to model within many theories of natural language.

Yu (2007) offers a similar approach to Udi, saying that the facts are consistent with his theory of infixation, which proposes that affixes can subcategorize for phonological information, and that they can therefore be aligned such that the

right edge of the clitic is adjacent to the left edge of the final consonant. Yu's approach faces the same problems as Harris' does, in that it allows into UG the opportunity to place clitics directly inside morphemes. As we'll see in section 4 this is problematic since Udi appears to be the only exponent of this, questioning its status as a UG operation. Furthermore, Yu's approach can offer no more of an explanation the distribution of the clitic, since it relies on other constraints, which presumably must also restate the descriptive rules.

3.2 A Derivational Analysis

In contrast to the approach of Harris, I present here a derivational account. A derivational account of this data allows us to assume that the clitic is placed in a position that is different from where it surfaces and there is some intervening process that moves the clitic into the place where it surfaces. Before getting into the analysis, firstly consider what benefits this could have. Harris' approach entails that there is some operation of syntax that is able to place a clitic directly inside another morpheme. Such an assumption is an extremely powerful mechanism to allow into the toolkit of universal grammar. It may end up being correct to do this, but there is another option before we make this move. It could also be the case that the clitic is placed somewhere else by the syntax and then is moved into the root internal position by some surface readjustment. To the extent that this approach is tenable, we do not need to say that the syntax can ever place a clitic inside another morpheme. We'll see in the next section that this is a desirable result when we look at a wider typology of endoclitics, but for now consider the analysis itself.

My analysis proposes that the subject marker clitics in Udi are a special case of second position clitics, but instead of being second position within a phrasal domain, they are in fact second position within a complex head. The nature of second position is something that I wish to leave slightly open (for a concrete analysis I refer the reader to Smith in prep.) since this is an issue that goes well beyond what I have space to discuss here. My major claim here is that the distribution of Udi can be captured once we understand that Harris' rules 4 through 7 all derive from a single default placement position of the Udi clitic (16d below), and then the differences in where the clitic is realized come about through the morphotactic considerations of Udi forcing the clitic to surface somewhere else.

Specifically, I propose that we can simplify Harris' seven rules into the following four, with (16d) being the innovation here:

(16) a. PMs are enclitic to the TAM categories Future II, subjunctive I, subjunctive II and imperative.
b. PMs are enclitic to focus.
c. PMs are enclitic to predicate nominals.

d. Elsewhere, PMs are enclitic to the first element within the complex head containing the verb.

In addition to remaining non-committal to how 'second position' is to be captured, I also leave discussion of what it is that underlies (16a-c) to further research. What I want to focus on in this article is the cases where the clitic surfaces as an endoclitic. Since (16a-c) all deal exclusively with enclitics, they are irrelevant to the discussion at hand of how endoclisis as a general phenomenon is to be analyzed.

(16d) is then presented here as the default rule of subject clitic placement in Udi; where no other category 'attracts' the clitic, the clitic will be positioned in second position inside the complex head that spells out the verb. This analysis yields an immediate benefit since it allows us to account for the cases of complex verbs where the clitic is transparently in second position within the verb. Recall that complex verbs in Udi consist of the schema given in (17), repeated from (4) above:

(17) IncE-(PM)-light verb-TAM suffix

Clitic in second position in the verb form.

When the clitic is hosted by complex verbs it appears in second position, as we might expect given the default rule of placement proposed here. We also account for the position of the clitic in the intransitive forms of the transitivity alternations that Harris accounted for under Rule 5. As discussed above, they are exactly the same as the complex verb cases.

(18) äyel kala-<u>ne</u>-bak-e
child.ABSL big-3SG-BECOME-AORII
'The child grew up.'

However, in the cases of simplex verbs, second position placement seems to make entirely the wrong predictions. Recall from the discussion in section 2 that when the clitic is to be hosted by a simplex verb, there are two possible locations. If the verb consists of a single consonant, or is an open syllable, then the clitic appears at the end of the entire verb form, outside the TAM suffix. If the verb is a closed syllable, then the clitic will appear internal to the root itself, creating a discontinuous root, with the clitic located before the final consonant of the verb. It is clear that neither of these positions is second position within the verb form, as rule (17d) requires. If (17d) applies as is, then we would expect that the clitics would appear between the monomorphemic verb root and the TAM suffix, contrary to fact:

Predicted:

(19) *q'ačaγ-γ-on bez tänginax bašq'-q'un-e
thief-PL-ERG my money.DAT steal-3PL-AORII

Found:

(20) q'ačaγ-γ-on bez tänginax baš-q'un-q'-e
thief-PL-ERG my money.DAT $steal_1$-3PL-$steal_2$-AORII
'The thieves stole my money.'

(16d) however, since it is couched within a derivational approach, only refers to where the clitic is placed by the syntax, and says nothing about any other movements that may arise throughout the rest of the derivation. I propose that there is an extra movement of the clitic away from its original position, which causes the clitic to be moved into its surface position. In the case of simplex verbs which can host an endoclitic, then (so, ending in a closed syllable), this means that the clitic is placed between the verb and the TAM suffix and is then moved internal to the verb root. In the cases where the clitic cannot be hosted by the verb (C or CV roots), the clitic again gets positioned between the root and the TAM suffix, but this time gets moved rightward outside the TAM suffix.

Two things must be answered at this point. Firstly, why would the clitic be placed in one position and then moved to another? Secondly, what is the process that moves the clitic? The answer to the second must either be a process of the morphology or of phonology, since where the clitic moves to is sensitive to the phonological information of the root. It is a crucial assumption of DM that syntax makes reference only to abstract feature bundles, with the phonological exponents of lexical items only being inserted in a post-syntactic morphology module. It follows from this that the syntax cannot make reference to phonological information, as there is no phonological information in the derivation until it is inserted by the morphological component.

Returning to the question of why a clitic would be placed in one position and then moved to another, here I propose that there is a conflict between the placement rule of (16d) and the morphotactic rules of Udi. (16d) will place the clitic in between the root and the TAM suffix, however, if we take a wider look at Udi, we find that nothing ever intervenes in between the root and the TAM suffix. I take this to mean not only that nothing is allowed to intervene between the root and TAM in Udi, but that anything - crucially involving clitics - that is placed there will be moved to ensure that in the surface representation, the root and the TAM suffix will be adjacent. The following morphotactic rule is in effect in Udi:[3]

[3] Something that might seem an exception to this rule are the cases described by Harris' rule 5. In these, it appears as though in the intransitive form of the relevant verbs the clitic lies between the root and the TAM suffix as in the following:

(21) *root-X-TAM suffix

I assume, following Arregi & Nevins (2012) who propose something in the same vein for Basque, that clitics can be moved by morphological metathesis from one position to another in the morphology. Note that the violation could be equally as well repaired by deletion of the clitic, since this would allow the verb root and the TAM suffixes to be adjacent. However, subject clitics are obligatory in Udi, showing that this particular repair strategy is never taken. To see how all of this works, consider how we arrive at the surface form in (22).

(22) q'ačaγ-γ-on bez tänginax baš-q'un-q'-e
thief-PL-ERG my money.DAT steal$_1$-3PL-steal$_2$-AORII
'Thieves stole my money.'

What we are interested in is the form *baš-q'un-q'-e,* which spells out the verb and the clitic. Following DM assumptions, in the output of syntax into morphology, the verb consists of a root morpheme and the feature bundle expressing the TAM information, aoristII. Then, since none of the more specific rules apply, the clitic is placed in the second position of the complex head of the verb when all the elements undergo linearization, which happens to be between the root and TAM suffix. Left in this position, it will cause a violation of the morphotactic rules of Udi, however I do not assume that it is repaired at this point. Rather, I take evaluation of the violation to occur at the point the clitic undergoes vocabulary insertion (VI). Following Bobaljik (2000) and Embick (2010) a.o. I assume that VI proceeds from the root outwards, so spell-out of the verb can be seen as iterative application of VI.

Firstly, the phonological exponent of the root is inserted. It is only after this has taken place that the clitic comes to be spelled out. At this point, the grammar recognizes that leaving things as they are would yield an output that does not satisfy the morphotactics of verb formation and so enacts the repair. The chosen repair for Udi, as mentioned above, is morphological metathesis, and this moves the clitic the minimal position leftward to ensure that the right edge of the root will be adjacent to the left edge of the TAM suffix. Placing the clitic inside the final consonant allows this, so the form is able to converge satisfying the morphotactics of

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(i) box-ne-sa
boil-3sg-pres
'it boils (intransitive)'

Harris however shows that the intransitive forms of these verbs are formed with a light verb 'GO', which is suppletively null in the present tense. The structure of the verb is then abstractly boil-3SG-GO-PRES. Thus, the clitic does not appear between the root and TAM. This shows that (21) is not a surface phonological constraint, but rather refers to the position of the morphemes, without reference to their phonological exponents.

Udi. This creates the discontinuous root *baš-q'un-q'*. Finally, the TAM suffix undergoes VI, and the final representation of *baš-q'un-q'-e* is derived.

(23)	i. linearization of elements:	√STEAL-**[3PL]**-[PRES]
	ii. VI of root:	/bašq'/-**[3PL]**-[+PRES]
	iii. VI of clitic:	/bašq'/-/**q'un**/-[+PRES]
	iv. metathesis repair:	/baš-**q'un**-q'/-[+PRES]
	v. VI of TAM:	/baš-**q'un**-q'-sa/

This explanation nicely explains why the clitic moves inside the verb root in Udi, and ends up breaking up the integrity of a simplex verb. However, as discussed there are also cases where the clitic does not appear internal to a simplex verb, as what I have just outlined would lead us to expect. In these cases, we find that the clitic moves to the end of the verb form. Harris explains these cases by proposing that only closed syllables can host clitics in Udi. A verb that is of shape CV or C is not of the correct shape to host a clitic, and therefore they appear at the end of the verb form. I follow Harris in assuming this to be the case, however I take the restriction to be a constraint on the repair that moves the clitic. It can only apply in cases where the destination of the clitic will be hosted inside a syllable. Put another way, (morphological) metathesis cannot move anything inside a (C)V syllable in Udi.

Why then does the clitic move outside of the TAM suffix? This finds a natural explanation under the approach given here. Instead of having to stipulate the word final position of the clitic, we can see it as an instance of rightwards metathesis. Leftward metathesis fails since the host is not large enough[4], but if the clitics remains between the root and the TAM suffix the resulting form would violate the morphotactics of Udi. We expect then that the clitic would be metathesized rightward, which then allows the root and TAM to be adjacent. However, it still begs the question of why the clitic goes all the way to the end and why not inside the TAM suffix, like it does with the root. This is actually predicted within DM, since the repair is enacted at the point of VI of the clitic. As shown in the above derivation, this means that the phonological information of the root is in the derivation (recall the VI proceeds from the root outwards) when the clitic moves. However, since the clitic undergoes VI before the TAM suffix does, then the phonological information of the TAM suffix is simply not there. TAM at that stage remains a feature bundle. Therefore, when the clitic comes to be metathesized, and cannot go leftwards, the only remaining position for it to go is outside of the TAM suffix. This is shown in the following derivation:

[4] Nor can the clitic go at the beginning of the word, since proclitics are not allowed in Udi.

(24) bi-esa-zu
die-PRES-1SG
'I am dying.'

(25) i. linearization of elements: √DIE-[1SG]-[+PRES]
ii. VI of root: /bi/-[1SG]-[+PRES]
iii. VI of clitic: /bi/-/zu/-[+PRES]
iv. metathesis repair: /bi/-[+PRES]-/zu/
v. VI of TAM: /bi-esa-zu/

4 Endoclisis in a Wider Context

As mentioned before, once we look at languages around the world, we find that endoclisis is a very rare phenomenon. One of the best known cases comes from so called 'mesoclisis' in European Portuguese (discussed in Anderson 2005), where the clitic appears between the verb root and agreement morphology. The relevant examples in (26a') and (26b') below:

(26) a. daríamos
give.1PL.COND
a'. dár-te-íamos
give-1PL-1PL.COND
b. perceberás
understand.2SG.FUT
b'. percerbér-me-ás
understand-2SG-2.SG.FUT

Whilst there is not space for me to provide an analysis of this language here, the data from European Portuguese show a clear case of intermorphemic placement. In (26a') for instance, the root *dár* is separated from the rest of its agreement morphology, which is spelled out by *-íamos*, by the clitic *te.*

Another case of endoclisis is found in Sorani Kurdish (Samvelian 2007, Bonami & Samvelian 2008, Walther 2012), a language which involves a similarly complex system of placing the relevant clitics as Udi. Again, for reasons of space I cannot delve too deeply into the language, but I will pick out three relevant remarks. Firstly, Sorani Kurdish has clitics which go into the second position within the word. This, recall, is what I am proposing is the case for Udi, only Udi is not as transparent as Sorani Kurdish, since the clitics are sometimes subject to further movement. Illustrative examples are given below, taken from Samvelian (2007), with the clitic representing the agreement features of the subject:

(27) a. na-m-xwârd
NEG-1SG-eat.PAST
'I did not eat.'

b. na-m-da-xwârd
NEG-1SG-PROG-eat.PAST
'I was not eating.'
c. nard-man-in
send.PAST-1PL-3PL
'We sent them.'

The second thing of note about Sorani Kurdish is that independent morphotactic rules can force movement of the clitic. (28) shows an idiosyncratic rule of Sorani Kurdish which requires a 3sg clitic to occur after the object agreement, forcing the clitic to move to the end of the verb form, not in the usual second position:

(28) nard-in-î
send.PAST-3PL-3SG
'He sent them.'

Finally, just like in Udi there is a morphotactic requirement that the root and TAM be together, in Sorani Kurdish the stem and past participle cannot be separated, forcing the clitic to surface ostensibly in 3rd position in the word:

(29) a. nârd-uw-tân-in
send.PAST-PART-2PL-3PL
'you have sent them.'
b. *nard-tan-uw-in
send.PAST-2PL-PART-3PL

Again, when looking at Sorani Kurdish, we see clear cases of endoclisis where the clitic is going inside a word. From these data, it seems clear that we need to recognize the existence of clitics which go inside a word, and allow for intermorphemic placement of clitics within a complex head. Under DM assumptions, this is not too surprising, since the syntax is the input to word formation; words do not enter the syntax fully formed, but rather are built. This means that the syntax can in principle place clitics between morphemes that comprise a single word. More interesting is intramorphemic placement, which as Halle (2001) points out is impossible to model within DM, since this would mean moving some element inside the terminal node that comprises a feature bundle. It is difficult to even conceive how this would happen in the grammar.

The final example of endoclisis which I would like to bring up is that of Pashto. Pashto is interesting since it has been argued (Tegey 1977) to be a case of intramorphemic placement of a clitic, just like Udi. The discussion centers around the position of a subject clitic in the imperfective form of certain verbs. In Pashto, the position of the clitics is sensitive to stress, with clitics following the first

stressed constituent in the sentence. Yet, sentences can also be single words. In the usual case, clitics appear after the verb.

However, for certain verbs there is an optional stress shift, which moves stress from final or penultimate position, to the first vowel in the verb. Where the stress is final or penultimate, the clitic appears enclitic to the entire verb. However, after the optional stress shift the clitic can appear internal to the verb form:

(30) a. axistə́lə me
buy 1SG
'I was buying them.'

b. á-me-xistələ
buy$_1$-1SG-buy$_2$
'I was buying them.'

(31) a. aγustə́ me
wear 1SG
'I was wearing it.'

b. á-me-γustə
wear$_1$-1SG-wear$_2$
'I was wearing it.'

Looking at these data, it may seem as though we have another language like Udi, where the integrity of a single morpheme can be broken up by a clitic. However, the case is not quite as clear as the glosses make out. Tegey claims that *axistələ* and *aγustə* are monomorphemic:

> It is important to bear in mind that in such instances the clitics are placed after a phonological segment which constitutes part of the root (i.e. 'a' - PWS), and which is not a separate morpheme (Tegey 1977:89).

However, various authors have taken issue with this claim and argued that the *a-* is actually a bound prefix that carries no independent meaning. For instance, Kaisse (1981) argues precisely this, and claims that this allows us to explain both the fact that the clitic appears in this position, but also the fact that there are only 9 verbs in the language that begin with a vowel. This approach then brings Pashto in line with having a word-internal second position like Sorani Kurdish above. It also makes the above verbs consistent with other forms in Pashto, where clitics can follow a stressed prefix. Furthermore, it is strongly supported by verbs which begin with a consonant that show the same stress shift. Here, we find that the clitic remains at the end of the verb form, and doesn't break up the integrity of the morpheme:

(32) a. pərebdə́ me
beat 1SG
'I was beating him.'

b. pə́rebdə me
beat 1SG
'I was beating him.'

With Kaisse's analysis in mind (see also Roberts 1997 as well as discussion in Anderson 2005 and Yu 2007), we can then analyze the Pashto cases as follows, not with the discontinuous roots as seen before, but rather with a compound verb:

(33) a. á-me-xistələ
PREFIX-1SG-buy

b. á-me-γustə
PREFIX-1SG-wear

The point which I wish to highlight in this section is that not only is endoclisis a strikingly rare phenomenon in itself - which is true since in addition to the languages given here, there is really only a handful of other cases to my knowledge - but that the specific type of endoclisis exhibited by Udi, intramorphemic placement, is unattested in any other language that we know of. This may of course represent simply a gap in the typology, and the fact that we don't know of any more cases simply reflect the rarity of the process to begin with. However, on the basis of the data, and the fact that there is an equally viable analysis of Udi where clitic placement is intermorphemic, then we can make the stronger claim that intramorphemic placement of clitics is not a possibility of UG.

This claim has implications beyond simply arguing for a derivational versus a representational approach of the Udi data. It also tells us something quite deep about clitics that must be built into any theory. It is well known that the distinction between clitics and affixes is often fuzzy at best, and despite repeated attempts in the literature to find definitional criteria for one or the other (see for instance Zwicky & Pullum 1983), cliticization versus affixation is decided on gradient diagnostics, not absolute judgements. However, to the extent that the argument I put forward here is correct, then we can observe a real, clear difference between clitics and affixes; affixes apparently can break up the integrity of a morpheme but clitics cannot. There are various consequences to this difference, and many questions to be asked, but I leave this open for now to future research.

5 Conclusions

In this paper I have discussed the status of endoclisis within UG. I have argued that whilst we ought to recognize that clitics can appear in a position that is non-word peripheral, whenever they appear inside a word they overwhelmingly are positioned between morphemes. Udi presents a complication to this relatively simple picture, in that we seem to find clitics placed internal to another morpheme. This led Harris (2002) and Yu (2007) to create theories of cliticization which in essence allows for the recognition of the cliticization equivalent of infixation. However, I have proposed that this is too hasty. The move to allow UG to position clitics directly inside other morphemes is not warranted in two respects. Firstly, it is not necessary from the Udi data alone, which as I have shown is equally explainable on an account where the root internal position is an epiphe-

nomenon, arising from intermorphemic placement of the clitic and then movement inside the root to satisfy morphotactic constraints. Nor is the move warranted on cross-linguistic considerations. As pointed out, there are only a handful of cases that we know of where a clitic appears internal to a word, and Udi seems to be the only case that involves a clitic being inside another morpheme. Weakening our theories of UG to allow for clitics to be placed inside a morpheme without something else forcing it there then massively overgenerates the range of clitic patterns that we find around the world.

In contrast, on the approach here we expect intramorphemic placement of clitics to be rare, since it requires a confluence of factors to come together. Firstly, the clitic must be placed in a position inside a word, which in itself is rare. Secondly, it must violate some morphotactic requirement specifically in the position that it's placed. Finally, the repair for the language needs to be a displacement operation, instead of simply deleting the clitic altogether.

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Measuring Linguistic Distance in Athapaskan

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Introduction

The following paper is a contribution to the study of language relationships in Athapaskan.[1] Despite many years of dedicated scholarship and research on Athapaskan languages, the field still lacks a definitive sub-grouping. Instead, the grouping of languages has relied largely on classification primarily on the basis of geographic and cultural proximity. This grouping no doubt has its merits, and it seems indeed likely that the larger geographic divisions—into Pacific coast, Southern (or Apachean), and Northern branches—also reflect longer and sustained historical relationships among their constituent speaker communities. At a higher level of resolution among languages within shared geographic areas, however, this form of grouping remains unsatisfactory. The reasons for this difficulty in grouping Athapaskan languages are outlined in more detail in the following section.

Since the last attempts to establish sub-grouping in Athapaskan (cf. Mithun 1999), the field has benefited from a wider availability of data through published grammars, dictionaries, and articles, as well the greater ease of accessibility to digital archives containing field notes and other relevant primary materials. Additionally, computer-aided techniques of data analysis have been developed, making it possible to treat larger sets of data and more readily visualize these data with graphs and maps. Here, we present the results of applying statistical clustering and mapping techniques in grouping Athapaskan languages on the basis

[1] As Rice (2012: 249) notes, the terms "Athapaskan" and "Athabaskan" (and further variants thereof) have long been used to refer to this language family, but the term "Dene" has also come to be favoured more recently in some communities. These terms are used here interchangeably.

of phonological similarity. We want to argue for the usefulness of applying such techniques to Athapaskan, and point toward future work that will integrate greater and more varied bodies of data that we believe will lead to a reliable sub-grouping of Athapaskan languages and bring greater understanding of the history of the Athapaskan-speaking peoples.

1 Classificatory problems in Athapaskan

Athapaskan represents one of the largest Indigenous language families in North America, comprising approximately forty languages spoken from western Alaska to northern Mexico. While having one of the most extensive geographical ranges of any Indigenous language family in North America, the distribution of Athapaskan is not contiguous. Athapaskan languages appear in three distinct areal clusters: one on the Pacific coast, with a group of eight languages centered in present-day Oregon and California; another in the American southwest, Oklahoma, and Texas, representing seven Apachean languages; and a geographically larger group of 23 or more languages in northwestern Canada and Alaska, with the majority of these spoken in Alaska and the Yukon (Krauss and Golla 1981, Mithun 1999).[2]

Despite the considerable geographical separation that exists between these clusters, all Athapaskan languages share a recognizable typological profile, retaining the heavily prefixing polysynthetic verbal morphology and coronal-heavy phoneme inventories characteristic of the family as a whole. Notably, this linguistic conservatism holds even in cases of extensive historical contact with neighboring non-Athapaskans: Athapaskan languages on the whole show few signs of significant morphological, phonological, or lexical influence from non-Athapaskan sources (Sapir 1925:185). In general, the degree of differentiation encountered between Athapaskan languages suggests relatively recent division into these branches, perhaps as late as 500 B.C.E. (Krauss and Golla 1981:68).

The high degree of geographical dispersion between members of the language family, combined with the relatively low degree of linguistic differentiation between languages, has raised questions as to the internal classification of Athapaskan, both within and between the aforementioned geographical clusters. In the case of Pacific Coast Athapaskan, recent assessments have called into question the treatment of this grouping as resulting from a single historical wave of southward migration and subsequent linguistic diversification, rather than a loose geographical grouping of communities whose separation occurred prior to their entry into the region (Golla 2011, Spence 2013). By comparison, classifications of Southern Athapaskan have generally been treated in the linguistic literature as a single historical unit, with later differentiation into

[2] In some cases, both Krauss and Golla (1981) and Mithun (1999) group several related languages (e.g., Tahltan [tht], Kaska [kkz], and Tagish [tgx]) into a single unit, thus lowering their estimates of the total number of distinct Northern Athapaskan languages.

distinct languages. While relationships between languages in both of these clusters have been suggested to be amenable to comparative reconstruction, the same cannot be said of Northern Athapaskan. For these languages, Krauss and Golla (1981:68) argue, "linguistic relations [...] cannot be adequately described in terms of discrete family-tree branches," with isoglosses for historical changes not forming clear bundles, but rather cross-cutting one another in ways that prove problematic for coherent classification. As a result of essentially constant intergroup communication, Krauss and Golla (1981:68-9) propose that Northern Athapaskan be treated as a "dialect complex," with the "areal diffusion of separate innovations from different points of origin" both obscuring earlier idiosyncratic historical developments and undermining attempts to establish consistent subgroups on the basis of such criteria alone.

In sum, while little disagreement exists over a broadly geographical classification of Athapaskan languages into three main branches, the status of (and prospects for) further internal classification on the basis of shared historical innovations within these branches remain in question. Areal diffusion of linguistic features through networks of regular contact between neighboring Athapaskan groups in at least Northern Athapaskan presents a situation not unlike a traditional dialect continuum, where the linguistic boundaries between adjacent varieties are sometimes similarly blurred as a result of contact. Given this similarity and the general geographical orientation of Athapaskan language classification, it might be expected that methods developed to study areal linguistic variation and dialect classification may be of some service in approaching internal classification in Athapaskan, as well. Such methods and their application to Athapaskan are considered in greater detail below.

2 Dialectometric approaches

As noted above, the situation described by Krauss and Golla (1981) for Northern Athapaskan bears some similarity to problems found in the analysis of dialect continua in traditional dialectology. While dialectology offers many methodological options for the interpretation of complex linguistic geography, we concentrate here specifically on quantitative, multivariate methods drawn from recent research in dialectometry (Goebl 2006, Nerbonne et al. 2011). These methods aggregate substantial amounts of dialect data in order to facilitate large-scale comparisons in which contemporary statistical methods might be applied. This approach has several notable strengths: first, aggregating multiple linguistic variables has the potential, as Nerbonne et al. (2011) suggest, to "strengthen the signal of speaker provenance," highlighting significant trends in the patterning of isoglosses which might otherwise be overlooked in manual inspection of the same data or obscured by apparently contradictory differences between individual dialect features. Second, such methods encourage the use of aggregation and classification algorithms that can be replicated between studies, situating such research to benefit from a growing literature on the interpretation of such data and

from continued methodological advances in this area. Third, dialectometric methods profit from the increasing availability of computational resources for classification and visualization, allowing more data to be weighed in consideration when evaluating possible linguistic groupings than would otherwise be possible. All of these reasons present incentives for considering potential applications of dialectometric methods to Athapaskan classification.

In a dialectometric analysis, a distance measure is applied to a set of linguistic features for some number of languages, producing for each feature a square matrix of linguistic distances between all unique pairs of languages. In order to estimate the distances between Athapaskan language features, we used a simple Levenshtein distance, which computes the minimum number of insertions, deletions and substitutions required to transform one string into another (Levenshtein 1969). Difference is evaluated on a binary basis, producing a count of 1 if the characters are different and 0 if they were the same. In cases where two characters are distinguished by a diacritical mark only (e.g. for tone marking or aspiration), the distance is counted as 0.5. In this study, Levenshtein distances were calculated for each pair of phonemically transcribed word forms, as illustrated by the comparison of two words for 'back' (body part) in Dene Sułiné /nené/ and Dena'ina /tʰanəq/ in (1) below. The total distance between these two features is given in the last column.

(1) Example of Levenshtein distance calculation

Dene Sułiné	n	e	n	é		
Dena'ina	tʰ	a	n	ə	q	
	1	1	0	1	1	4

Once these distance matrices have been computed for all available words, the overall linguistic distance between two languages is then calculated as the average of the distances between all corresponding word pairs (Heeringa 2004:145). This results in a distance matrix that can be fed into a clustering algorithm to produce a dendrogram indicating language proximity. The algorithm used to calculate the distances between languages is implemented in the Gabmap application (Nerbonne et al. 2011). In order to compensate for the variability of outcomes from different clustering procedures, the stability of clusters can be checked against an analysis of the same data using Multi-Dimensional Scaling (MDS).

The data compiled for this study form part of an ongoing project at the University of Alberta that aims to build a database of linguistic, cultural, and biological information on the Athapaskan languages and their speech communities. The origins of this project lie in the work of Sally Rice and Jack Ives, who sought to bring together linguistic and archaeological information for research into Athapaskan prehistory, especially with a view to shedding light on the migration of Apachean peoples. Rice and Ives named the database the Pan-

Athapaskan Comparative Lexicon (PACL; Snoek 2012).[3] PACL is envisioned as a dynamically expanding project which will allow individuals from multiple communities and institutions to access and contribute information. At present, the most developed aspect of the database is a set of comparative lexical lists which have been annotated for morphological and semantic information.

Drawing on both published resources and unpublished field notes, we selected three lexical domains from PACL—kinship terms, numerals, and body parts—to serve as the basic set of comparative items for the Athapaskan languages included in this study. While we view this list as partial in the sense that the addition of more lexical domains will eventually be necessary for reliable comparison, we nevertheless consider the choice of these items a potential improvement over the strategy of using Swadesh lists, as these items represent culturally meaningful categories. In this respect, we are following suggestions made by Matisoff (1975:134) in his work on Tibeto-Burman, wherein he argued for the adaptation of the Swadesh list approach to the cultural context of the languages he was studying. We consider this a particularly fruitful approach for our case, especially because, with the possible exception of Haida, the membership of the Athapaskan language family is uncontroversial, with only the relationships of the member languages to each other remaining unclear. In the spirit of Matisoff (1975), then, we have sought to make the basis of comparison a culturally meaningful set of lexical items.

3 Exploring Athapaskan classification

For this analysis, 105 comparative lexical items were assembled from the three PACL lexical domains, with 52 body part terms (e.g., "finger", "heart", "teeth"), 30 kinship terms (e.g., F, M, FB, MB), and 23 numerals (e.g. "one", "two", "three", "two persons"). These items were sampled for 22 Athapaskan varieties representing 15 distinct languages. These languages were chosen to represent members of all three major geographical divisions for which adequate information in all three lexical domains was available, while taking care to include several well-documented dialect distinctions within particular languages (e.g., between the varieties of Dena'ina represented in Kari 2007) as a means of checking the ability of these methods to correctly identify such subgroups. (2) presents the geographical range of the varieties in the sample visually, while (3) provides additional information about each variety and the sources of information consulted on these lexical items.

[3] http://www.linguistics.ualberta.ca/en/Research/Projects/PanAthapaskanComparativeLexico.aspx

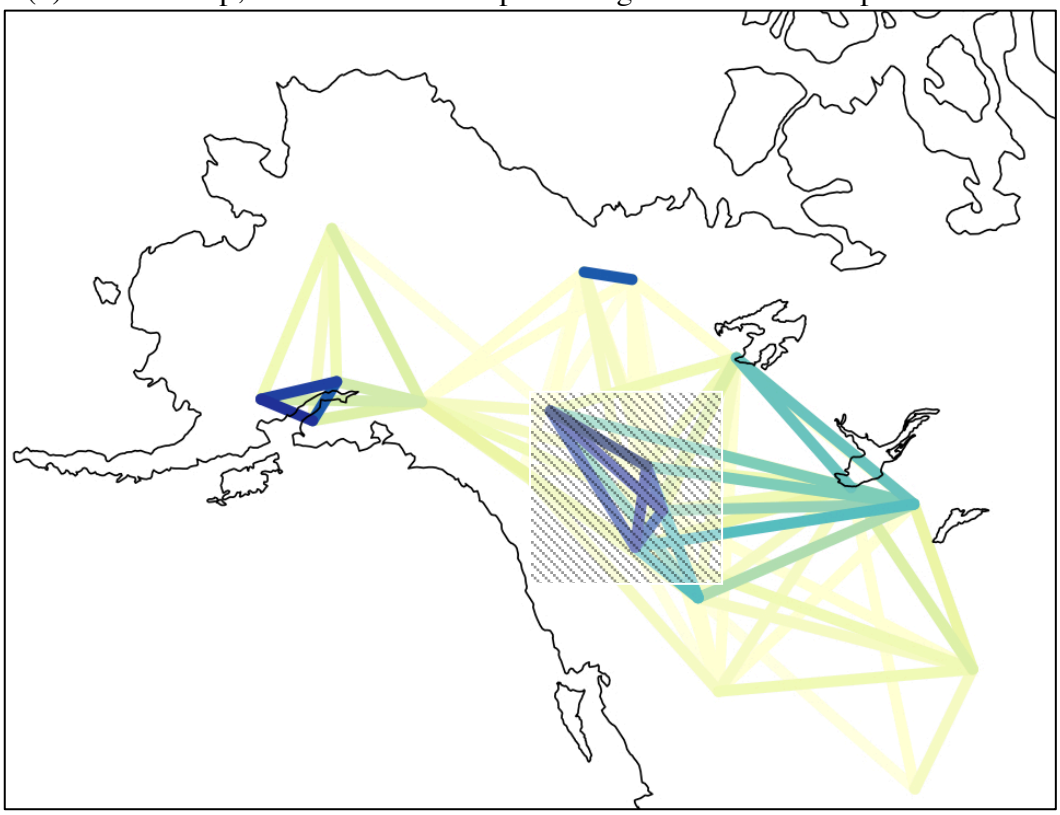
(2) Geographical distribution of the languages in the sample

(3) Languages in the sample, with varieties given in parentheses. Codes refer to ISO 639-3 language identifiers, while row numbers correspond to geographical points in (2) above.

#	*Language (Variety)*	*Code*	*Sources*
1	Ahtna	aht	Kari (1990)
2	Carrier (Central)	crx	Antoine et al. (1974)
4	Dena'ina (Inland)	tfn	Kari (2007)
5	Dena'ina (Outer Inlet)	tfn	Kari (2007)
6	Dena'ina (Upper Inlet)	tfn	Kari (2007)
7	Dene Sułiné	chp	Elford and Elford (1998), Cook (2004)
9	Gwich'in (Gwichya)	gwi	GSCI and GLC (2005)
8	Gwich'in (Teetl'it)	gwi	GSCI and GLC (2005)
11	Jicarilla Apache	apj	Opler (1936), Phone, Olsen, and Martinez (2007)
12	Kaska (Frances Lake)	kkz	Kaska Tribal Council (1997)
15	Kaska (Good Hope Lake)	kkz	Kaska Tribal Council (1997)
13	Kaska (Liard)	kkz	Kaska Tribal Council (1997)
14	Kaska (Pelly)	kkz	Kaska Tribal Council (1997)
16	Koyukon	koy	Jetté and Jones (2000)
17	Navajo	nav	Young and Morgan (1987)
19	North Slave (Bearlake)	scs	Bloomquist (1978), Rice (1989)
18	North Slave (Mountain)	scs	Rice (1989), Kaska Tribal Council (1997)
20	Sekani (Kwadacha)	sek	Kaska Tribal Council (1997)
22	Southern Tutchone (Kluane)	tce	Tlen (1990)
21	South Slave (Katl'odehche)	xsl	Rice (1989), SSDEC (2009)
24	Tolowa	tol	Bommelyn (1995)
25	Tsuut'ina	srs	Cook (1984)

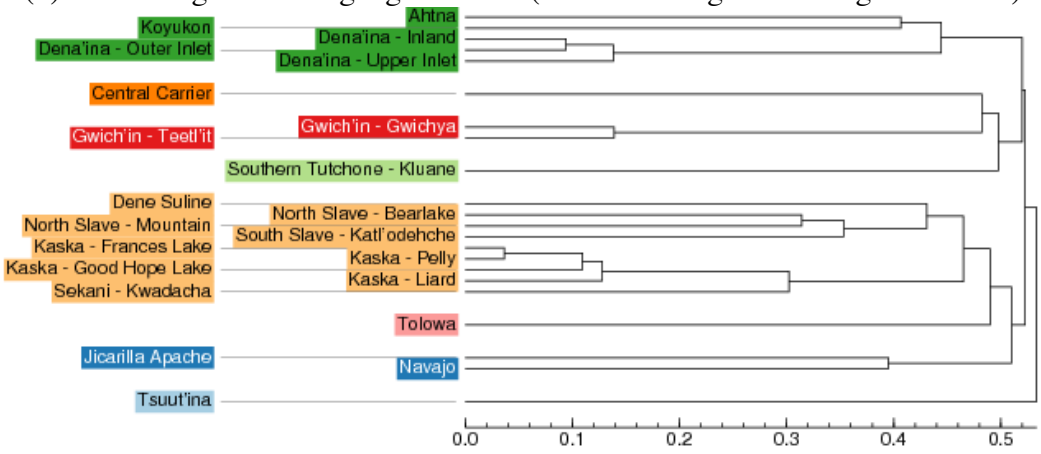
The lexical data were subsequently imported into Gabmap, which was used to compute Levenshtein distances for each of the lexical items. As Nerbonne et al. (2011) note, Gabmap allows for inspection not only of the distribution of individual lexical items, but also of the aggregate distances computed over the entire set of lexical items. These aggregate distances can then be visualized in several forms, including as a beam map, as seen in (4) below.

(4) Beam map, with darker lines representing closer relationships



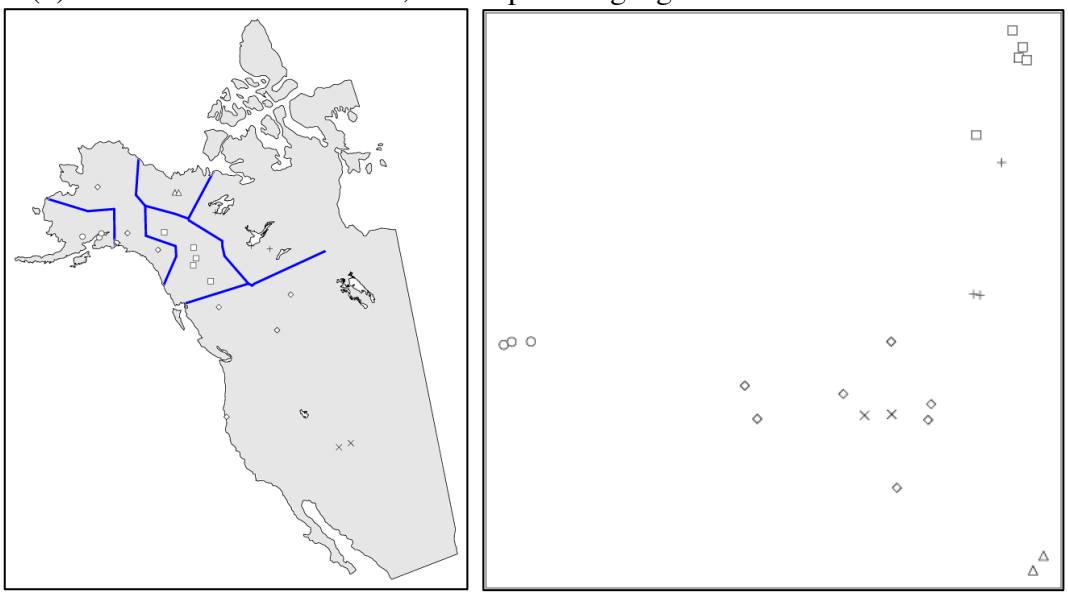
In (4), we can observe very dark lines connecting communities on the central Alaskan coast representing dialects of Dena'ina. The area marked by diagonal hatching is constituted by dialects of Kaska. To the north, dark lines connect the two dialects of Gwich'in. The algorithm identifies these dialect chains quite clearly. Furthermore, it is interesting to note the proximity of the Kaska dialect chain to the Slave languages to the east and Sekani to the south. This relationship is visible in the cluster dendrogram in (5) below.

(5) Dendrogram of language clusters (based on weighted average distances)



In the above dendrogram, Sekani and the four varieties of Kaska form one half of a larger cluster, with the Slave languages and Dene Sųłiné forming the other. Comparing the cluster validation in (6) with the above dendrogram, however, shows that the relationships between Slave and Dene Sųłiné are less tightly knit than among the Kaska dialects. The two Gwich'in dialects present another loose cluster, with Southern Tutchone forming a group of Athapaskan languages spoken in what is today the Yukon Territory and adjacent areas of the Northwest Territories. This is an interesting result, as Gwich'in has been traditionally viewed as being closer to the Alaskan languages, and Southern Tutchone is spoken in regions geographically much closer to the northern end of the Kaska dialect chain.

(6) MDS cluster validation, all sampled languages



The Alaskan languages form their own cluster, as would be expected both from studies with traditional methods as well as on the basis of regional association. Equally unsurprising is the coherence of the Apachean cluster (here, Navajo and Jicarilla Apache). Tolowa is isolated as the only representative of the Pacific coast languages. Finally, Tsuut'ina also forms its own branch, which is in line with prior classifications, where it is identified as a sharply-defined outlier among the (Northern) Athapaskan languages (cf. Krauss and Golla 1981:84). Comparison of the results of this clustering against an MDS analysis of the same data presented in the right panel of (6) reveals that only three of these clusters can be viewed as immediately reliable groupings. These clusters are the Kaska dialect chain, the Gwich'in languages, and the dialects of Dena'ina.

Leaving aside these more robustly attested groupings briefly to inspect the remaining languages in detail, we find evidence for a smaller cluster consisting of the three Slave languages, a weaker Alaskan subgroup made up of Ahtna and Koyukon, and a clear north-south division separating the representatives of the Pacific Coast and Southern branches from the Northern Athapaskan languages. These smaller clusters are represented graphically in (7) below.

(7) MDS cluster validation, all sampled languages except Sekani-Kaska, Dena'ina, and Gwich'in

It must not be forgotten, however, that this provisional sample represents only a third of the languages of the Athapaskan family, and that other relationships could emerge when further data are brought into the analysis. Indeed, the sparseness of representation of languages in the Pacific Coast and Southern branches may be expected to present a challenge for any form of general classification, whether based on manual comparison or aggregate analysis of phonological differences. Given the scope of the present sample, we consider these results to be reasonable and view them as promising enough to warrant further expansion to include both further lexical domains and additional members of the language family.

4 Prospects and conclusions

Although the results presented in this study are necessarily limited in scope, given the restricted size of the sample in terms of both languages and semantic domains, we nevertheless find them to provide sufficient motivation for continued investigation of the application of similar computational methods to outstanding problems in Athapaskan classification. Given the apparent complexity of the Northern Athapaskan situation in particular, it would seem important to identify methods which neither whitewash attested points of differentiation between varieties, nor allow individual points of deviation to exert undue influence on the overall classification under development. Inasmuch as the problem of linguistic classification is a multivariate one, so too should multivariate methods be considered that are capable of giving balanced attention to the full range of linguistic phenomena which form the empirical basis of classification.

In the case of dialectometric studies, quantitative, statistical methods and accompanying visualizations often serve this purpose, facilitating the identification of significant trends in the data even when seemingly opposing patterns are also attested. Yet, current tools for dialectometry are also capable of providing detailed information on the distribution of individual items, opening these data to further comparative analysis and to other forms of visualization and thus serving a range of quantitative and qualitative purposes.

While we have found these methods to be useful for Athapaskan, it bears noting that some arguments have been made against the use of Levenshtein distances in linguistic classification (Greenhill 2011). In the present study, we would argue that the application of this distance measure is not entirely inappropriate. As Greenhill (2011:693) notes, the apparent congruence of Levenshtein-distance-based sub-grouping with the results of traditional dialectology is likely due to the greater accuracy of Levenshtein distances between languages of relatively low phylogenetic difference. This would appear to be the case at least in most of Northern Athapaskan, where a dialect continuum-like configuration of varieties is reported; and arguably within the Southern and Pacific Coast branches, as well, given the relatively shallow degree of linguistic differentiation found in each. This may have contributed to the good approximation of our results to prior sub-groupings derived through traditional

methods. However, we do not claim to have produced a definitive classification, and view these results more as a stepping stone to further work on this formidable problem. Beyond the distance measures and clustering algorithms provided by dialectometric services such as Gabmap, the visualization of lexical and phonological data that such systems offer presents researchers with another excellent tool for the exploration of areal linguistic phenomena and linguistic classification.

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The Phylogenetic Status of Pacific Coast Athabaskan: A Computational Assessment

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1 Introduction

The Athabaskan language family, one of the most geographically widespread in North America, is canonically discussed according to its three non-contiguous regional concentrations: Northern Athabaskan in Alaska and western Canada, Apachean in the southwestern United States, and Pacific Coast Athabaskan (PCA) in northern California and southwestern Oregon. The historical significance of these regional groupings is unclear, however (Krauss 1973, Krauss and Golla 1981). The PCA languages are a case in point: while they are uncontroversially divided into an Oregon subfamily that includes Tututni, Tolowa, and Galice (inter alia), and a California subfamily consisting of Hupa, Mattole, Wailaki, and Kato, there is disagreement in the literature about whether PCA as a whole is a meaningful phylogenetic unit that reflects a higher-order historical reality within the family (Hoijer 1960, 1962; Golla 2011:69, 257). The present study considers the status of the Pacific Coast Athabaskan languages, both in relation to each other and in relation to the rest of the family, by applying computational approaches to phylogenetic inference adapted from the biological sciences that have invigorated historical linguistic research over the past decade. These methods have shed light on previously intractable problems, and in some cases sparked new controversies, in language families as diverse as Indo-European (Gray and Atkinson 2003; Atkinson and Gray 2006; Nakhleh et al. 2005; Bouckaert et al. 2012), Bantu (Holden and Gray 2006, Marten 2006), Austronesian (Bryant 2006, Dunn et al. 2008), and Pama-Nyungan (Bowern and Atkinson 2012).

While the main goal of this study is to explore the status of PCA through computational analysis of lexical data, the discussion is set against a backdrop of broader theoretical and methodological interest. Previous research has suggested that applying branching tree-like models to the Athabaskan family has not been successful. Krauss (1973) in particular has argued that patterns of cross-cutting lexical and phonological isoglosses found throughout the family (especially Northern Athabaskan – cf. Krauss and Golla 1981) indicate a historical development involving local innovations that spread more or less widely within a vast dialect continuum. Given this scenario, it is of interest to determine how computational models perform where there are no well-established subgroups to compare the results against – and indeed, where it has been suggested that it is futile to seek such subgroups in the first place. The evolutionary models used in the present analysis are explicitly geared toward providing metrics for the degree of certainty associated with tree topologies and therefore can quantify the extent to which subgroups can be found within the family.

Another point of interest is methodological, relating to the way linguistic features ("characters" in the evolutionary idiom) are coded. Gray and Atkinson (2003) use a method for coding lexical datasets according to which characters with multiple states (i.e., meanings expressed by two or more cognates across a set of languages) are recoded in a binary scheme. Evans, Ringe, and Warnow (2006) argue that this recoding creates dependencies among characters and can potentially lead to biased results. Pagel and Meade (2006), however, maintain that dependencies among characters introduced in binary recoding will merely create scaled versions of the best topology. The present paper considers results based on both multi-state and binary codings of characters in light of this debate.

The paper is structured as follows. Section 2 provides an overview of the languages and data sources included in the study. Section 3 outlines the computational methods employed and gives some details about particular coding decisions that were made. Section 4 presents results, the main finding being that the Pacific Coast Athabaskan languages do indeed emerge as a subgroup that is well-supported under different data codings (multi-state vs. binary) and assumptions about rates of change across lineages (non-clock, strict clock, and relaxed clock evolutionary models). Another finding of interest is that differences in tree topologies are found under multi-state and binary codings of the data. Section 5 summarizes these findings and concludes.

2 Languages and Sources

The core lexical data for this research were harvested from the glottochronological study of Hoijer (1956), which contains Swadesh-100 lists for fifteen Athabaskan languages: the Northern languages Beaver, Dakelh (Carrier), Dëne Sųłiné (Chipewyan), Gwich'in (Kutchin), Hare, and Tsuut'ina (Sarcee); the Apachean

languages Chiricahua, Jicarilla, Lipan, Navajo, and San Carlos; and the Pacific Coast languages Galice, Hupa, Kato, and Mattole. Seven other Athabaskan languages were added to this set: the Pacific Coast languages Tututni (Golla 2008), Tolowa (Bommelyn 1989), and Wailaki (Li n.d.) and the Northern languages Ahtna (Kari 1990), Dena'ina (Kari 2007), Koyukon (Jetté and Jones 2000), and Minto (Krauss 1963, Kari 1994). The Athabaskan languages are widely accepted to be part of a larger Na-Dene family that also includes Eyak and Tlingit, which were included in the study using data in Krauss (1963). The PCA data were supplemented by information from various published and archival sources: Bright (1964), Collins (1989), Dorsey (1884), Golla (1996), Goddard (1902-1903, 1923), Harrington (1982-1990), Hoijer (1973), Landar (1977), Merriam (1850-1974), Tuttle (n.d.), and Waterman (n.d.).[1]

More than 40 Athabaskan languages have been identified in the literature, so restricting the dataset to only slightly more than half this number exposes this study to one of Krauss' (1973) main criticisms of earlier phylogenetic research on Athabaskan: discrete, well-defined boundaries distinguishing Athabaskan languages from one another may be an artifact of the fact that documentation was collected at widely-dispersed checkpoints, thereby obscuring internal diversity and linguistic features that have diffused regionally within Krauss' Athabaskan dialect network. This criticism can be countered to some extent insofar as the dataset is surely adequate to allow reasonable inferences related to the status of PCA, the main research question addressed in this paper. Moreover, a moderate amount of dialect diversity has been accounted for by coding some characters as polymorphic. Nonetheless, Krauss' point is well-taken, and therefore for Northern Athabaskan especially the results reported in §4 must be considered provisional.

3 Methods

This study uses Bayesian phylogenetic inference using the software program MrBayes (Ronquist et al. 2012) to address questions of subgrouping related to Pacific Coast Athabaskan. The fundamental premise of this and other recent computational approaches in historical linguistics is that lexical items are heritable traits that evolve in a manner that can be understood as analogous to evolution in biology. The methodology is summarized in this section, following the discussions in Nichols and Warnow (2008), Atkinson and Gray (2006), Pagel and Meade (2006), and Bowern and Atkinson (2012). In the interests of space, certain details about the coding procedures employed have been omitted from this paper; further discussion can be found in Spence (2013).

[1] Excluded from this study is the Oregon Athabaskan language Upper Umpqua. Preliminary analysis of the available data for this sparsely-documented language and its impact on the results presented in §4 can be found in Spence (2013).

The goal of the computational analysis is to infer the evolutionary tree that makes a set of observed comparative data – coded as a matrix of similarities and differences between languages according to the procedure outlined below – most likely given a model of evolution. Ideally the likelihood of every possible tree would be inspected and the winning candidate(s) selected, but the large number of such trees makes this computation effectively impossible. Therefore, Markov chain Monte Carlo (MCMC) sampling is employed to generate a set of trees from which the best phylogeny is inferred. An analysis proceeds by making incremental changes to a randomly-selected starting tree. At each step, if changes increase the likelihood of the data given the evolutionary model, the tree is added to the sample set. If the changes decrease the likelihood, the tree is retained in the sample some relatively low proportion of the time. At the end of the analysis – after a sufficient number of trees have been generated – the sample reflects the posterior probability distribution of the universe of possible trees. The sample can then be summarized to indicate the extent to which particular features (tree topologies and branch lengths) occur. The proportion of trees that a subgroup appears in can be taken as an approximation of its posterior probability – i.e., the degree of certainty that a subgroup is part of the true evolutionary history of the language family.

As input to MrBayes in the present study, a data matrix was constructed whose rows were the twenty-four languages and whose columns were the meanings in the Swadesh-100 list. Each cell in the matrix contained one or more integers indicating the cognate set(s) found in a given language in a given meaning, as illustrated in the table in (1) for the meanings ‘blood’, ‘two’, and ‘cloud’:

(1) Multi-state character coding

	‘blood’	‘two’	‘cloud’
Tlingit	2	2	2
Eyak	0	1	0
Gwich’in	3	0	0
Navajo	0	0	0
Hupa	1	0	1
Kato	1	0	1
Tututni	0	0	1

Taking ‘blood’ as an example, most Athabaskan languages and Eyak have a reflex of *dəɬ in this meaning, so these languages were assigned the integer 0 to indicate that they all have the same state for this character. The California Athabaskan languages all have a word cognate with Hupa *tse:lin* in this meaning, so these languages were assigned character state 1. Gwich’in (Kutchin) and Tlingit both have distinct words for this meaning, so they were coded with unique

integers '2' and '3'. This procedure was repeated for all items and all languages, yielding a data matrix with 100 items for 24 languages.[2] One item had more than the 10 states allowed for integer-valued data in MrBayes and was discarded; an additional five items were uninformative under the multi-state coding retaining all polymorphisms.[3] Most of the results reported below are therefore based on a matrix of 94 informative characters coded for 24 languages, or 2256 data points. Of these, 41 (1.8%) were missing and coded using the character '?' (cf. Atkinson and Gray 2006). Polymorphic characters were permitted in the dataset, but additional analyses using alternative codings excluding them were performed as well (cf. Nakhleh et al. 2005 for discussion); some of the results obtained using these alternative codings are reported in §4.

Multi-state characters, where each character can have more than two states, can be transformed into binary-valued characters according to a method introduced by Gray and Atkinson (2003) for Indo-European. The basic procedure is to consider each state in the multi-state coding – i.e., each cognate set associated with a given meaning in a wordlist – as a binary-valued character in its own right. For example, the item 'blood' in (1) is a character with five states. This single multi-state character is transformed to five binary-valued characters, with each language assigned state 0 or state 1 depending on whether it has that cognate in the relevant meaning. Hupa would have state 1 ('present') for the cognate set *tse:lin* in the meaning 'blood', and would have state 0 ('absent') for the other four binary-valued characters.

This recoding procedure has been criticized by Evans et al. (2006:124), who point out that one of the foundational assumptions of the models invoked in computational historical linguistic studies requires that characters evolve independently of one another. Because the innovation of a new association between a meaning and a form typically involves replacement of an existing association, binary recoding of multi-state characters introduces many dependencies among characters: if a language has state 1 for a given cognate in a particular meaning, it will usually have state 0 for all other cognates associated with that meaning. For example, the innovation of *tse:lin* for the meaning 'blood' in California Athabaskan in all cases went hand-in-hand with the loss of the reflex of *dəɬ in that

[2] Hoijer's (1956) original cognacy judgments were sometimes modified, especially for the PCA languages, but sometimes for other languages in the family in light of the cognate sets published in Krauss and Leer (1981) and Krauss (2005) and Leer's (2011) unpublished comparative lexicon. Cognacy judgments for Minto, Tlingit, and Eyak were taken from Krauss (1963). For Northern languages not included in Hoijer (1956), some of the cognacy judgments were found in the original sources, whereas others were my own.

[3] Uninformative characters have the same state for all languages. Some of them became informative when polymorphisms were removed, so under some codings there were as many as 96 informative lexical items in the dataset.

meaning. The fact of having *tse:lin* in this meaning thus makes it highly likely (if not inevitable) that a language will not have a reflex of *dəɬ. Evans et al. (2006) argue that these changes are not independent of one another, leading to "extreme violations of the independence assumption" underlying the evolutionary models, making this binary recoding "patently inappropriate."

Atkinson and Gray (2006) respond to this critique by questioning whether a language having multiple cognates in a given meaning is really atypical, pointing to the existence of polymorphic characters that imply that the innovation of a cognate in a given meaning in some cases does not entail the loss of a cognate in that meaning. They maintain that one of the advantages of their binary coding scheme is how easily it handles such polymorphisms. Atkinson and Gray (2006) follow Pagel and Meade's (2006) arguments that non-independence introduced by binary recoding will have two effects: it will tend to shorten the branch lengths of the tree returned by the analysis and inflate posterior probabilities at each node. However, Pagel and Meade predict that non-independent characters introduced by binary recoding will not affect the subgroups detected by the analysis. To test this prediction, the present study created two binary recodings of the original multi-state data matrix, one in which all states were retained, and another in which all unique states were discarded (Atkinson and Gray 2006:104). Results of analyses run with these alternative codings are reported in §4.

For some of the coding configurations (polymorphisms retained vs. excluded, multi-state vs. binary coding), separate analyses were run using three different evolutionary models: A non-clock model placing no constraints on the rates of evolution across lineages, a strict clock model that assumes all lineages evolve at a constant rate (analogous to the so-called "glotto-clock" of the glottochronology of yesteryear – cf. Hoijer 1956), and a relaxed clock model constraining rates of evolution across lineages but allowing for variation. Strict and relaxed clock models produce rooted trees, whereas non-clock models do not and must be rooted on an outgroup, Tlingit in the present study.

One of the main pitfalls in Bayesian analysis is that there are no criteria guaranteeing that the universe of possible trees has been adequately sampled – that is, how many generations are required to obtain a statistically reliable result, when an analysis is said to have "converged" (Nichols and Warnow 2008). One heuristic diagnostic for convergence is to run simultaneous analyses and monitor the average standard deviation of split frequencies, which is generated on the fly by MrBayes. For the present study, two simultaneous runs of between 1 million and 10 million generations were conducted until this convergence diagnostic fell below the value .01. Post hoc analysis of two additional convergence diagnostics – the Potential Scale Reduction Factor (PSRF) and Effective Sample Size (ESS) of model parameters – was conducted. PSRF values for each parameter should approach 1 as an analysis converges, and following Bowern and Atkinson (2012) an ESS greater than 2000 was sought. For relaxed clock models, ESS > 1000 was

ultimately accepted due to the large number of model parameters and the number of generations required to bring each analysis above the more stringent threshold.

Results reported in §4 are given in the form of majority-rule consensus trees, which show nodes occurring in 50% or more of trees in the sample after the first 25% are discarded as burn-in. Scores at each node indicate the percentage of trees the node occurs in, which can be taken as an approximation of the posterior probability of the node (Pagel and Meade 2006). Particular nodes will be said to have, for example "90% support", which can be interpreted to mean that they occur in 90% of the trees in the sample or, equivalently, that they have a posterior probability of .9. As Bowern and Atkinson (2012:829) point out, there are no well-established criteria for considering a node well-supported versus merely adequately supported. Their standards are adopted here: a node with 80% support (i.e., posterior probability greater than .8) is considered well-supported.

It is important to emphasize that the main question of interest in the ensuing discussion is whether or not the Pacific Coast Athabaskan languages emerge as a well-supported subgroup of the Athabaskan family. The tree topologies and branch lengths presented here raise a host of other questions of potential interest within the family. Some of them relate to the grouping of languages within PCA itself, others to how PCA is related to other languages in the family, and still others to how non-PCA languages are related to one another. Some of these additional points of interest will be noted in passing, but in general no special effort will be made to explain them.

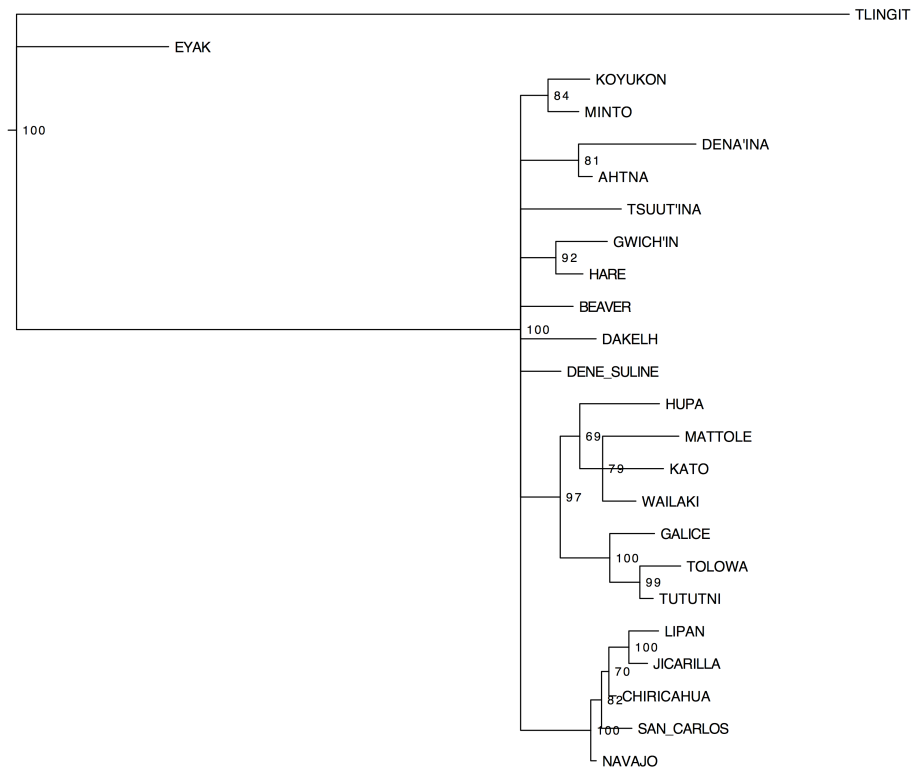
4 Results

The figure in (2) shows the majority-rule consensus tree obtained from the 94 informative lexical characters in the dataset with all polymorphisms included, run with a non-clock model of evolution. This is the least complicated analysis insofar as it has no manipulations to the underlying multi-state coding and the smallest number of model parameters in MrBayes. The main point of interest in (2) is that a Pacific Coast Athabaskan subgroup is detected with a high degree of support (97%). The Apachean languages also emerge as a subgroup with strong support; any other result would be shocking, since these languages are so similar to one another (Hoijer 1956). The Northern languages show a highly unresolved, rake-like branching – Gwich'in and Hare, Koyukon and Minto, and Dena'ina and Ahtna appear as clades with over 80% support, but the rest of the Northern group does not resolve into a branching structure. This is consistent with the view of Krauss (1973) and Krauss and Golla (1981) that a highly structured family tree is an inappropriate model of Northern Athabaskan linguistic relationships.

The consensus tree in (2) can be taken as support for the view that the Pacific Coast Athabaskan languages are a well-defined subgroup within Athabaskan. Within PCA, the Oregon Athabaskan languages emerge as a subgroup with strong

support (100%). A further subgroup including Tututni and Tolowa to the exclusion of Galice also receives strong support. Interestingly, there is only moderate support for a California Athabaskan subgroup comprised of Hupa, Mattole, Kato, and Wailaki (69%); the Mattole, Kato, and Wailaki subgroup falls just below the threshold for strong support at 79%. This is consistent with Hoijer's (1962) observation that a California Athabaskan subgroup is not well-supported by lexical data.[4]

(2) Majority-rule consensus tree produced with a multi-state coding and all polymorphisms included (non-clock evolutionary model)

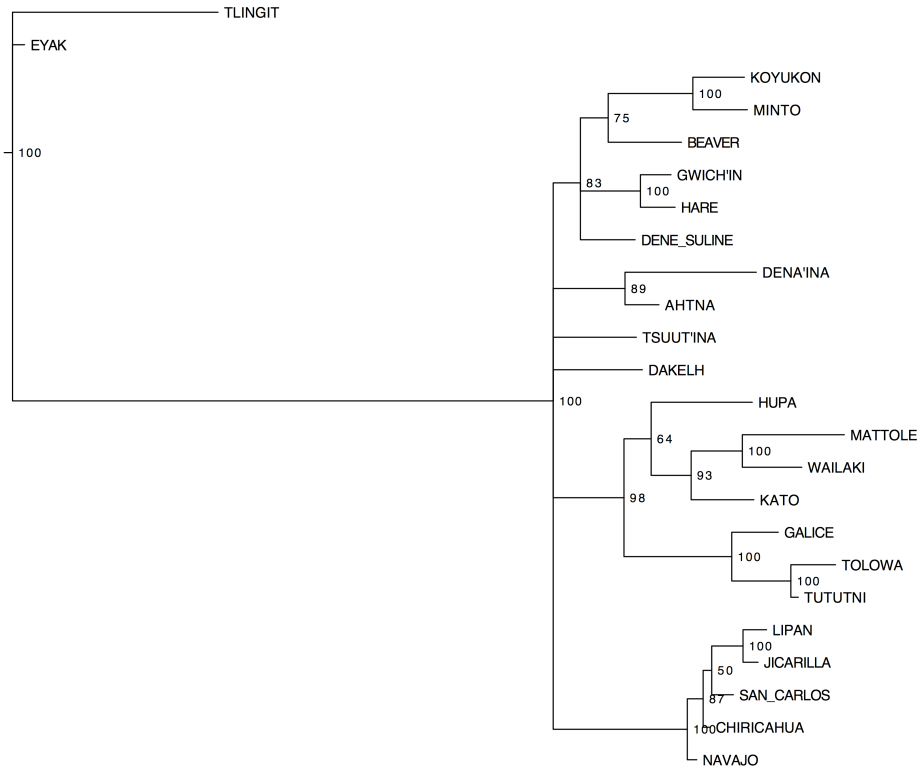


Analysis of the data was also conducted using a binary recoding. This was done in two ways: one including all character states, and another according to which all unique character states were removed, which should reduce the impact of non-independence introduced in the recoding (Atkinson and Gray 2006:104). Results from the two conditions were similar to each other; the consensus tree from the

[4] The dataset recoded to exclude polymorphisms produced a consensus tree with minor differences from the figure in (2). The PCA subgroup had slightly lower (93%) support, but the topologies were identical except for some minor restructuring in California Athabaskan and the emergence of a subgroup including PCA and Apachean languages (with only 60-61% support).

latter recoding is shown in (3), where once again PCA emerges as a well-supported (98%) subgroup:[5]

(3) Majority-rule consensus tree produced with a binary coding and unique character states removed (non-clock evolutionary model)

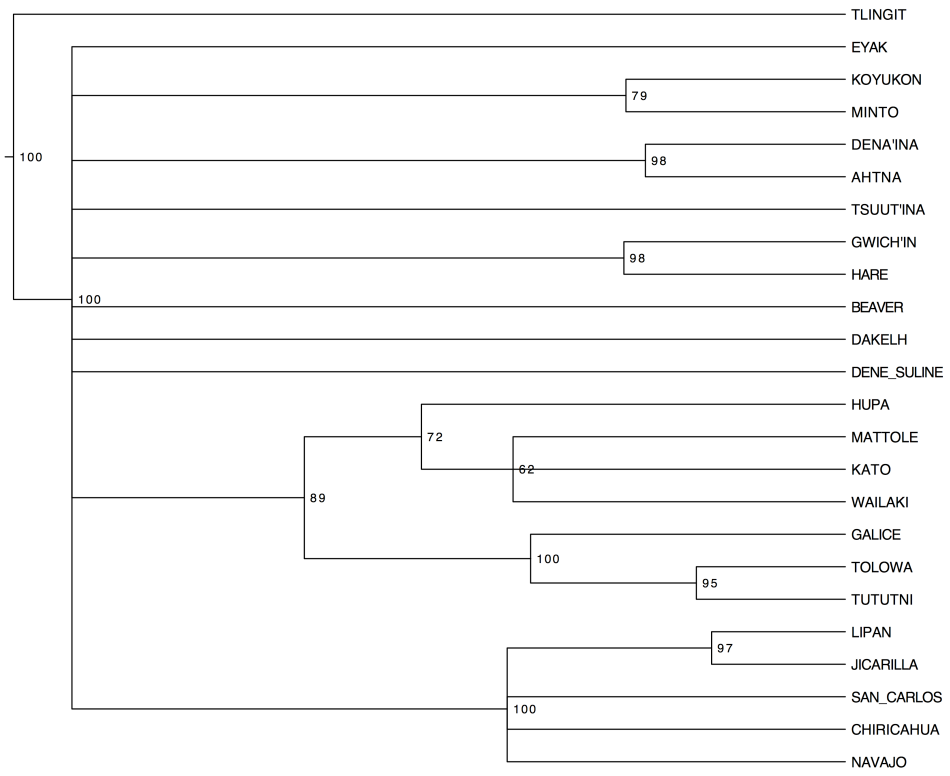


As discussed in §3, the binary recoding procedure introduces dependencies among characters. According to Pagel and Meade (2006), this will produce a scaled version of the best topology, shortening branch lengths and increasing posterior probabilities without altering the subgroups themselves. Comparison of the figures in (2) and (3) suggests that, contrary to Pagel and Meade's predictions, binary recoding had a non-trivial impact on the topology returned by the analysis. For example, within PCA, a well-supported split between Kato and Wailaki + Mattole emerges in California Athabaskan. More strikingly, many of the Northern Athabaskan languages are subsumed under a well-supported (83%) subgroup, one that also contains a subgroup with moderate support (75%) consisting of Beaver, Koyukon, and Minto. And the California Athabaskan node has slightly weaker support (64%) under the binary recoding than it had with the multi-state coding.

[5] The shortening of branch lengths for Tlingit and Eyak in (3) relative to (2) is due to the exclusion of unique character states, many of which are found in those two languages.

Analysis of the dataset with all polymorphisms retained was also conducted using relaxed and strict clock models of evolution. The resulting consensus tree for the relaxed clock analysis is shown in (4):[6]

(4) Majority-rule consensus tree produced with a multi-state coding and all polymorphisms included (relaxed clock evolutionary model)



The subgroups in (4) are similar to those in (2). Notably, PCA again emerges as a subgroup, one with weaker support (89%) than under the non-clock model but still comfortably above the 80% threshold to be considered well-supported. Northern Athabaskan has the same rake-like branching as found in (2), but the model does not produce the high-level Eyak-Athabaskan split, and there is much

[6] The strict clock model produced much shorter relative branch lengths than the relaxed clock model, implying a later split within the family. There were differences in the tree topologies as well: the strict clock finds a clade with 67% support that includes the Northern and Apachean languages to the exclusion of PCA. Bayes factors analysis suggests that in general the relaxed clock model performed better than the strict clock models on each coding, BF > 5, in a range that is considered "substantial" but not "strong" support for one model over another (Bowern and Atkinson 2012:830). The relaxed clock models generally performed slightly better than non-clock models but with BF < 5.

less resolution within Apachean. Moreover, the branch lengths within Athabaskan in (4) are much longer relative to the root, suggesting a much earlier split for Athabaskan than is implied in (2).

5 Discussion

The most pertinent result for the main research question considered here is that the Pacific Coast Athabaskan languages emerge as a well-supported subgroup of Athabaskan in all conditions: with non-clock, relaxed clock, or strict clock models; with polymorphic characters included or excluded under a multi-state coding; with unique character states included or excluded in a binary recoding. All of this can be taken as evidence in favor of a PCA subgroup within Athabaskan, as argued by Hoijer (1960). Note that the question of the subgrouping of the PCA languages is orthogonally related to the migration of Athabaskan-speaking people into California and Oregon. The results reported here do not speak to the locus of differentiation of PCA, whether it was in situ after a single Athabaskan-speaking group migrated into the California-Oregon region, or in some other place prior to migration. Golla (2011:69) argues that a lack of shared lexical innovations indicative of a common migration into a new biological and cultural region suggest that the latter scenario is correct. This is surprising, since a priori a theory of differentiation in situ is preferable: it requires positing only a single migration event and thus provides the simplest explanation for the concentration of a closely-related subset of the Athabaskan languages in a locale far removed from the rest of the family. Multiple migration events subsequent to the diversification of PCA are not a historical impossibility, however.[7]

Another result worth noting is that multi-state versus binary codings of the data produced different tree topologies, contrary to the expectations of Pagel and Meade (2006). This may be due to the inflationary effect of non-independence on posterior probabilities, with some nodes achieving the 50% threshold required to be included in the consensus tree in (3).[8] Alternatively, differences in topologies in (2) and (3) might be due to a disproportionate influence of characters with large numbers of states. Binary recoding of characters with many states will introduce more dependencies than will binary recoding of characters with fewer states. Such uneven distribution of dependencies in the dataset may cause characters with more states in the multi-state coding to contribute disproportionately to likelihood calculations in a binary recoding. A similar point is made by Pagel and Meade

[7] Golla's (2011:69, 257) suggestion of a "partially shared" history of migration that occurred in two or more "pulses" may provide the key to understanding the dynamics of Athabaskan migration from the north.

[8] Note, however, that support for some nodes in (3) (with binary recoding) is actually lower than what is found in (2), e.g., the group subsuming Hupa and the other California Athabaskan languages.

with respect to the effect of binary recoding on branch lengths, and perhaps is implied for their argument concerning topology as well. Nonetheless, the upshot is that one cannot assume that the best topology obtained under a binary recoding will simply be a scaled version of the topology obtained under the corresponding multi-state coding.

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Automatic Extraction of Linguistic Data from Digitized Documents

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Introduction

This paper presents a system for automatically extracting linguistic data from digitized linguistic documents using a combination of existing software packages and custom scripts. The system is designed to leverage existing resources in online digital libraries in order to bootstrap the creation of large, multi-lingual linguistic corpora, which can then be used to conduct data-driven experimental research into cross-linguistic or universal linguistic phenomena. The system identifies instances of foreign-language text accompanied by reference-language translations within the text of printed books that have been scanned into digital format, and extracts these to produce a parallel corpus of example sentences. While the system achieves a high precision on predicting foreign text, its accuracy overall is low, and directions for improvement and future work are identified.

1 Background and Objectives

1.1 Motivation

The increasing availability of large amounts of linguistic data in digital form, combined with the development of computational methods for analyzing such data, leads naturally to the question of what can be learned about the nature of language from analyzing large, multi-lingual corpora. John Goldsmith, advocating

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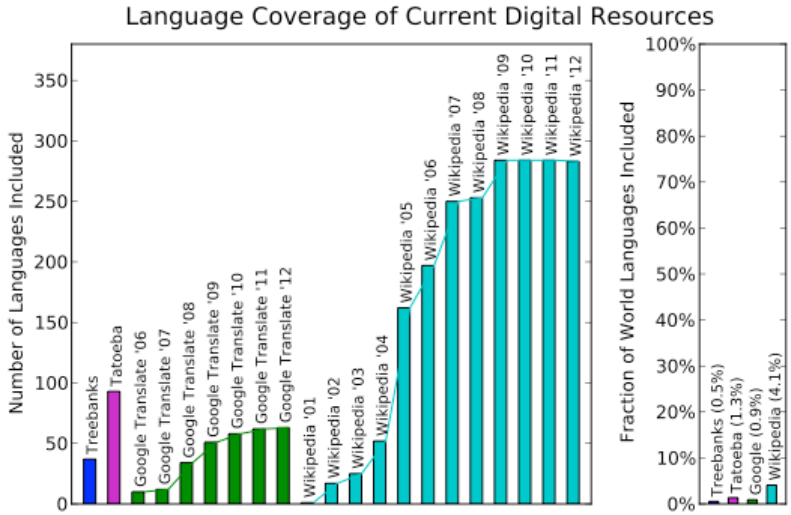
for the use of formal, mathematical models of grammar in linguistics, motivates his approach with the observation that "the goal of the linguist is to provide the most compact overall description of *all of the linguistic data that exists at present* [emphasis added]" (Goldsmith 2007). Steven Abney, similarly arguing for the use of computational methods to study the fundamental questions that linguists ask, writes "Any experimental foray into universal linguistics will be a data-intensive undertaking. It will require substantial samples of many languages—*ultimately all human languages* [emphasis added]—in a consistent form that supports automated processing across languages." (Abney 2011).

Both of these quotations emphasize that in order for a computational analysis of language to yield truly universal linguistic insights, the analysis must be performed on a data set that represents the full linguistic diversity that exists on this planet. However, the number of the world's languages currently represented in machine-readable corpora readily available online falls well short of the total number of languages currently spoken. Figure (1) below illustrates the comparative numbers of languages available in a variety of corpus types, and also compares these numbers to the total number of languages spoken around the globe.

(1) The current state of language resources available in digital form.



The data sources in (1) represent decreasing levels of annotation from left to right. Treebanks, used to train syntactic parsers, are corpora that have been manually annotated with phrase structure trees. Parallel corpora, of which Tatoeba[2] is one example, pair text from two languages and are essential for

[2] http://tatoeba.org/

training machine translation systems, of which Google Translate[3] is one example. Monolingual corpora, represented here by Wikipedia,[4] are the most abundantly available but also of the least use to linguists because they lack any linguistic annotation or reference outside of the text itself. While the number of languages represented in these resources has grown significantly in recent years, these totals are but a small fraction of the world's total languages, as illustrated in the smaller chart on the right-hand side.

In addition to the data sources included in (1), there is much more data that exists in digital form, but is not in a machine-readable format. This is a crucial distinction to make, because while such resources may be immensely useful to human linguists, they are useless from a computational linguist's perspective, at least until they have been converted in some way into a more processing-friendly format. The objective of this project is to explore the potential for automated methods to extract relevant linguistic data from online digital sources, converting that data into a machine-readable format that can then be used as a data source for computational linguistic research.

1.2 System Overview

The system proposed and described in this paper takes as its input digitized books from online sources, and produces as output a machine-readable corpus of bitexts. The term bitext here refers to paired text and its translation in a second language. The input documents, described in more detail in the following section, are descriptive linguistic books containing text examples of the target language. The figure in (2) below illustrates the goal of this process and the types of bitexts that we would like to produce as output.

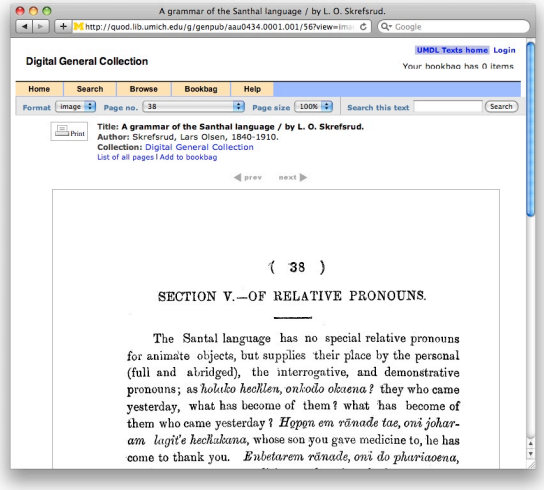
The system processes these documents in two major stages. The first stage identifies instances of foreign text, classifying each word in the document as either belonging to the target (foreign) language or the reference language. (In this project the reference language is always English, although it could be any other language provided that good NLP tools exist for that language.) Then, for each instance of foreign-language text, the second stage identifies an adjacent span of reference-language text that serves as a translation of that text. These two processing stages are described in detail in sections 2 and 3. In practice, this is a challenging process, however, and the actual output of the system contains errors; performance and directions for improvement are discussed in detail in section 4.

1.3 Data Sources

The data sources targeted in this project are descriptive linguistic books, e.g. grammars, dictionaries, and readers, which were originally published in print

[3] http://translate.google.com
[4] http://www.wikipedia.org

(2) The high-level objective of bitext data collection.

Input (scanned digital book)	**Output** (bitext corpus)
	... F-52: *holako hechlen, onkodo okaena?* E-52: they who came yesterday, what has become of them? F-53: *Hopon em ranade tae, oni jo-haram lagit'e hechakana* E-53: whose son you gave medicine to, he has come to thank you F-54: *Enbetarem ranade, oni do phariaoena,* E-54: to whom you gave medicine at that time, he has recovered. ...

form and have since been scanned into digital libraries. These sources were targeted as a potentially large and valuable source of data that is readily available in electronic form, but is not in a machine-readable format. The advantage of extracting the linguistic data from these books is that it could produce data for a large number of languages that previously were unrepresented in digital corpora. The benefit of scale applies mainly to cross-linguistic research; presumably a researcher interested in a specific language could extract the data from a single document by hand relatively easily.

The types of documents targeted are one of the key differences between the present work and ODIN, the Online Database of Interlinear Text (Lewis and Xia 2010). ODIN looks at linguistics articles containing interlinear glossed text (IGT); in such cases the text is relatively easily identified by its distinctive three-line format. The linguistic books targeted in this project may contain IGT, but they also contain instances of foreign text in wordlists, paradigm tables, and inline bitext. Inline bitext occurs when a text and its translation are given sequentially in a running sentence, and cannot be identified simply by looking at the page layout.

A hands-on approach to identifying relevant books was used, manually searching the University of Michigan's Digital General Collection. Queries included searching for the word “language” in the subject field (which matches subject codes like “Thai language dictionaries” or “Czech language Grammar”), and searching terms like “Grammar of” or “Dictionary of” in the title of the book. A list of 110 relevant documents was produced, though not all of these texts were suitable for automated processing: for example, some used non-Roman orthography, which is not recognized by the optical character recognition (OCR) process. Ultimately, a collection of 20 books was chosen for annotation and

additional processing. Basic statistics about this collection are given in (3).

Portions of each document were manually annotated for instances of embedded bitext. Looking at pages that were annotated by more than one person, we calculated an average inter-annotator agreement rate of 0.95 and a kappa value of 0.88. Kappa (Carletta, 1996) is a measure of inter-annotator agreement that takes into account the expected rate of accidental agreement between annotators, and a score of 0.5 or higher is generally considered a good level of agreement. Thus, these results show that there is strong inter-annotator agreement, which is encouraging for the possibility of high-accuracy automated tagging. These annotations were also used for training and evaluating components of the extraction system.

(3) Summary of the scanned linguistics documents used in this project.

Bilingual Texts	11 (Caddoan, Fox, Haida, Kickapoo, Koryak, Kutenai, Maidu, Menomini, Ojibwa, Passamaquoddy, Zuni)
Dictionaries	2 (Burmese, Hungarian)
Grammars	7 (Arapesh, Filipino, Italian, Navaho, Malayan, Pangasinan, Santhal)
Annotated pages	304 (from 9 documents)
Total pages	7,479
Total words	780,000 (estimated)

Most of the results presented in this paper focus on a single representative book, *Grammar of the Santhal Language* (Skrefsrud 1873), which describes Santhali, an Austroasiatic language of about 6 million speakers mostly located in India (Lewis 2009). Several features of this book make it well-suited to this project. Due to its age, this book belongs to the public domain, meaning that the extracted data could be reproduced in a corpus without any concerns of copyright. Also, it is written in English, and the target language is represented in a Latin-based orthography.

2 Language Identification

The first major processing stage is the language identification stage. The objective of language identification is to label each word token in the document as either English or foreign. Linguistics documents are unique in that they are bi- or multi-lingual, combining text from multiple languages in a single document. Outside of texts which are explicitly about language, it is rare to find texts that combine significant amounts of material from multiple languages, and as a result there is fairly little prior research on automatic language identification of individual words within a text. Traditional language ID aims to classify entire documents, not individual words, and does so by comparing the text to samples of known text

from a variety of languages and identifying the sample that best matches the test data. While it is possible to achieve 99% identification accuracy using samples of just a few hundred sentences apiece (Kruengkrai et al. 2006), such approaches still require a sample of text from each language for training.

The creators of the ODIN corpus of interlinear glossed text faced a slightly different variation on the language ID problem (Xia et al. 2009); in their case the IGT instances are already identified within the text, but each IGT needs to be associated with a language. However, this still differs from the present task, in which the documents typically only contain a single target language and the objective is not to identify the language, but to identify the tokens that belong to that language.

Often, target-language text will be distinguished in print by some typographic features, e.g. bold or italic text. While some OCR systems produce output in a markup language (such as HTML or Rich Text) which preserves such typographical information, the OCR used in this project was plain unformatted text. Therefore, the language identification component is tasked with classifying each text token as either an English or a foreign word, based purely on its orthographic form.

2.1 Dictionary and Statistical Methods

One natural approach to the language ID task is a dictionary-based approach, in which tokens are compared to a list of known words in the reference language. One complication is that OCR errors in the English text pose a potential problem since tokens with OCR errors would not be in the dictionary but should be correctly labeled as English. To evaluate the dictionary-based method, we created an English dictionary based off of the *ispell* spell-checking program dictionary, which we augmented with a list of common linguistic terms and abbreviations. This dictionary was used to classify each word in the Santhali grammar: if the token appeared in the dictionary then it was classified as English, otherwise it was classified as foreign.

Another approach is to use a statistical model, for instance one based on n-gram features, to classify word tokens. This approach has the benefit of being tailored to the particular language in question and it is "softer" in the sense that an English word that doesn't appear in training set could still potentially be classified as English. The main drawback of this approach is that it requires a sample of foreign text to train the model on, and in the context of this project we cannot assume that a sample of text from the target language is available beforehand. Still, it is not unreasonable to manually annotate a small number of tokens from the document in order to automatically label the remainder.

To evaluate this approach, we used a 2,620 token subset of the Santhali grammar that had been manually annotated for bitexts. This corresponds to roughly 10 pages of annotated text, and it is a small data set by machine learning standards. Each token was represented as a vector of n-gram features, with *n*

ranging from 1 to 3. The *svmlight* software package (Joachims 1999) was used to train and evaluate a support vector machine (SVM) model. Due to the small data set, we used a hold-one-out methodology for evaluation.

Both the dictionary and SVM models were evaluated on the same data set of manually annotated tokens from the Santhali grammar. The results are shown in (4) below. Here, recall indicates how many true foreign words were correctly predicted as foreign, and accuracy indicates the proportion of predicted foreign words that were true foreign words. Accuracy is the number of tokens (both English and foreign) that were correctly labeled overall.

(4) Comparison of dictionary and statistical language identification results.

	Dictionary	SVM
Precision	66.9	81.7
Recall	76.0	66.0
Accuracy	86.7	88.0

Both systems achieved similar and reasonably high levels of accuracy, with the SVM performing slightly better. However, the two approaches had different characteristic behaviors with respect to precision and recall. The dictionary-based approach predicted more foreign words overall, but with a lower precision: this is likely due at least in part English words that were mis-recognized by OCR.

3 Translation Identification

Once foreign text has been identified in a document, the next step is to identify nearby English text that acts as a translation of the foreign text. In the case of inline bitext, the gloss is either immediately preceding or immediately following the foreign text, but it is unknown which is correct. A statistical translation model could be used to identify the true translation: if the foreign sentence is statistically aligned to two hypothesized translations (one from the preceding text and one from the following text), then the alignment corresponding to the true translation should display a much lower alignment cost than the other alignment.

However, in the absence of a separate corpus of bitext to train the translation model, we are forced to somehow train a translation model without knowing in advance what the bitexts are. A possible solution to this problem is to consider both the preceding and the following text as candidate translations and train a translation model on all of these sentence pairs, even though half of the pairs will be false translations. In order to evaluate the feasibility of this approach, we conducted an experiment on a controlled parallel corpus taken from the Tatoeba database. For this experiment, we collected all of the English-French sentence pairs from the database. To mimic the application setting, each English sentence in the database was also paired with a randomly-chosen French sentence to

produce a false translation for that sentence.[5] The false translations were controlled for length to roughly match the true translations, in order to avoid biasing the results (all else being equal, an alignment with more word tokens will generally have a higher alignment cost).

A statistical translation model was then trained using the combined set of true and false translation pairs. The model was trained using the GIZA++ software package with its default settings (Och and Ney 2003). The alignment scores produced during training were then used to select the better candidate translation for each English sentence. The table in (9) below illustrates the scenario: in each case the *a* translation is the correct one, and accordingly it has a lower cost than the false translation in both instances.

(5) Example alignment costs of true and false translation pairs.

Sentence and Candidate Translations	Cost
'He abused our trust.'	
a) *Il a abusé de notre confiance.*	*18.5*
b) *Il éclata en larmes.*	40.3
'The floor was covered with blood.'	
a) *Le sol était couvert de sang.*	*15.9*
b) *La machine était recouverte de poussière.*	46.7

Because the number of sentence pairs in a single document is generally much less than is usually used to train machine translation systems, we performed this experiment on differently sized subsets of the Tatoeba data set to explore the effect of corpus size (using sets of 500, 5k, and 50k sentence pairs). The translation-selection process was repeated for each corpus under two scenarios: in the first, "gold" scenario, the translation model was trained only on the true translation pairs; in the second, "both" scenario, the translation model was trained on both the true and the false sentence pairs, mimicking the actual case encountered in bitext extraction, where the true translation is not known in advance. Accuracy, defined as the percentage of test sentences for which the true translation received a better alignment score than the false translation, is averaged over five folds of cross-validation, with standard deviation in parentheses. The results are summarized in (6) below:

[5]Note: here French is being treated as the reference language and English the foreign language. This has no significance and the results are expected to hold in the reverse direction as well.

(6) Translation ID accuracy, compared by corpus size and training set.

Corpus size (sentences)	Accuracy (train on gold)	Accuracy (train on both)
500	71.2% (4.7)	72.8% (5.2)
5,000	89.3% (.98)	87.9% (1.3)
53,129	95.4% (.15)	94.4% (.11)

From these results, it is clear that the size of the corpus has a strong effect on the prediction accuracy, which is expected. Also as expected, training on only the true translation pairs yields higher prediction accuracy than training on both the true and false translations. However, this effect is not very large, and for the 500-word corpus any advantage this may have offered is obscured by the noise associated with training on such a small data set.

These experiments show that it is possible to effectively use a translation model that is trained on noisy data to select true glosses from a candidate set containing both true and false glosses. For a small data set, such as might be obtained from a single book, the accuracy rate drops significantly, but is still well above chance. The performance of this technique on a digitized linguistic document is addressed in the following section.

4 Evaluating the System

This section explores the performance of the end-to-end system, taking OCR text from the Santhali grammar as input and producing bitext sentence pairs as output. Word tokens were classified using the same SVM method described in section 2, and each sequence of two or more foreign word tokens (ignoring all non-word tokens, such as punctuation and numbers) was selected as a foreign text. For each foreign text, a preceding and following candidate translation was identified by choosing the appropriate number of tokens to approximately match the length in characters of the foreign text. Finally, these pairs were used as input to the same translation ID system described above in section 3, and the best translation for each foreign text was identified in this way.

This procedure produced 3,503 predicted Santhali bitexts. Nearly none of the predicted bitexts are exactly perfect; even the most accurate are off by a few characters or tokens. Because of this, and because all of the annotated text was used to train the SVM classifier, a random sample of 100 predicted bitexts was chosen for manual inspection. Each of these was assesd on three yes/no questions to determine the quality of the predicted bitext: the questions and results are given in table (7) below.

(7) Santhali bitext extraction evaluation questions.

Question	Yes	No	Pct
Is the predicted foreign text actually foreign text?	99	1	99%
Is this actually an inline bitext?	69	31	69%
If this is an inline bitext, is the prediction approximately correct?	19	50	28%

The first question is meant to assess how well the language ID component performed. 99 out of the 100 bitexts were in fact centered on foreign text, indicating that the precision of the SVM language classifier, when combined with the two-or-more token restriction, is sufficiently high. It is not possible to estimate the recall using this method of evaluation, so 10 pages of the document were randomly selected to inspect. Those pages contained 136 instances of actual bitext, of which 61 were identified by the system, resulting in a recall of 44.9%. The limit of two sequential foreign words for predicting foreign bitexts means that many single-word instances (such as found in inflectional paradigms) were omitted, and this is partially responsible for the low recall.

The second question addresses the fact that not all instances of foreign text have an English translation immediately preceding or following the foreign text. In the sample of 100 predicted bitexts, 69 were in fact inline bitext, meaning that an English translation was present immediately before or after the span of foreign text, and therefore retrievable in principle. In the remaining 31 cases, the present system will always fail to find the translation because it is not immediately adjacent to the foreign text. The third question is a somewhat subjective evaluation of overall correctness. Three examples of the predictions made by this procedure are displayed in (8), along with the responses to the three questions used for evaluation.

Example 1 in (8) shows a three-column table, which are common in the Santhali grammar. This illustrates the need for a method to detect the table structure and deal with it appropriately, since the present system is forced to look only at adjacent text for the translation. Example 2 illustrates a case where the prediction is correct: the full foreign text span was correctly identified as well as the adjacent English translation. Example 3 shows foreign text within a paragraph; the foreign span is cut short (perhaps due the presence of the token "do," which is a frequent English word), and the translation is misidentified. This may be due to the fact that the actual translation is non-adjacent in this example. These examples are illustrative of the type of texts that are encountered and their associated challenges.

(8) Three examples of predicted bitexts from the Santhali grammar.

1)	had struck him. DUAL. I D-al-a1,kat'-ti;4-**ta- Dal-akat'-li.-tcth'-** Paset'-e-dat-a~cat'-liti.. lt-1can-a-e, He had struck us	had struck him. DUAL. kan-A-han-e, If he had struck us	he had struck hitn. DUAL. tcth~loan, Perhaps he had struck us
	Foreign? Yes.	Inline? No	Correct? No
2)	strike. INCHOATIVE PAST. **Dal-Jko-dagido1l-kan-tahVkan,** Tlhey whom they were about to strike. OPTATIVE.		
	Foreign? Yes.	Inline? Yes	Correct? Yes
3)	oni hola-m del-led-e, what has become of him whom you saw yesterday? This is much more elegant and certainly more correct than to say: **oni hola-m diel-ed-e-a, oni** do okare, for the latter means literally: you saw him yesterday, what has become of him?		
	Foreign? Yes.	Inline? No	Correct? No

4.1 Directions for Improvement

Clearly, the precision rate of 19 correct out of 100 predicted bitexts leaves something to be desired. Accounting for the fact that in 31 instances it would be impossible to identify the English translation simply by looking at adjacent text, precision increases to 28%, which is still not nearly good enough to be useful for data collection. There are a number of improvements to the system which could not be made in the present study, but which have the potential to yield more favorable results. Some of these are discussed below.

4.1.1 Improving Language ID

If the foreign text spans were detected perfectly, then a simple baseline of always choosing the text to the left or the text to the right would be expected to be correct 50% of the time overall. However, the most common reason for a predicted bitext to be judged incorrect is that the foreign span is too short. If the foreign span is predicted too short, then this will usually throw off the range of the predicted English translation as well. The current language ID system achieves high precision at the cost of low recall; it is essentially too conservative. It is possible that tuning the classifier or training on more data could alleviate this problem.

Another possible solution is to use a sequential model, such as a Hidden Markov Model, to label sequences of foreign words in a soft manner. This should help in cases where an English-looking word appears in the midst of a sequence of foreign words. For example, in Santhali the tokens *an*, *a*, *do* and *than*, among others, could be either English or Santhali, depending on the context, but a token-

based classifier must always label them in the same way regardless of context. (In addition to truly shared words, noisy tokens also pose a challenge.) When such words occur within a Santhali sentence, they incorrectly cause a break in the predicted foreign span. While belonging to an entirely different domain, this is conceptually related to work using HMMs to extract structured information from classified ads (Grenager et al. 2005). Such an approach models a document as being generated from multiple sources, which aligns well with the concept of a bilingual document being generated by two sources (i.e. two languages).

4.1.2 Improving OCR

OCR quality is better today that it ever has been, but OCR errors are a major problem for this type of project. One issue is that the books that we have collected are more prone to OCR errors than typical books. In addition to being old, with faded text and stray marks on the page, the foreign-language text causes problem for OCR that expects English text. Several of the books we originally identified could not be used because they include non-Latin scripts, which are either skipped entirely by the OCR software or produce gibberish output. Even when the foreign-language text uses Latin-based orthography, that text often includes various diacritic marks which lead to errors in the OCR. The figure in (9) below illustrates a typically frustrating example: the grammar presents a paradigm of the Santhali noun *Ṭaṅga* 'axe'.

(9) Comparison of a portion of a scanned page and its OCR output.

Scanned Image	OCR Text
Instr. *Ṭaṅga-te,* by, with, the axe. Dat. *Ṭaṅga-ṭhen,* to the axe. Acc. *Ṭaṅga,* the axe. Abl. *Ṭaṅga-khon, khoch,* etc., from the axe. Loc. *Ṭaṅga-re,* in, on the axe. Voc. *e Ṭaṅga!* O, axe!	Instr. Tasga-te, by, with, the axe. Dat. Taiga-then, to the axe. Acc. Tagga, the axe. Abl. Tariga-khon, khoci, etc., from the axe. Loc. Tatiga-re, in, on the axe. Voc. e Talga! 0, axe

This example illustrates how the OCR process loses typographic (e.g. italics) and layout information (the spacing and line breaks), but more significantly the letters themselves are misidentified. Although the stem is identical in all six forms of the noun, the OCR software has rendered the same stem in six different ways: Tasga, Taiga, Tagga, Tariga, Tatiga, and Talga. This type of error poses a serious impediment to using the text for further downstream linguistic processing. A morphological analysis based on this data would wrongly posit some strange sort of stem-internal process when in fact there is none.

It is possible that using commercial OCR software could provide improvements. No direct comparisons of quality could be done for this project, but some experiments with a commercial OCR package seemed to improve the

quality of the OCR text. Additionally, commercial OCR software is capable of preserving typographic information and tabular layouts by producing HTML, rather than plain text, output.

4.1.3 Utilizing Typographic and Layout Information

The system described here models the document as a sequence of tokens., which discards much of the typographic and layout information that human readers use to identify foreign text in one of these books. Much of the foreign-language data in linguistic documents is given in a structured format, such as wordlists and paradigms. If this format could be preserved (by using OCR software such as described in the previous section), then it is possible that this information could be used to improve the language ID and translation ID systems. However, the techniques used would need to be modified accordingly to take advantage of this additional markup.

The HMM approach mentioned in section 4.1.1 could incorporate typographic features into its emission probability model. However, while conventions tend to be consistent within a single book, there is not always consistency across books. One author might use italics for foreign text, while another might use it for the reference text. Similarly, in one book, the foreign text might consistently follow the reference text, while in another book the order is reversed. These are parameters that would need to be set (either manually, or inferred automatically) on a per-document basis, but once set should improve the performance of the translation ID system within that document.

5 Conclusion

This paper has presented a system for automatically extracting instances of bitext from scanned linguistic books found online in digital libraries. The performance of the system at present is not sufficient to produce output that could reliably be used to perform linguistic analysis, but there is reason to believe that the performance could be improved with additional work. It is also possible that the output of the current system could be useful in a context where the primary use is to identify interesting instances of bitext which are then manually verified and inspected by the user.

The quality of text produced by OCR is a major issue, even when the remainder of the system works as intended. While the OCR quality may be improved by using different OCR software, it remains unknown whether the quality will reach the level needed to perform reliable linguistic analysis. The OCR issue could be avoided entirely by looking at digitally-composed documents, for instance modern journals and conference proceedings or language-themed web pages.

One alternative to the type of automated process described in this paper is to use a crowd-sourcing approach, using human annotators to identify foreign text

and its translations. If automated processing is not feasible, then this may be a more effective way forward. Ultimately, the types of documents addressed in this project contain a wealth of information of value to researchers in linguistics and computational linguistics, and this value will only be increased if the data can be extracted to a format that facilitates automatic processing.

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Clitics and voicing in Dutch*

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1. Introduction

This paper considers the interaction of voicing processes and clitic attachment in Dutch. This forms a challenge to phonological theories since clitic attachment shows opaque interaction with final devoicing, and in addition voice assimilation in cliticized structures is subject to variation.

I propose a two-level Optimality Theory (OT) analysis (Prince and Smolensky 1993, Kiparsky 2000) of these data, in which the existence of two levels can handle the opaque interaction, and a combination of prosodic structure constraints and segmental constrains accounts for the attested variation. I will compare my analysis to two previous accounts for these data, those of Booij (1995, 1996, 1997) and Grijzenhout and Krämer (2000). Booij's work is formulated in the framework of rule-based Lexical Phonology, while that of Grijzenhout and Krämer is a single-level OT theory. I will argue that the former theory is unsatisfactory because of theoretical problems, mainly because it stipulatively assigns prosodic structures to cliticization structures. My proposal does not have this problem because prosodic structures are derived in the normal manner, from violable constraints on the well-formedness of prosodic structure (the Strict Layer Hypothesis, Itô and Mester 1992,

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Selkirk 2004). On the other hand, I will show that Grijzenhout and Krämer's (2000) theory has some empirical shortcomings: it does not derive all data, whereas my analysis derives these problematic data in a regular way. Hence, as I hope to show, the proposal I put forward in this paper, which combines insights from both Booij's work and that of Grijzenhout and Krämer, is superior to either theory. This not only offers an account for the Dutch data, but on a more conceptual level also illustrates how constraints on prosodic structure and traditional segmental constraints can work together to describe empirical findings such as variation.

The structure of the paper is as follows. Section 2 will introduce the general voicing processes that apply in Dutch and explicate the set of Dutch clitics, and subsequently present the main data of how clitic attachment interacts with these voicing processes. In section 3, I present my proposal for the case of final devoicing, and contrasts it with the two earlier accounts. Section 4 explains how my proposal works for voice assimilation data, again compared to previous theories. Section 5 concludes.

2. Main data

2.1. Voicing processes in Dutch

Voicing phenomena in Dutch have been well studied and described in the literature (e.g. van de Weijer and van der Torre 2007). The major processes are final devoicing and voice assimilation.[1]

Final devoicing

Obstruents are devoiced before word boundaries (1a) and in compounds (1b). Certain affixes, sometimes called semisuffixes (Grijzenhout and Krämer 2000), also induce final devoicing (1c), while others do not (sometimes called internal suffixes, Grijzenhout and Krämer 2000), (1d).

(1) a. /bɛd/ ⟶ [bɛt] 'bed'

b. /(loːd)$_{N}$(ɛrts)$_{N}$/ ⟶ [loːt.ɛrts] 'lead ore'

c. /roːd+ɑxtəx$_{Affix}$/ ⟶ [rɔːtɑxtəx] 'red-ish'

d. /roːd+ər$_{Affix}$/ ⟶ [rɔːdər] 'more red')

Progressive voice assimilation

Voice assimilation is progressive when the right member of a cluster is a fricative. This is illustrated in (2) for compounds and derived words:

[1] There are some other processes, such as intervocalic voicing (also known as 'Fricative Voicing', see Booij 1995: 147). This process is much more erratic, subject to variation, and most likely related to frequency effects (see Booij 1996: 236). I will not consider this process here in relation with cliticization, other than some brief comments in section 5.

(2) a. /ʋɛrk+zaːm/ ⟶ [ʋɛrksaːm] ‘active’

b. /(pɔst)$_N$(vɑk)$_N$/ ⟶ [pɔstfɑk] ‘mailbox’

Regressive voice assimilation

Voice assimilation is regressive when the right member of a cluster is a stop.

(3) a. /eːt+baːr/ ⟶ [eːdbaːr] ‘edible’

b. /(ɦɑnd)$_N$(pɛrs)$_N$/ ⟶ [ɦɑntpɛrs] ‘hand-press’

For more detailed discussion of these and other processes, as well as a general overview of Dutch phonology, I refer the reader to Booij (1995).

2.2. Clitics

Dutch has pronominal and adverbial clitics. Pronominal clitics, which are the most numerous, are reduced forms of pronouns. Whereas full-fledged pronouns are regular words with a full vowel that may receive stress, pronominal clitics are reduced variants of them. Most of them have a schwa vowel and accordingly they cannot be stressed and must attach to a host.

In (4) I present an overview of the most common Dutch clitics, together with the full forms they derive from. I have listed the [d]-initial clitics separately, since they share some special properties that will be discussed later (Lahiri *et al.* 1990 focus exclusively on these types of clitics).

(4)

/Cə/ *clitics*		
Full form	Clitic	
/mɛi/	/mə/	‘me’
/jɛi/	/jə/	‘you’
/jɔu/	/jə/	‘your’
/zɛi/	/zə/	‘them’ / ‘she’
/ʋɛi/	/ʋə/	‘we’

/əC/ *clitics*		
Full form	Clitic	
/ən/	/ən/	‘a’
/ɦɛt/	/ət/	‘it’ / ‘the’
/ɪk/	/ɪk/	‘I’
/ɦɛm/	/əm/	‘him’
/eːns/	/əs/	‘once’

[d]-*initial clitics*		
Full form	Clitic	
/ɦaːr/	/dər/	‘her’
/ɦɛi/	/di/	‘he’
/ɛr/	/dər/	‘there’

closed clitics		
Full form	Clitic	
/mɛin/	/mən/	‘my’
/zɛin/	/zən/	‘his’

2.3. Main data: interaction of clitics and voicing

Final devoicing

The interaction of cliticization and final devoicing shows counterfeeding opacity with respect to resyllabification: although in the output form of (5b) the underlying [v] is now in onset position, it is still devoiced.

(5) a. /ɣeːv+ət$_{\text{Clitic}}$/ ⟶ [ɣeː.fət] ‘give it’

b. /rɛd+əm$_{\text{Clitic}}$/ ⟶ [rɛ.təm] ‘save him’

c. /koːp+ət$_{\text{Clitic}}$/ ⟶ [koː.pət] ‘buy it’

Progressive assimilation

When a fricative-initial clitic attachment creates a consonant cluster, progressive assimilation takes place. Examples (6bc) show that final devoicing feeds progressive assimilation.

(6) a. /trɛf+zə$_{\text{Clitic}}$/ ⟶ [trɛf.sə] ‘meet them’

b. /ɣeːv+zə$_{\text{Clitic}}$/ ⟶ [ɣeːf.sə] ‘give them’

c. /rɛd+zə$_{\text{Clitic}}$/ ⟶ [rɛt.sə] ‘save them’

Regressive assimilation

The [d]-initial clitics are the only clitics that have a voiced stop in their onset. In this case, we find variation: the voiced cluster may optionally be devoiced.

(7) a. *geef d’r* /ɣeːv+dər$_{\text{Clitic}}$/ ⟶ [ɣeːv.dər] or [ɣeːf.tər] ‘give her’

b. *(ik) zoek d’r (auto)* /zuk+dər/ ⟶ [zugdər] or [zuktər] ‘(I) look for her (car)’

c. *kies d’r* /kiz+dər/ ⟶ [kistər] or [kizdər] ‘choose her’

I now to turn to the analysis of these data, first the final devoicing data in section 3, followed by the voice assimilation data in section 4.

3. Final devoicing

Booij’s analysis (1995, 1996, 1997) overcomes the opacity problem of final devoicing by presenting an analysis in the framework of Lexical Phonology. The main tenet of this theory is that there are distinct levels (a Lexical level and a Postlexical level) that each come with their own set of (morphological) word-formation rules (WFRs) and a set of phonological rules. These rules apply only in the domain of

their own level, and the output of one level serves as the input for the next level. The basic assumption for Booij's application of Lexical Phonology to the current data is that final devoicing is a lexical rule that devoices codas, while cliticization occurs postlexically and induces resyllabification.

For example, /ɣeːv/ 'give' is devoiced at the Lexical level [ɣeːf], then the clitic is attached at the Postlexical level, and resyllabification takes place: [ɣeː.fət].

(8) *Booij's (1995) derivation of* /ɣeːv+ət$_{\text{Clitic}}$/ 'give it' *and* /ɣeːv+ər$_{\text{Affix}}$/ 'someone who gives':

			/ɣeːv/+/ət$_{\text{Cl}}$/	/ɣeːv/+/ər$_{\text{Aff}}$/
LL	WFRs	Affixation	———	[ɣeːvər]
	Phonological	Syllabification	[ɣeːv]	[ɣeː.vər]
	rules	Final devoicing	[ɣeːf]	———
PL	WFRs	Cliticization	[ɣeːfət]	———
	Phonological	Resyllabification	[ɣeː.fət]	———
	rules			

(LL = Lexical level, PL = Postlexical level)

My proposal adopts Booij's basic idea, but cast in terms of two-level Optimality Theory (OT, Kiparsky 2000). Two-level OT also assumes a Lexical and a Postlexical level, each of which comes with its own constraint ranking. Again, the output of one level is the input of the following level. An earlier, single-level OT analysis of the current data is Grijzenhout and Krämer (2000). They employ a *[+voice])$_{\omega}$ constraint to account for the basic devoicing data: words, compound components and semisuffixes form their own prosodic word, while internal affixes incorporate into the prosodic word of their host, generating the data in (1).

Grijzenhout and Krämer further introduce Alignment constraints to derive prosodic structures:

(9) ALIGN-R(PWd): Align the right edge of every prosodic word with the right edge of some lexical word (N, V or A).

(10) ALIGN-L(Stem): Align the left edge of every stem with the left edge of some prosodic word.

In my proposal I adopt G&K's *[+voice])$_{\omega}$ constraint, which is high ranked at the Lexical level. This gives us the basic (non-clitic) data. Throughout the paper, in linear representations, I adopt the typographical convention that prosodic words are indicated by parentheses, and lexical words by vertical bars. If one level is irrelevant for a derivation (e.g., the Postlexical level for (11–12)) I will not give its tableau.

(11)

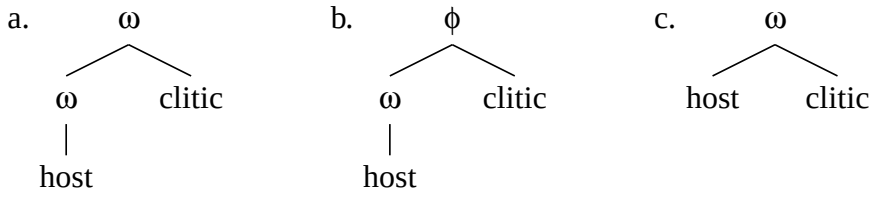
	LEXICAL		
	/bɛd/ ‘bed’	*[+voice])$_\omega$	ID([voice])
a.	|(bɛd)|	*!	
b. ☞	|(bɛt)|		*

(12)

	LEXICAL				
	/rɛd+ər$_{\text{Affix}}$/ ‘save her’	ALIGN(PWd,R;Stem,R)	*[+voice])$_\omega$	ONSET	ID([voice])
a.	|(rɛ).dər|	*!			
b.	|(rɛd.ər)|			*!	
c. ☞	|(rɛ.dər)|				
d.	|(rɛ.tər)|				*!

When we consider the analysis of cliticized words, the details of the prosodic structure are of great importance. In principle, there are three basic structures available for cliticization. The clitic may attach to the prosodic word of the host and form a new prosodic word (13a), attach to the prosodic word to form a phonological phrase (13b), or incorporate into the prosodic word, as in (13c).

(13)



Prosodic structure also sets apart Booij’s theory on the one hand and Grijzenhout and Krämer’s analysis and my proposal on the other. In Booij’s analysis, the prosodic structures must be explicitly stipulated, and any conflicts with structural well-formedness conditions (e.g. the Strict Layer Hypothesis, see (16)) must be explained away. To give an example, Booij (1996) argues for structure (13c) for enclitics, but has to make the stipulation that Dutch words can sometimes have ternary feet, instead of the “universally preferred” binary feet (p. 230). However, more than two Dutch clitics can stack up, requiring additional explanations for even larger feet:

(14) [wanneer ik 't 'm] vertel [ʋɑneːrɪkətəm]
when I it him tell
'when I report it to him'

More recently, the Strict Layer Hypothesis has been recast in terms of violable OT constraints (Itô and Mester 1992, Selkirk 2004). This makes it possible to derive prosodic structures in a regular manner from constraint ranking, without the need for ad-hoc stipulation.

(15) *Prosodic Hierarchy*
Utterance (Utt) – Intonational Phrase (IP) – Phonological Phrase (ϕ) – Phonological Word (ω) – Foot (F) – Syllable (σ)

(16) *Strict Layer Hypothesis*
The categories of the Prosodic Hierarchy are enumerated from C_6 (utterance) to C_1 (syllable).

LAYEREDNESS	No C_i dominates a C_j when $j > i$;
HEADEDNESS	Any C_i must dominate a C_{i-1}, for $i > 1$;
NON-RECURSIVITY	No C_i dominates another C_i;
EXHAUSTIVITY	No C_i immediately dominates a C_k, when $k < i - 1$.

Using these constraints, we can derive the final devoicing opacity we found in cliticization structure. In the example /ɣeːv/+/ət/ 'give it', final devoicing of the stem first applies at the Lexical level, in the manner described above. At the Postlexical level, the ranking of non-recursivity of prosodic words (NONREC$_\omega$) and exhaustivity of phonological phrases (EXH$_\phi$) derives structure (13c). Furthermore, a standard ONSET constraint yields the correct syllabification, resulting in (17d) as the winner.

(17)

POSTLEXICAL					
	/ɣeːf/+/ət/	NONREC$_\omega$	EXH$_\phi$	ONSET	ID([voice])
a.	|((ɣeː.f)|.ət)	*!		*	
b.	|(ɣeːf)|.ət		*!	*	
c.	|(ɣeːf|.ət)			*!	
d. ☞	|(ɣeː.f|ət)				
e.	|(ɣeː.v|ət)				*!

Grijzenhout and Krämer's (2000) also derives the right winner in (17), but by other means: they use Alignment constraints of the type in (9–10). However, this analysis fails for verb stems with a complex coda, like /ʋɔrd/ 'become'. The attested form is /ʋɔrd+ət/ ⟶ [ʋɔr.tət], in which resyllabification breaks up the complex coda. However, Grijzenhout and Krämer's theory incorrectly predicts *[ʋɔrt.ət] 'becomes

it', violating ONSET. The tableau (18) shows how the unattested form (18b) (indicated by a bomb symbol) is derived, rather than the attested form (18e) (unhappy face).

(18) *Grijzenhout and Krämer's (2000) tableau incorrectly predicting [vɔrt.ət]*

		/vɔrd+ət$_{Clitic}$/	ALIGN-R(PWd)	*[+voice])$_{\omega}$	ONSET
a.		|(vɔrd)|.ət		*!	*
b.	💣	|(vɔrt)|.ət			*
c.		|(vɔrd|.ət)	*!		*
d.		|(vɔr).d|ət	*!		
e.	☹	|(vɔr).t|ət	*!		

The alignment constraints make the prosodic and lexical word coincide, which results in the wrong syllabification. There is much more to say about syllabification in Dutch than space allows here. Dutch is usually analyzed as having the Minimal Rhyme Constraint (MRC, Booij 1995: 31), requiring the rhyme of a syllable to constitute at least two moras. Consequently ambisyllabic segments are predicted. Although Grijzenhout and Krämer apparently adopt this analysis (p. 77), they include no constraints to this effect in their analysis. It is straightforward to add OT constraints to my analysis (MRC, and a markedness constraint *AMBISYLLABIC).

In addition, Grijzenhout and Krämer (2000: 77) claim that "there is no reliable means" to determine the syllabic position of stem-final consonants in clitic structures such as [ɣeːvət] 'give it'. Still, they allow the syllabification [vɔrt.ət] 'becomes it', which violates the widely-assumed constraint that syllables cannot have an initial schwa (see e.g. Booij 1995: 169). Grijzenhout and Krämer (1999) report an informal investigation of syllabification in which native speakers were asked to syllabify a small number of host+clitic combinations. Although this did not include hosts with a complex coda such as /vɔrd/ 'become', they conclude that resyllabification does not take place in those cases. They took this experiment as support for their theoretical claims on syllabification, but they did not consider several confounding factors, such as the potential role of orthography (clitics are written as separate words in Dutch). A perception experiment, in which speakers are asked to judge given syllabifications, might be more insightful.

Leaving these issues aside, I assume [vɔr.tət] is the correct form. This is indeed derived regularly in my analysis. Final devoicing takes place at the Lexical level, resulting in the output [vɔrt], subsequently the Postlexical computation proceeds as follows:

(19)

	POSTLEXICAL				
		/ʋɔrt/+/ət/	EXH$_\phi$	ONSET	ID([voice])
a.		|(ʋɔr).t|ət	*!		
b.		|(ʋɔrt)|.ət	*!	*	
c.	☞	|(ʋɔr.t|ət)			
d.		|(ʋɔrt|.ət)		*!	
e.		|(ʋɔr.d|ət)			*!

The exhaustivity constraint EXH$_\phi$ forbids structures (19ab) in which the clitic directly attaches to the phonological phrase level, 'skipping' the prosodic word.

Before turning to the voice assimilation data in section 4, let me summarize what we have found so-far. The analysis put forward in this section incorporates elements of both Booij's and Grijzenhout and Krämer's analyses. However, it overcomes problems that both theories have. My analysis has a theoretical advantage over Booij's because prosodic structures are derived in a regular way by means of prosodic wellformedness constraints from the Strict Layer Hypothesis (16). In contrast, Booij needs to stipulate and explain why the morphological structure of clitics has a certain prosodic structure and not another.

My analysis has an empirical advantage over Grijzenhout and Krämer's analysis. As I have argued, their analysis does not yield the right result for verb stems with a complex coda (see tableau in (18)), but it is derived regularly in my proposal.

4. Voice assimilation

4.1. Variation with regressive assimilation

The main challenge for phonological theories in accounting for the data on voice assimilation is the attested variation with respect to regressive assimilation in [d]-initial clitics, as in (7b), repeated below.

(7b) *(ik) zoek d'r (auto)* /zuk+dər/ ⟶ [zuktər] or [zugdər]
'I am looking for her car'

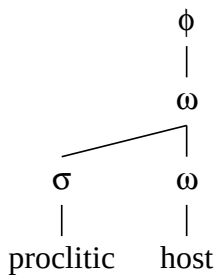
Although no quantitative data are available for this type of variation,[2] we can account for variation in OT by positing a variable constraint ranking: two constraints can be ranked freely, with the two orders generating the two variants. This can be made more explicit in frameworks such as Stochastic OT (Boersma 1998) and MaxEnt OT (Goldwater and Johnson 2003) in which constraints are assigned weights, which in turn determines the probability for certain rankings over others.

Earlier theories have analyzed the two variants in (7b) as representing two different prosodic structures for cliticization. For instance, Booij (1995, 1996, 1997)

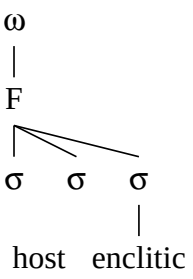
[2] But see Ernestus (2000) for other corpus research on voicing processes in Dutch.

assumes different structures for enclitics and proclitics:[3]

(20) a.



b.



Booij (1995) uses this difference to explain the variation in (7b): a clitic can either incorporate into the prosodic word of a preceding host, or attach to the prosodic word of a following host. These options give rise to different voicing behavior because of a domain span rule:[4]

(21) *Word-internal devoicing* (Booij 1995: 177)

$$[-\text{son}] \longrightarrow [-\text{voice}] \,/\, \begin{bmatrix} -\text{son} \\ -\text{voice} \end{bmatrix} \_\_\_\_$$

Domain: ω

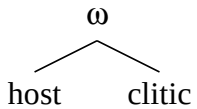
Enclitic integration now yields the [zuktər] variant, whereas proclitic adjunction results in the [zugdər] variant.

Lahiri *et al.* (1990) point out that there is a problem with such an analysis, namely that the same two variants are found when the clitic is utterance final, and there is no following host available for procliticization.

(22) Ik kies d'r. /kiz+dər/ ⟶ [kistər] or [kizdər]
I choose her$_{\text{Clitic}}$
'I choose her'

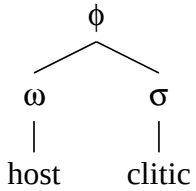
As an alternative, they suggest that the two variants are both the result of encliticization, but at different prosodic levels: incorporation into the preceding prosodic word, or attachment to it.

(23) a.



Enclitic type 1

b.



Enclitic type 2

[3] For reasons of space, I have left out proclitics from the discussion, but some C-final clitics in (4) can procliticize into their host. See section 5 for some brief remarks.

[4] The proclitic structure in (20a) does not trigger the rule, because of a Chomskyan definition of 'domain' (Booij 1995: 170).

My proposal adopts Lahiri *et al.*'s (1990) idea to model the variation as a result of different prosodic encliticization structures. However in my theory, following the same line as above, this follows regularly from the constraint ranking. In particular, the variable ranking between an exhaustivity constraint EXH_ϕ and a voice identity constraint gives the two prosodic structures and corresponding attested variants.

In (24), I give a derivation of example (22). The double dashed lines in (24) indicate variably ranked constraints. The '(☞)' symbol indicates the winner under the ranking opposite from what is printed.

(24)

	POSTLEXICAL					
		/kis/+/dər/	S-IDENT	EXH_ϕ	ID([voi])_ω	ID([voi])-OS
a.	☞	|(kiz|.dər)			*	
b.		|(kis|.dər)	*!			
c.		|(kiz|.tər)	*!		**	*
d.		|(kis|.tər)			*	*!
e.		|(kiz)|.dər		*!	*	
f.		|(kis)|.dər	*!	*		
g.		|(kiz)|.tər	*!	*	*	*
h.	(☞)	|(kis)|.tər		*(!)		*

This tableau needs some explanation. Although Grijzenhout and Krämer (2000) do not account for this variation, they do account for voice assimilation in general. I adopt their S-IDENT constraint (p. 71), a typical agreement constraint.

(25) S-IDENT: Adjacent obstruents agree in voicing.

I also use two specific positional voice identity constraints, in analogy to similar constraints of Grijzenhout and Krämer (2000):[5]

(26) $\text{ID([voice])}_\omega$: Consonants in a phonological word are faithful with respect to [voice].

(27) ID([voice])-OS: Stops in onset position are faithful with respect to [voice].

First, at the Lexical level the stem undergoes final devoicing, and the input of the Postlexical level is /kis+dər/. The two variant forms [kiz.dər] and [kis.tər] are derived by allowing two alternative prosodic structures to win. The candidates in (24) are divided into incorporation structures (24a–d) and adjunction structures (24e–h). Only the latter violate EXH_ϕ. Consequently, when the ranking is $\text{EXH}_\omega \gg$

[5] Grijzenhout and Krämer (2000:71-2) have slightly different constraints, such as IDENT-PWO (onsets of prosodic words should be faithful w.r.t. [voice]) and IDENT-STOP (stops should be faithful w.r.t. [voice]). Due to differences between the prosodic structures for clitics I assume here, and those of Grijzenhout and Krämer, I have made some small adaptations.

ID([voice])$_\omega$, the clitic incorporates into the prosodic word yielding regressive assimilation. The adjunction structure arises under the inverse ranking (ID([voice])$_\omega$ $\gg$ EXH$_\omega$). In that case ID([voice])$_\omega$ does not apply to the clitic-initial [d], since it now is outside of the prosodic word. This gives (24h) as winner.

4.2. Progressive assimilation

In the case of progressive assimilation we do not find variation. The examples in (6) do not allow a voiced cluster. The challenge is to ensure that the two constraint rankings posited in the previous section do not yield unattested variants in the case of progressive assimilation.

Grijzenhout and Krämer (2000) do not account for the variation with regressive assimilation, but they do have an analysis for progressive assimilation. They employ S-IDENT (see (25)), and IDENT-PWOS (cf. footnote 5):

(28) IDENT-PWOS: Stops in onset position of prosodic words are faithful with respect to [voice]). (Grijzenhout and Krämer 2000: 72)

Their derivation of (6b) looks as follows:

(29) *Grijzenhout and Krämer's (2000) tableau for (6b)*

		/ɣeːv+zə$_{Clitic}$/	S-IDENT	IDENT-PWOS	*[+voice])$_\omega$
a.		|(ɣeːv)|.zə			*!
b.		|(ɣeːf)|.zə	*!		
c.		|(ɣeːv)|.sə	*!		*
d.	☞	|(ɣeːf)|.sə			

In my proposal, besides the constraints introduced in (25–27), I need to add another constraint in order to account for progressive assimilation. Because the prosodic structures my analysis predicts are different from those in Grijzenhout and Krämer, their positional identity constraints (such as IDENT-PWOS) do not give the right result. I add a constraint to implement progressive assimilation:

(30) *CVF: Do not have a voiced fricative directly after an obstruent.

The Postlexical ranking is as follows, with $\sim$ indicating variable ranking:

(31) S-IDENT $\gg$ *CVF $\gg$ EXH$_\phi$ $\sim$ ID([voice])$_\omega$ $\gg$ ID([voice])-OS

Tableau (32) shows the Postlexical derivation of (6b), repeated below.

(6b) /ɣeːv+zə$_{Clitic}$/ $\longrightarrow$ [ɣeːf.sə], *[geːv.zə] 'give them'

(32)

	POSTLEXICAL					
		/ɣeːf/+/zə/	S-IDENT	*CVF	EXH$_\phi$	ID([voice])$_\omega$
a.	☞	|(ɣeːf|.sə)				*
b.		|(ɣeːf|.zə)	*!	*		
c.		|(ɣeːv|.sə)	*!			**
d.		|(ɣeːv|.zə)		*!		*
e.	(☞)	|(ɣeːf)|.sə			*(!)	
f.		|(ɣeːf)|.zə	*!	*	*	
g.		|(ɣeːv)|.sə	*!		*	*
h.		|(ɣeːv)|.zə		*!	*	*

Irrespective of the relative ordering of EXH$_\phi$ and ID([voice])$_\omega$, the same surface candidate with a voiceless cluster (32a/e) wins.

5. Conclusion

I proposed an analysis for a set of Dutch data on the interplay between cliticization and voicing that combines insights from Booij's (1995, 1996, 1997) and Grijzenhout and Krämer's (2000) earlier work. The basic tenets of my analysis are a distinction between a Lexical and Postlexical level, and the interaction of segmental and constraints governing wellformedness of prosodic structure. By having final devoicing apply at the Lexical level and clitics attach at Postlexical level, this approach takes care of the problematic data that showed opaque interaction between final devoicing and resyllabification. Following Lahiri *et al.* (1990), my analysis derives the two variants we find for regressive assimilation with [d]-initial clitics by generating two different prosodic structures. These structures are derived regularly by the variable ranking of a structural constraint EXH$_\phi$ and a positional voice identity constraint ID([voice])$_\omega$.

I have argued that my proposal compares favorably to the two previous accounts by Booij and Grijzenhout and Krämer. It is theoretically superior to Booij's analysis because prosodic structures are derived in a regular manner from violable OT constraints. Furthermore, it has a greater empirical coverage than Grijzenhout and Krämer's analysis: my proposal accounts regularly for stems with complex codas, and accounts for variation with [d]-initial clitics as well.

This analysis shows the merits of two-level Optimality Theory: it reflects the insights from Booij that clitics are in the midfield between morphology and syntax, corresponding with separate sets of morphological and phonological rules. My analysis also shows how segmental and prosodic constraints can work together to form a theoretically simple account of empirical data, giving a new approach to arguments that try to restrict such interactions (Blumenfeld 2006).

There are several points on which the theory put forward in this paper can be extended. Although most of the constraints I have discussed are standard varieties of identity and agreement constraints as well as constraints from the Strict Layer

Hypothesis, the implementation of progressive assimilation (section 4.2) using the constraint *CVF (see (30)) could arguably be reformulated in a more elegant way. However, I believe that the general idea of a constraint outranking the variably ranked ones and thereby overriding their effect is the right approach to block unattested variants from winning.

For reasons of space, I have not been able to consider certain data in my analysis. For instance the case of proclitics is discussed in Grijzenhout and Krämer (2000). For cases of simple progressive assimilation, such as /ət+zin/ 'the seeing', my theory correctly predicts [ətsin], so there is no loss of empirical coverage with respect to Grijzenhout and Krämer. However, regressive assimilation is still a problem: [ətbɑkən] 'the baking' violates S-IDENT. This problem is not particular to Grijzenhout and Krämer's approach, and is related to the unusual licensing of a disagreeing cluster. Booij, discussing clitics that consist of a single consonant only, takes the existence of such clusters as evidence that proclitics cannot be integrated into the following prosodic word (1995:177), but rather form an "obstruent appendix" to their host (1996:233). An appendix is considered to be a 'loose segment' directly adjoined to the prosodic word (Booij 1995:26ff.), and hence involves a 'double' violation of EXHAUSTIVITY. Additional constraints will have to deal with the licensing of such prosodic structures and the concomitant consonant clusters.

A second empirical point that I have not discussed is the process of intervocalic voicing (see fn. 1), a less well understood process that has been argued to be subject to individual variation and performance factors. There are indications that this process only applies to more frequent hosts (although this could not be clearly confirmed in Ernestus's (2000) corpus study), and Booij (1996) suggests that host+affix complexes that show intervocalic voicing have become lexicalized to a certain extent, and are therefore input to the Lexical level. Such an idea could be carried over to my analysis, with a different constraint ranking at the Lexical level yielding the right result.

In a wider perspective, it would be interesting to give the theoretical account of variation I have given more empirical underpinning by modeling it in stochastic variants of OT (see section 4.1); however, to my knowledge no large experimental or corpus studies have currently been undertaken that consider this type of variation in Dutch. Finally, the interaction of prosodic and segmental constraints has proven fruitful in light of the Dutch data presented here, but its theoretical appeal will become even clearer when it is applied to data in other languages and can be shown to derive empirical results there.

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Possession as Non-Verbal Predication

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1. Introduction

This paper argues that crosslinguistic variation in the forms of clausal possessive predication (1-2) arises to a large extent from the NON-VERBAL nature of possessive predication.

(1) *raam-ke paas ek hii makaan hai*
Ram-OBL.GEN near one only building be-PR[1]
Ram has/owns only one building. Indefinite possessive predication
(Hindi: Mohanan 1994:179, (63))

(2) This pen is Pat's. Definite possessive predication

As evidence, I demonstrate that possessive predication across languages shows all the variation possible for non-verbal predication in general. I show the non-verbal approach not only accounts for previously observed major strategies in possessive predication, for both INDEFINITE (1) and DEFINITE (2) possessive predication (also known respectively as HAVE and BELONG possessives), it also predicts the availability of "minor", less-frequently observed encoding strategies.

[1] Abbreviations: 1/2/3 = 1st, 2nd, 3rd person; ADESS = adessive; CL = classifier; DAT = dative; DEF = definite; FEM = feminine; GEN = genitive; INSTR = instrumental; ND = non-determinate; NOM = nominative; OBL = oblique; PR = present; SG = singular; SJ = subject.

Before proceeding, a caveat: Possession may certainly be verbally expressed, e.g. English *own*, *belong*, Japanese *motu* 'own', but not all languages have possessive verbs. In contrast, both in languages with and without such verbs, non-verbal possessive structures such as (1) and (2) may occur.

In the next two sections, I provide background on crosslinguistic variation in both the forms of possessive predication (Section 2) and non-verbal predication (Section 3). Section 4 shows that possessive predication manifests all the variation of non-verbal predication structures. Section 5 concludes.

2. Variation in possessive predication

This section introduces crosslinguistic variation in the forms of possessive predication through the lens of two important works. Heine (1997) is concerned with the conceptual sources of possessive morphemes. Stassen (2009) proposes a typology of indefinite possessive predication clauses.

2.1. Possessive morphemes have different metaphorical sources

One major source of crosslinguistic variation in possessive predication is that possessive-encoding morphology may have its source in other conceptual categories. Heine (1997) identifies eight "event schemas" for possessive predication:

(3)

Formula	Label of event schema
X takes Y	Action
X is located at Y	Location
X is with Y	Companion
X's Y exists	Genitive
Y exists for/to X	Goal
Y exists from X	Source
As for X, Y exists	Topic
Y is X's (property)	Equation

(Heine 1997:47 Table 2.1)

Among these, locative morphology in possessive encoding, e.g. in Hindi (1) above is perhaps the best-known and most-discussed (Lyons 1968:388-399, Clark 1970, Freeze 1992, among others). This work takes for granted, and does not focus on, this variation in the conceptual categories of possessive-encoding morphemes.

2.2. Variation in the forms of possessive clauses

More directly relevant to the current discussion is Stassen's (2009) morphosyntactically- (rather than conceptually-) based four-way typology of possessive predication, drawn from extensive crosslinguistic study. The four basic classes proposed are Locational, With, Topic, and Have possessives, described below. For reasons of space, each class is illustrated with only one language. Where possible, examples from other languages are given in later sections.

The **Locational** class may be exemplified by Finnish possessives, where the possesor (PSR) nominal shows locative marking (4a,b) (see also Hindi (1)), and the possessive sentence appears structurally parallel to an existential sentence (4c). Stassen includes in this class PSRs in genitive and dative case, so it is clear that, unlike Heine's approach, it is overt marking on the PSR, rather than the conceptual category of the marker, that defines Locational possessives.

(4) Finnish (Locational)

a. *Kissa on mato-**lla***
cat is mat-ADESS
The cat is on the mat. (Locative)

b. *Johni-**lla** on kissa*
John-ADESS is cat
John has a cat. (Possessive)

c. *Mato-**lla** on kissa*
mat-ADESS is cat
There is a cat on the mat. (Existential) (Data from Paul Kiparsky, p.c.)

With possessives feature a possessee (PSE) nominal with comitative marking, e.g. a *with* adposition (5).

(5) Amele (With)

*Ija sigin **ca***
1SG knife **with**
I have a knife. (Roberts 1987:81, cited in Stassen 2009:56 (44))

In **Topic** possessives (6), the PSR and PSE nominals show no marking; the clause contains an existential verb, presumed to be intransitive. The PSR is assumed to be the topic and the PSE the subject.

(6) Mandarin (Topic)

a. *Sānmáo **yǒu** yì zhī gǒu*
Sanmao have one CL dog
Sanmao has a dog. (Possessive)

b. *shù-xia **yǒu** yì zhī gǒu*
tree-below exist one CL dog
There is a dog under the tree. (Existential)

Finally, **Have** possessives (7) resemble Topic possessives in that the PSR and PSE nominals also show no marking. The main contrast between these classes is that the Have possessive clause contains a transitive verb typically descended from an Action verb of taking, seizing, grabbing etc.

(7) English (Have): Pat has a dog.

Stassen's categories correspond partially to Heine's. The main distinction between them is that Stassen's typology is confined to INDEFINITE POSSESSIVE PREDICATION (e.g. (1)) where the PSE nominal is canonically indefinite. Heine's includes DEFINITE POSSESSIVE PREDICATION (e.g. (2)), where the PSE nominal is

canonically definite. Specifically, Stassen's Locational class covers Heine's Location, Genitive, Goal (and sometimes Source)[2] possessives. Stassen's With possessives correspond to Heine's Companion schema. The Topic possessives in both proposals coincide, while Stassen's Have possessives are Heine's Action possessives. But Heine's Equation schema, which accounts for definite possessive predication, has no parallel in Stassen's system.

Stassen derives these four basic possessives and other less-frequently observed possessive encoding options from an analysis of indefinite possessives as underlyingly two existential clauses in a sequencing structure. Very briefly, possessive encoding correlates with (i) whether in a language, a temporally simultaneous clause sequence with different subjects consists of two independent clauses or if one of these clauses is subordinated; (ii) whether, in non-verbal predication, a language uses the same grammatical device (e.g. the same copula) in nominal and locative predication sentences. See Stassen (2009) Parts II-III, for the full exposition.

While the importance and scope of this work cannot be overstated, Stassen's approach leaves certain questions unanswered. For instance, it does not account for definite possessive predication. Furthermore, classifying languages as belonging to a particular typological class (Stassen 2009, 45) runs into the problem of multiple encoding strategies in the same language, whether for possessive predication, or for the proposed determinant structures such as simultaneous sequence clauses.

Implicit in Stassen's discussion is the idea that possessive predication is (at least sometimes) a non-verbal predication structure (see also Hengeveld 1992, 100). The consequences of this assumption have yet to be fully explored, though. Below, I propose that the non-verbal assumption alone accounts for much of the variation in the forms of possessive predication. I show that both indefinite and definite possessive predication clauses show the same range of variation as non-verbal predication structures. This approach is compatible with the existence of multiple possessive encoding strategies in one language. It further predicts the availability of less-frequently observed possessive clause structures.

3. Non-verbal predication

Non-verbal predication structures (NVPSs) are those in which the semantic relation need not be expressed by a verb (Dik 1980, Hengeveld 1992). Across languages, NVPSs may vary according to (i) the morphosyntactic category of the predicate phrase; (ii) the predication type of the clause (ascriptive, equative, presentative); and (iii) the kinds of verbal elements such as copulas (if any) that occur in them, and their semantic contribution. I elaborate on each point below.

[2] The Source schema is characterized by a PSR with ablative marking, and is mainly restricted to adnominal possessive expressions (Heine 1997, 64).

3.1. Non-verbal predicate categories

A non-verbal predicate may be nominal (8a), adjectival (8b), or an oblique phrase which shows some kind of adpositional or semantic case marking (8c).

(8) a. John is a carpenter. (Nominal) b. Sheila is intelligent. (Adjectival) c. John is in the garden. (Oblique phrase)

Nominal predication expresses notional categories such as set membership (8a), class inclusion (e.g. *A cat is an animal*), and identity, e.g. *John is my best friend*.

Adjectives predicate a property of an individual (8b), while an oblique phrase may express a range of relations including locative (8c), possessive (9a), accompaniment (9b), benefit (9c) etc.

(9) a. This book is John's. b. John is with Bill. c. This book is for John.

3.2. Predication type

NVPSs also fall into different categories of PREDICATION TYPE. These categories have been given different labels. I follow largely (though not entirely) the use in Hengeveld (1992) of ASCRIPTIVE, EQUATIVE, and PRESENTATIVE.

In **ascriptive** sentences, a predicate meaning is applied to a subject. This would be the category of NVPSs such as (10) and (12), with the relatively standard semantic structures in (11) and (13) respectively.

(10) Jemima is a cat. (11) $\lambda x\ [cat(x)](j)$

(12) Jemima is in the garden. (13) $\lambda x\ [\iota y\ garden(y) \wedge in(y)(x)](j)$

NVPSs may also be **equative**, indicating that two descriptions of the same semantic type have the same denotation, e.g. the classic *The Morning Star is the Evening Star*. Now, NVPSs with two definite NPs may further differ in terms of whether they are specifying or characterizing (Higgins 1979, Hengeveld 1992, 82-88), but it should be clear that at least a subset of sentences with two referring expressions of the same type can be interpreted as expressing identity. For instance, (14a) would have a semantic structure as in (14b).

(14) a. That dog over there is Fido. b. $\lambda y\ \lambda x\ [x = y](f)(that.dog.over.there)$

Finally, NVPSs may be **presentative**, the typical example being an existential sentence, e.g. *There is a boy/someone/a strange book in the room*. For current purposes, presentative sentences are best characterized in terms of their function, which I assume is to introduce or re-introduce an individual into the discourse. The definiteness effect (DE) exhibited by the post-copular nominal (the pivot) in an English *there*- existential is well-known (15).

(15) #There is my sister/everyone/the strange book in the room.
(Safir 1987, 71 (1))

A copious literature exists on how best to formally characterize the NPs that occur felicitously in this position across contexts (Milsark 1974, Barwise and Cooper 1980, McNally 1997, among others). Formal properties aside, however, there is a general recognition that there is a pragmatic component to the DE (Barwise and Cooper 1980, Abbott 1992, McNally 1997, to name a few), which Abbott (1992:9) characterizes as functioning "typically to present items to the addressee".

Drawing on these insights, I adopt a working definition of "presentative" as any construction that imposes some condition of newness or unfamiliarity on one nominal in the construction. This condition may be realized differently in different kinds of sentences. In *there* existentials, this condition shows up in part as a formal condition on the pivot. In other kinds of presentative sentences, e.g. "presentational *there*-insertion" (16) (Aissen 1975) and locative inversion (17) (see e.g. Bresnan 1994), the condition applies to the information status of the postposed nominal (e.g. it cannot be the sentence or discourse topic).

(16) a. There hangs on the office wall a picture of Edward Sapir. (Aissen 1975:1 (1))
b. There still stands on this desk the bowling trophy he won last year. (ibid.:2 (11)))

(17) a. In the corner was a lamp. (Bresnan 1994:75 (1b))
b. Among the guests was sitting my friend Rose. (ibid. (2b))

3.3. Verbal elements in NVPSs

NVPSs often contain a verbal element, although the role played by this element varies, and is not always obvious. Still, semantic relations expressed non-verbally in some languages (e.g. different kinds of property ascription, identity) may clearly also be encoded verbally either in the same language or in other languages.

Copulas

An NVPS may contain a copula (e.g. English *be*), often considered a semantically empty element, present only as a carrier of grammatical features such as tense (Lyons 1968, Dik 1980:94-98, Hengeveld 1992:73, Pustet 2003:3, though see Stassen (1997:65-76) for a critique).

Languages vary as to whether a copula is available. The copula may be verbal or non-verbal (and a bound or free morpheme) (Pustet 2003:41ff). In languages with a copula, the copula may be present or absent depending on the category of the non-verbal predicate, or on sentence tense category (Stassen 1997, 64). For instance, in Russian, NVPSs in the present tense do not allow a copula, but in all other tenses, the copula *byt* is required (Stassen 1997, 64). In Hungarian present tense NVPSs with a 3rd person subject, a copula is disallowed with a nominal predicate, but required for locative predication (Stassen 1997, 67).

Light verbs

In some languages, NVPSs of different morphosyntactic and predication categories use the same copula, e.g. English, French, Finnish. NVPSs in other languages, however, may show a "split" (Stassen 1997) based on the meaning expressed.

Often, there is a split between existential and non-existential predication (Stassen 1997). An example is Serbo-Croat, where nominal, adjectival, and locative predication show the copula *biti* "to be". Existential sentences employ the impersonal form of the verb *imati* "to have", with the presented theme occurring in the accusative case (Stassen 1997:10). In Mandarin, the copula *shì* 'be' is used in nominal predication (Li and Thompson 1981, 148), adjectival predication (p143) does not allow the copula. Existential predication uses the verb *yǒu* 'have/exist' (p509). Locative predication is expressed with the "coverb" *zài* 'be at', which shows properties of both verbs and prepositions (p356-369).

Below, I reserve the term COPULA for a verb or "linking word" in nominal predication, where one occurs. If a distinct word is used in existential predication, I refer to that word as a LIGHT VERB. This is because such verbs often evolve to express more abstract meanings, e.g. tense, aspect, modality (Heine 1997, 187ff). In what follows, I extend the range of NVPSs to include light verb predication structures (LVPSs) such as Serbo-Croat *imati* sentences and Mandarin *yǒu* sentences.

To sum up, NVPSs may vary by (i) morphosyntactic category of the predicate phrase; (ii) predication type (ascriptive, equative, presentative); (iii) whether a copula is present, and (iv) whether a light verb distinct from the copula is used.

4. The non-verbal analysis of possessive predication

I now return to possessive predication structures, showing that for both indefinite and definite possessive predication across languages, variation follows the lines drawn by NVPSs (including LVPSs). The non-verbal analysis also predicts the possibility of less-frequently observed possessive encoding options.

4.1. Major classes: deriving Stassen's (2009) basic classes

I first show how the major categories of indefinite possessive predication as identified in Stassen (2009) arise. Possession is a two-place relation, so we may reasonably expect two nominals in a possessive clause, the PSR and the PSE. Turning first to cases where there is no light verb, and where the NVPS contains an oblique phrase, this means oblique marking could fall on either PSR or PSE.[3]

Without further assumptions, this already gives us two major classes in Stassen's 2009 typology: Locational possessives (oblique marking on PSR) (4c) and With possessives (oblique marking on PSE) (5). Relevant examples from Finnish and Amele are repeated below.

[3] I presume there are general markedness restrictions against both PSR and PSE nominals showing oblique marking.

(4c) ***John-lla*** *on kissa*
John-ADESS is cat
John has a cat. (Finnish: oblique PSR)

(5) *Ija sigin* ***ca***
1sg knife with
I have a knife. (Amele: oblique PSE)

Alternatively, a light verb may be used. Disregarding whether the verb is "truly" transitive, this yields the other two members of the typology: Topic (18) (also (6)) and Have (19) (also (7)) possessives.[4]

(18) *Ahmad* ***ada*** *kereta*
Ahmad have car
Ahmad has a car.
(Malay: "Topic",
data from Hafizah Binte Jumat, p.c.)

(19) *Mannen* ***ha-r*** *en hund*
man.DEF have-PR a dog
The man has a dog.
(Norwegian: "Have" Stassen 2009:65
(87), data from Pål Kristian Eriksen)

4.2. Presence of a copula

As with other NVPSs, possessive clauses may or may not show a copula. This point is relevant only for cases where there is no light verb. Whether oblique marking occurs on PSR or PSE, there may or may not be a copula present. Both Finnish (4c) and Kabyle (20) possessives show oblique PSRs, but the former exhibits a copula while the latter does not. Similarly, both Amele (5) and Mbay (21) possessives mark the PSE, but a copula is present in the latter but not the former.

(20) *γur-s takerrust tamellalt*
at-him car white
He has a white car. (Oblique PSR, no copula)
(Kabyle: Naït-Zerrad 2001:130, cited in Stassen 2009:79 (57))

(21) *Ngōn ǐ kɔ̀ kìyā*
child is with knife
The child has a knife. (Oblique PSE, with copula)
(Mbay: Keegan 1997:77, cited in Stassen 2009:57 (52))

4.3. Extending the major classes to definite possessive predication

The same assumptions account for definite possessive predication (e.g. *This pen is Pat's*), which show almost all the same kinds of morphosyntactic variation.

Definite possessive predication may show oblique marking on PSRs, with the same range – locative (22), dative (23), genitive (24) – as indefinite possessive predication. Again, a copula may be present ((22), (24)) or not (23), but for lack of space, I do not provide examples for each case marker.

(22) *Le livre est à Jean.*
the book is at/to Jean
The book is Jean's. (French: Locative PSR, Clark 1970:1 (4b))

[4] Malay has no overt copula in nominal predication sentences, *ada* is also the existential verb.

(23) *Kamirri yila manin-ji*
that dog woman-DAT
That dog is the woman's. OR That dog belongs to the woman.
(Nyikina: Dative PSR, Stokes 1982:398, cited in McGregor 2001:342 (12))

(24) *liber est Marc-i*
book be.3SG.PR Mark-GEN
The book belongs to Mark. (Genitive PSR, Latin: Seiler 2001:33 (1b))

There are also cases of definite possessive predication realized with a light verb. Akan employs a light verb (distinct from the copula in nominal predication) in definite possessive predication (25). Indefinite possessives in Akan use the – almost identical – existential and locative verb *wɔ̀*, which has a different tone (Boadi 1971).

(25) *ntamá no wɔ́ ɔbariḿà no*
cloth that be$_{POSS}$ man that
The cloth belongs to the man. (Akan: Boadi 1971:23 (18))

Definite possessive predication shows one less kind of encoding than indefinite possessive predication: There seem to be no PSE-oblique definite possessives. I do not address this question here due to space constraints. For discussion, see Tham (ms).

4.4. Predication type in possessive sentences

Possessive predication sentences may also be ascriptive, equative, or presentative.

Ascriptive and equative meanings for possessives

Partee and Borschev (2001) argue that a definite possessive predication sentence such as *The pen is Pat's* has two possible analyses. The genitive NP could be predicative, with a type $< e,t >$ meaning ((26)), i.e. the sentence would be ascriptive.

(26) **Pat's**: λ x [R$_{POSS}$(Pat)(x)]; **type**: $< e,t >$ (Partee and Borschev 2001: (31))

Alternatively, it could be understood as an elliptical NP, potentially ranging over type e, type $< e,t >$, or type $< e, < e,t >>$ in an equative sentence. Partee and Borschev (2001) propose that definite possessive predication in Russian allows both ascriptive and equative options. In such sentences, the PSR may be in instrumental case in the past tense (27a), or it may be nominative (27b) (Partee and Borschev 2001). There is a contrast between nominative and instrumental PSRs: The instrumental PSR is synonymous with a full adnominal possessive (27a). If the PSR is in nominative case, however, it cannot be replaced by an adnominal possessive (27b).

(27) Russian definite possessive predication

a. *Éta* *strana* *byla* *kogda-to*
that-FEM.NOM.SG country-FEM.NOM.SG was-FEM.SG once
moej ***/ moja*** ***stranoj***
my-FEM.INSTR / my-FEM.INSTR.SG country-FEM.INSTR.SG
That country was once mine / my country ('possession' or citizenship)

b. *Éta* *strana* *byla* *kogda-to*
that-FEM.NOM.SG country-FEM.NOM.SG was-FEM.SG once
moja ***/ *moja*** ***strana***
my-FEM.NOM.SG / my-FEM.NOM.SG country-FEM.NOM.SG
That country was once mine / my country' ('possession' only)

This indicates the instrumental PSR in (27a) is an elliptical NP, and the possessive sentence is an equative one. The nominative PSR in (27b), however, would be a predicate of type $< e,t >$, and the sentence is ascriptive. Partee and Borschev (2001) further support this distinction with data from Polish and German.

Presentative

Indefinite possessive predication sentences in various languages show a definiteness effect on the PSE nominal, and are presentative according to the working definition proposed above. Partee (1999) shows that English *have*, like the pivot in existential *there* sentences, is infelicitous with definite or "strong" NPs (Milsark 1974):

(28) John has a/some/three/at least three/several/many/a few/no/few/at most three/exactly three sisters.

(29) #John has the/every/both/most/neither/all/all three/the three sisters.
(adapted from Partee 1999 (4)-(6))

Tham (2006) argues that this DE is imposed by possessive *have*, reflecting its presentative function. *Have* sentences with an indefinite complement nominal e.g. *Pat has a sister/a crooked nose/a pen* allow two kinds of interpretations. The most natural interpretation would be the relational interpretation with kinship and body-part nominals such as *a sister/a nose*. With a non-relational nominal, e.g. *pen*, the obvious interpretation is one of ownership or some kind of control, disposal rights, etc. I consider these as core possessive relations.

Other interpretations are possible: E.g., if some friends had adopted puppies from the same litter, *Pat has a sister* could well mean Pat adopted a puppy that is sister to a friend's puppy. Similarly, when comparing gains from a raffle, *Pat has a pen* could mean that Pat had drawn a pen in the raffle. But these interpretations, unlike core possessive relations, clearly require a context. Such contexts also allow definite complements to *have*, e.g. *Pat has the sister*. Yet, even in such contexts, indefinite complements still allow core possessive meanings: *Pat has a sister* in

the puppy context could still mean "Pat has a female sibling", e.g. if followed by *She got a puppy from the same litter*. That is, indefinite complements to *have* alone consistently yield core possessive meanings across contexts, tying possessive predication to the DE and in turn, to a presentative function.

Similar DEs in possessive clauses have been noted, e.g. in German (Heine 1997, 30) and Japanese (Tsujioka 2002). The preceding discussion shows that possessive sentences, like NVPSs, may be ascriptive, equative, and presentative.

4.5. Predictions: other encoding strategies

The non-verbal analysis predicts that other kinds of NVPSs should be found in possessive predication. Some of these structures are also compatible with Stassen's existential clause sequence approach, though the two approaches differ on others.

NP juxtaposition

Both the non-verbal and existential clause sequence analyses predict the possibility of possessive clauses that simply juxtapose PSR and PSE nominals (30) (Stassen 2009, 82-89).

(30) *ngumban-da* *wakatha* *maku* *kiyarrng-k*
2SG.POSS-NOM sister.NOM sister-in-law.NOM two-NOM
Your sister has two sisters-in-law. (Kayardild: Evans 1995, 318 (9-24))

The non-verbal analysis directly predicts such structures. As far as I understand, for the existential clause sequence analysis, these should only arise in a language where there is no existential verb, which in turn is supposed to be possible only in a language with no overt copula (Stassen 1997). Possessive sentences of this shape are thus ambiguous with nominal predication interpretations, although real world knowledge frequently constrains the interpretation to one or the other. This ambiguity may be why it is rare to find such possessive sentences (Stassen 2009).

Conjunction

Stassen (2009:89-94) reports the use of conjunction in possessive predication "in a small number of unrelated languages". The morpheme *dé* in the Galela possessive (31) corresponds to a clausal conjunction morpheme (ibid. p90 (105a)).

(31) *Ngohi* ***dé*** *ai* *tahu-ka*
1SG and my house-already
I have a house.
(Galela: Van Baarda 1908:135, cited in Stassen 2009:90 (104))

In the existential clause sequence analysis, the conjunction marker presumably reflects the presence of a clause sequence. The non-verbal analysis does not directly

predict these structures, but since a conjunction morpheme is a relational non-verbal morpheme that could potentially develop predicative status, its use in possessive encoding can be accommodated. Since conjunctions are typically non-predicative, the non-verbal approach would predict this option to be infrequent, whereas this rarity seems somewhat unexpected under the clause sequence analysis.

Affixation

The non-verbal analysis also predicts other options such as affixal stragies in languages where agglutinative structures are prevalent. Chiquitano, a genetically isolated language spoken in Bolivia (Adelaar *et al.* 2004:477ff), expresses possessive predication (32c) by "prefixing a noun with a person marking and adding *-ka* at the end" (ibid. p487). (The noun describes the PSE, person marking indexes the PSR.)

(32) Chiquitano: Affixal strategy in possessive encoding

a. *ɨriaboˇṣ-nʸi*	b. *ɨriaboˇṣ-ka-nʸi*	c. *ɪ-poː-ka*
captain-1SJ.SG	captain-ND-1SJ.SG	1SG-house-ND
I am a captain.	I have become a captain.	I have a house

(Adam and Henry (1880, 45), cited in Adelaar *et al.* (2004, 487))

McGregor (2001) notes that Jabirrjabirr, a Western Nyulnyulan language spoken on the Dampier Land peninsula in Australia, uses an applicative morpheme in possessive predication. It is not immediately clear how these examples should be handled under the existential clause sequence analysis.

Adjectival predicates in possessive predication?

Finally, Stassen (2009:137ff) suggests that With possessives may in some languages become reanalyzed as an intransitive predicate that could be seen as adjectival.

The proposal is formulated somewhat indirectly. In different languages, adjectives may pattern morphosyntactically like nouns or like verbs (Stassen 1997). Drawing on this division, Stassen (2009, 139-140) demonstrates that, in languages where a With possessive has been reanalyzed to an intransitive predicate: If adjectives pattern like verbs (e.g. they directly combine with tense and agreement markers without a copula present), the possessive predicate also patterns like a verb. If adjectives pattern like nouns (they cannot directly combine with tense and agreement markers), the possessive predicate also patterns like nouns.

The point is subtle and needs further investigation, but if correct, this suggests possessive predicates show the whole range of non-verbal predicate categories: nominal (e.g. NP-juxtaposition), oblique phrase (adpositional or oblique case), and adjectival! This conclusion would further support the non-verbal analysis.

5. Conclusion

To recapitulate, the non-verbal analysis of possessive predication, extended with light verbs, (i) provides a principled account for the morphosyntactic categories of indefinite possessive predication in Stassen (2009), and (ii) accounts for definite possessive predication in the same way, using (iii) existing generalizations about NVPSs without special mechanisms particular to possession. This suggests that the non-verbal predication structures in a language may be the key to predicting the encoding options for possessive predication in that language. Finally, (33) compares the non-verbal analysis with the typologies of Stassen (2009) and Heine (1997).

(33) The non-verbal analysis, Stassen (2009) and Heine (1997) compared

Non-verbal analysis	**Stassen (2009)**	**Heine (1997)**
INDEFINITE POSSESSIVE PREDICATION		
Oblique PSR	Locational	Locative, Genitive, Goal
Oblique PSE	With	Companion
Light verb	Topic, Have	Topic, Action
NP NP	Clause sequence	NA
Relational non-verbal morpheme	Conjunction	NA
Affixal	?	NA
DEFINITE POSSESSIVE PREDICATION		
Oblique PSR	NA	Equation
Oblique PSE predicted, not observed	NA	not mentioned
Light verb	NA	not mentioned

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Exhaustifying Focus Intervention Effects: A Crosslinguistic Study

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1 Introduction

This paper describes, from a crosslinguistic perspective, the empirical pattern of focus phrases interacting with *wh*-in-situ arguments in their scope, and provides a preliminary theoretical analysis of the pattern. It has been observed in the literature (e.g., Beck 1996, Pesetsky 2000) that an in-situ *wh*-phrase cannot be separated from its operator by a quantificational phrase or a focus phrase. Violation of this constraint would give rise to the so-called intervention effects. In the minimal pair in (1), the quantificational phrase *jede Aufgabe* in the ungrammatical (a) sentence blocks *wann* in a lower position from linking with its covert operator at the sentence-top level. No such blocking exists in the grammatical (b) sentence.

(1)	a. *Wer	hat	jede	Aufgabe		wann	gelöst?	(German)
	who	has	every	problem		when	solved	
	b. Wer	hat	wann	jede	Aufgabe		gelöst?	
	who	has	when	every	problem		solved	
	'Who solved every problem when?'							(Beck 1996)

The phenomenon of intervention effects (IE) is by no means a uniform one, especially when seen from a crosslinguistic perspective. This claim can be verified from several different angles. First, *wh*-arguments and *wh*-adjuncts in a language may have distinguished behaviors with respect to whether they are subject to IE (Soh 2005, Yoon 2011). Second, a *wh*-phrase that is subject to IE in one language may not be subject to it in another language (Tsai 1994, Ko 2005). Third, an intervener in one language does not necessarily intervene in another

language (Kim 2002, 2005, Beck 2006, Yang 2012). Against the background set by the third observation, Kim (2002, 2005) argued that among all the potential elements that trigger intervention effects, focus phrases (FPs) consist of a cross-linguistically stable core set of interveners. This generalization has been adopted by, and/or formed the empirical basis of, many subsequent works on (focus-induced) IE (Beck 2006, Tomioka 2007, Yang 2012, among others).

In this paper, I will cite examples from genetically unrelated languages to show that, contrary to Kim's (2002, 2005) claim, not all FPs trigger IE. To control for any potential asymmetry between *wh*-arguments and *wh*-adjuncts, in my discussion of focus-included IE, I exclude *wh*-adjunct questions from consideration. I will show that whether an FP is an intervener for *wh*-in-situ argument questions depends on whether the FP receives an exhaustive interpretation or not.

The paper is organized as follows. In the next section, I synthesize current literature on the exhaustive vs. non-exhaustive distinction of FPs. Certain focus strategies are exhaustive in all languages, while some other focus strategies show crosslinguistic and/or contextual variations with regard to exhaustive interpretation. In Section 3, I demonstrate that crosslinguistically, exhaustive FPs, but not non-exhaustive FPs, trigger IE for *wh*-in-situ argument questions. In Section 4, I outline a preliminary semantically-oriented account of the new pattern of focus-induced IE that has been observed in this paper. Section 5 concludes the paper.

2 An Exhaustivity-based Dichotomy of Focus Phrases

This paper classifies focus phrases on the basis of whether they are exhaustively interpreted or not. Here, the notion of "focus" is defined in terms of the property of triggering alternatives in the sense of Rooth's (1985, 1992) theory. This is in line with Kim's use of "focus" in her generalization mentioned above; so I will be comparing apples to apples when I claim that Kim's generalization over-predicts. I adopt a rather broad definition of "exhaustivity:" if an FP in a sentence *identifies or implicates* all and only the individuals of whom the predicate holds true in a relevant contextual domain, then the FP is said to be interpreted exhaustively in the contextual domain. Furthermore, if the FP receives an exhaustive interpretation in all contextual domains, then the FP is considered to be exhaustive.

The use of exhaustivity to classify FPs has a long tradition, and does not come out of the blue. É. Kiss (1998), for example, proposed two types of FPs in Hungarian that manifest different syntactic and semantic properties: the exhaustive, identificational focus and the non-exhaustive, presentational focus. According to van Rooij (2008), bare focus in languages like English is interpreted exhaustively. Beaver and Clark (2008) classified FPs from the perspective of what effects they achieve, and claimed that some focus strategies encode exhaustivity.

In this section, I offer a brief review of whether bound focus, bare focus, and weak negative polarity items (NPIs) receive an exhaustive interpretation. I claim

that crosslingustically, FPs that associate with *only* and *even*, the cleft construction, and weak NPIs are all exhaustive. On the other hand, whether bare FPs are exhaustively interpreted is subject to crosslinguistic variation and (to a lesser extent,) contextual manipulation (in certain languages). First, let us consider bound focus, which refers to FPs associated with an overt focus sensitive element. For reasons to be made clear later in this paper, I will postpone the discussion of bound FPs associated with the additive focus element *also* until the next section.

2.1 *Only*-focus

It appears rather intuitive to account for the meaning of *only* in terms of exhaustivity. This is indeed the line of analysis pursued by Zeevat (1994) and Beaver and Clark (2008). However, van Rooy (2002) raised an important question: if the meaning of *only* is reduced to exhaustification, given that bare focus phrases (in English) such as "$[\text{Bill}]_F$" in (2) encode exhaustivity as well (cf. van Rooij 2008), isn't it uneconomical to mark exhaustivity twice when *only* associates with an FP (3)? Why would one ever use *only*, at least for focus in English?

(2) John introduced $[\text{Bill}]_F$ to Sue.

(3) John only introduced $[\text{Bill}]_F$ to Sue. (van Rooij 2008: ex. 2)

In this paper, I claim that FPs associated with *only* have an inherently exhaustive interpretation all by themselves, and that *only* contributes a scalar reading. There is empirical evidence to attribute exhaustivity with *only*-focus to the FP associated with *only*, as opposed to *only* itself. Consider the following Hungarian question-answer pair (Balogh 2006). The *wh*-phrase *kik* 'who' in (4a) is plural, so the inquirer has an expectation that more than one person has called Emil. In the answer (4b), the focus phrase "Anna" is in an identificational focus position that is inherently exhaustive in Hungarian (É. Kiss 1998). If the function of *csak* 'only' in (4c) is to contribute exhaustivity, then, contrary to fact, one would expect the two answers in (4b-c) to be equally (in)felicitous as answers to (4a).

(4) a. *Kik* *hívták* *fel* *Emilt*?
who.PL called.PL VM Emil.ACC
'Who(plural) called Emil?'
b. *#[Anna]$_F$ hívta fel Emilt.* (= $[\text{Anna}]_F$ called Emil.)[1]
c. *Csak [Anna]$_F$ hívta fel Emilt.* (*csak*: 'only')

Based on data like (4), Balogh (2006) proposed that the focus sensitive element *only* itself does not contribute exhaustivity. Its function is to cancel the plu-

[1] "#" in (4b) is used to indicate that the sentence is infelicitous as an answer to (4a).

rality expectation. Moreover, exhaustivity on the FP and the cancellation of the plurality expectation by *csak* 'only' has a similar effect. Both (4b) and (4c) receive the interpretation that no one else but Anna called Emil. However, *csak* in (4c) has a pragmatic effect that the actual answer is against the inquirer's plurality expectation. *Csak* is not responsible for the exhaustive meaning; rather, exhaustivity comes from the meaning of the associated FP. The sentence in (4b) is unacceptable as an answer to (4a) because nothing cancels out the pragmatic plurality expectation. I assume that the Hungarian evidence that *only* is not responsible for the exhaustive interpretation of its associated FP carries over to other languages.

2.2 *Even*-focus

FPs introduced by the scalar additive element *even* have an exhaustive interpretation, as well. Take (5) as an example. It says that John came to the party and other people in the relevant contextual domain also came. The scalar implicature says that the likelihood of any of those other people coming to the party exceeds the likelihood of John coming. That is, from (5) one can induce that everyone in the relevant contextual domain, including the least likely John, came to the party. In this sense, *even* and *only* behave like opposites (Beaver and Clark 2008), because from (6) one can induce that *no one except John* (parallel to *everyone including John* for (5)) came to the party. The sentences in (5-6) are similar when it comes to exhaustivity. The FP "$[\text{John}]_F$" in (5) encodes the exhaustive set of partygoers by way of scalar implicature, and the FP in (6) presumably does so via semantic interpretation. In addition, just as with FPs associated with *only*, I assume that exhaustivity in (5) is attributable to the FP "$[\text{John}]_F$," not to *even*. The scalar additive *even* only serves to guarantee the right "type" of exhaustivity on the FP.

(5) Even $[\text{John}]_F$ came to the party.

(6) Only $[\text{John}]_F$ came to the party.

2.3 The Cleft Construction

The cleft construction conveys exhaustivity, as well. It is often compared to FPs associated with *only*. For the sentence in (7), native intuition has it that John was the only one who dropped the course. In this paper, I adopt Büring and Kriz's (2013) proposal that exhaustivity with the cleft construction is a product of assertion and presupposition. More specifically, a cleft sentence has a conditional presupposition whose protasis is the assertion (for positive cleft sentences) or the positive counterpart of the assertion (for negative cleft sentences). The assertion and presupposition for (7) are given in (7a-b), respectively. According to Büring and Kriz, exhaustivity comes about because the presupposition, combined with

the assertion, amounts to saying that the individuals in the extension of the predicate in the cleft sentence are all and only the individuals in the extension.

(7) It was $[\text{John}]_F$ who dropped the course.
a. assertion: John dropped the course.
b. presuppsition: If John dropped the course, no one else dropped it.

2.4 (Weak) Negative Polarity Items

There are two major types of negative polarity items (Zwarts 1995): weak NPIs (e.g., *any*, *ever*) and strong NPIs (e.g., *lift a figure*, *give a damn*). According to Krifka (1995), weak NPIs have two key properties. First, they introduce alternatives. Second, the alternatives are ordered based on semantic specificity, with NPIs denoting "a most specific element in that order" (p. 8). The first property suggests that weak NPIs resemble canonical FPs. From the second property, Krifka derived that a weak NPI is exhaustive, in the sense that it excludes all alternatives it introduces from verifying the sentence in which it occurs.

As for strong NPIs, they have been argued to involve a covert focus sensitive element *even* (Heim 1984). Because FPs associated with *even* are exhaustive, I assume that strong NPIs are focus-sensitive and exhaustive, as well. That being said, strong NPIs trigger negative bias in questions (van Rooy 2003, Guerzoni 2004), giving *wh*-questions a rhetorical "flavor" and as such, interfering with judgment of the availability of information-seeking reading. Thus, in this paper, I will not consider cases of strong NPIs being potential interveners.

2.5 Bare Focus

Whether bare focus is exhaustive is subject to crosslinguistic variation, and to a lesser extent, contextual manipulation (in certain languages). Previous works (e.g., Beaver and Clark 2008, Schulz and van Rooy 2006) have claimed that bare focus in English has an exhaustive interpretation. Roughly the same pattern exists in such languages as Korean and Japanese. Lee (2003), for example, argued that the sentence in (8), with contrastive focus on "Sam," is comparable to English "Did $[\text{Sam}]_F$ leave?" which asks whether Sam is the only one who left.

(8) *$[Sam]_F$-i* *ttena-ss-ni*? (Korean)
Sam-NOM leave-PAST-Q
'Did $[\text{Sam}]_F$ leave?' (Lee 2003)

Destruel (2009) claimed that bare focus in French is open, regarding whether it is exhaustively interpreted, and that contextual factors may help to disambiguate. The sentence in (9) is compatible with both situations where only Paul bought

Mary a watch and situations where someone else also bought Mary a watch.

(9) *[Paul]$_F$ a offert une montre à Marie pour son anniversaire.*
Paul has bought a watch to Mary for her birthday
'[Paul]$_F$ bought Mary a watch for her birthday.'

On the other hand, in languages like Mandarin Chinese and Tibetan, bare focus has an inherently non-exhaustive interpretation. There is empirical evidence in support of this claim. According to É. Kiss (1998), exhaustivity can be denied by negating the associated proposition and following it with an alternative proposition that is modified by *too* or *as well*. In a situation where Mary picked a hat, a coat, a scarf, and nothing else, an exhaustive proposition expressing that Mary only picked a hat can be denied with "no" and followed by saying that she also took a coat (10), if the hearer knew (or just thought) that Mary did so. The proposition cannot be followed by an acknowledgement and then saying that she also took a coat. For a non-exhaustive proposition, the pattern is exactly the reverse, as illustrated in (11) (in the non-exhaustive interpretation intended here).

(10) a. Mary only picked a [hat]$_F$.
b. No, she picked a coat, too.
b'. *Yes, and she picked a coat, too
(11) a. Mary picked a hat.
b. *No, she picked a coat, too.
b'. Yes, and she picked a coat, too.

Mandarin Chinese and Tibetan sentences with bare focus phrases pattern with non-exhaustive propositions rather than exhaustive propositions. This is evident from the observation that the Mandarin Chinese sentence in (12) can be followed by "Yes, he bought a printer, too," but not by "No, he bought a printer, too." Similarly, the Tibetan sentence in (13) can be followed by "Yes, he went to Shigatse, too," but not by "No, he went to Shigatse, too."

(12) *Zhangsan mai le [diannao]$_F$.* (Mandarin Chinese)
Zhangsan buy PAST computer
'Zhangsan bought a [computer]$_F$.'
(13) *Bkrashis-lags [Lhasa]$_F$-la phyin-pa-red* (Tibetan)
Tashi-HON Lhasa-LOC go- PAST-AGR
'Tashi went to [Lhasa]$_F$.'

To summarize, in this section I classified FPs based on whether they are interpreted exhaustively or non-exhaustively. Exhaustive focus includes FPs associated with *only* and *even*, the cleft construction, and (weak) NPIs. Non-exhaustive

focus shows crosslinguistic variation and to a lesser extent, contextual variation.

3 Correlation between Exhaustivity and Focus-induced IE

Recall that Kim (2002, 2005) claimed, and many works followed her work to assume, that FPs constitute a crosslinguistically stable core set of interveners. None of those works distinguished among different types of FPs. In this section, I show that crosslinguistically, a correlation exists between whether an FP is exhaustively interpreted and whether it triggers IE for *wh*-in-situ argument questions.

3.1 Exhaustive Focus

All FPs that Kim (2002, 2005) argued to trigger IE are actually exhaustive focus (excluding cases of additive *also* to be discussed later). Thus, it is relatively trivial for the current paper to show that exhaustive focus triggers IE. The following examples, taken from a variety of languages, show that *only*-focus, *even*-focus, the cleft construction, and NPIs are interveners for *wh*-in-situ argument questions.

***Only*-focus**

(14) ?* [*Mira*]$_F$-*man* *nwukwu-lul* *chotayha-ess-ni*? (Korean)
Mira-only who-ACC invite-PAST-Q
Intended: 'Who did only [Mira]$_F$ invite?' (Kim 2005)

(15) * *Seulement* [*Jean*]$_F$ *arrive* *à* *faire* *quoi*? (French)
only Jean arrive to do what
Intended: 'What does only [Jean]$_F$ manage to do?' (Mathieu 1999)

***Even*-focus**

(16) **Lian* [*Zhangsan*]$_F$ *dou* *chi le* *shenme*? (Mandarin Chinese)
Even Zhangsan DOU eat PAST what
Intended: 'What did even [Zhangsan]$_F$ eat?' (Yang 2012)

(17) *[*Kofi*]$_F$ *mpo* *bɔɔ* *hena* (Asante Twi)
Kofi even hit.PAST who
Intended: 'Who did even [Kofi]$_F$ hit?' (Kobele and Torrence 2006)

The cleft construction

(18) *Which book was it that which person read? (English)
(cf. Which book did which person read?)
(cf. Which book was it that John read?) (based on Pesetsky 2000: ex.98)

(19) **Shi* [*Zhangsan*]$_F$ *chi* *le* *shenme*? (Mandarin Chinese)
Cop Zhangsan eat PAST what
Intended: 'What was x s.t. it was Zhangsan who ate x?' (Yang 2012)

Weak NPIs

(20) ?**amuto* *muôs-ûl* *sa-chi* *anh-ass-ni*? (Korean)
anyone what-ACC buy-CHI not do-PAST-Q
Intended: 'What did no one buy?' (Kim 2002)

(21) **Pierre* *n'a* *jamais* *vu* *qui*? (French)
Pierre not has ever seen whom?
Intended: 'Who has Pierre ever not seen?' (Zubizarreta 2003)

It has been shown that bare FPs in Korean receive an exhaustive interpretation. Thus, to further illustrate the correlation, bare FPs in Korean trigger IE. The same observation holds in Japanese, a typologically similar language.

(22) **[Mira]$_F$-ka* *nwukwu-lul* *chotayha-ess-ni*? (Korean)
Mira-NOM who-ACC invite-PAST-Q
Intended: 'Who did [Mira]$_F$ invite?' (Kim 2005)

(23) ???*[Ken]$_F$-ga* *nani-o* *yon-da-no*? (Japanese)
Ken-NOM what-ACC read-PAST-Q
Intended: 'What did [Ken]$_F$ read?' (Tomioka 2008)

3.2 Non-Exhaustive Focus

In this subsection, I show that non-exhaustive FPs do not induce IE. First of all, when certain FPs in a language can have both exhaustive and non-exhaustive interpretations, only the exhaustive interpretation triggers IE. Bare FPs in French are ambiguous between being exhaustive and non-exhaustive. Zubizarreta (2003) argued that French bare FPs trigger IE *when and only when* they are interpreted exhaustively. According to Zubizarreta's idea, only when *Jean* and *Livre* in (24a-b) are "contrastively focused" and thus interpreted exhaustively are the two sentences ungrammatical.[2]

(24) a. */√ [*Jean*]$_F$ *a* *parlé* *à* *qui?* (French)
'[Jean]$_F$ talked to whom?'

[2] Zubizarreta (2003) argued for a correlation between IE and what she called "contrastive focus." "Contrastive focus" in her paper is necessarily associated with an exhaustive interpretation.

b.*/√ *Pierre a donné un* [*Livre*]$_F$ *à qui?*
'Pierre gave a [book]$_F$ to whom?' (Zubizarreta 2003)

Secondly, in Section 2 I showed that bare FPs in Mandarin Chinese and Tibetan are interpreted non-exhaustively. Correlatively, bare FPs in the two languages do not trigger IE. Take the sentences in (25) as an example. In (25a), the focus on the subject *mali* does not preclude Mary's invitee(s) from being invited by someone else (for exhaustivity on *only*-associating FPs) or everyone else (for exhaustivity on *even*-associating FPs). The FP in the sentence is not interpreted exhaustively, and (25a) is acceptable. Likewise, the FP *[shuxue]*$_F$ in (25b) does not receive an exhaustive interpretation. Thus, though it appears in a potentially intervening position, it does not trigger IE. By contrast, *mali* in (26a-b), associating with *zhiyou* 'only' and *lian…ye* 'even' respectively, is interpreted exhaustively and induces IE.

(25) a. *[Mali]*$_F$ *qing le shei*? (Mandarin Chinese)
Mary invite PAST who
'Who did [Mary]$_F$ invite?'
b. *Zhangsan xiang song [shuxue]*$_F$ *laoshi shenme*?
Zhangsan want send math teacher what
'What does Zhangsan want to give the [math]$_F$ teacher?'

(26) a. **zhiyou [Mali]*$_F$ *qing le shei?* (Mandarin Chinese)
only Mary invite PAST who
Intended: 'Who is the person x such that only [Mary]$_F$ invited x?'
b. **lian [Mali]*$_F$ *ye qing le shei?*
even Mary Emp invite PAST who
Intended: 'Who is the person x such that even [Mary]$_F$ invited x?'

A similar pattern exists in Tibetan. In this language, bare focus is not interpreted exhaustively and does not trigger IE, whereas bound focus, by virtue of being exhaustive, triggers IE. This contrast is illustrated by the sentences in (27).[3]

(27) a. *[Bkrashis]*$_F$*-lags kare slobsbyong-gnang pa-red*? (Tibetan)
Tashi-HON what study-do PAST-AGR
'What did [Tashi]$_F$ study?'
b. **[Bkrashis]*$_F$*-lags gcigpo kare slobsbyong-gnang pa-red*?
Tashi-HON only what study-do PAST-AGR
Intended: 'What did only [Tashi]$_F$ study?'

[3] *Gcigpo* is ambiguous between a focus sensitive reading 'only' and a non-focus sensitive reading 'alone.' (27b) is ungrammatical only when *gcigpo* receives the former reading.

The above discussion argued that exhaustive FPs, but not non-exhaustive FPs, trigger IE. Thus, Kim's generalization – that FPs indiscriminatively constitute a crosslinguistically stable core set of interveners – over-predicts. It follows that any analysis that takes Kim's generalization as given needs to be revised or even abandoned.

3.3 Excursion: The Special Case of *also*

It is intuitively clear that focus phrases associated with the additive focus element *also* do not have an exhaustive interpretation (Beaver and Clark 2008, Krifka 2008). Nevertheless, they trigger IE (28-29). This fact begs the following question: does *also* constitute a counterexample to the new pattern of focus-induced IE that I proposed with reference to exhaustivity? The answer is negative.

(28) *[*Lili*]$_F$-*yum* *eete* *pustakam-aane* *waayikk-ate*? (Malayalam)
Lili-also which book-COP read-NOM
Intended: 'Which book did [Lili]$_F$, too, read?' (Beck 2006)

(29) *[*zhangsan*]$_F$ *ye* *mai* *le* *shenme?* (Mandarin Chinese)
Zhangsan also buy PAST what
Intended: 'What was the thing x such that [Zhangsan]$_F$ also bought x?'

The unacceptability of sentences like (28-29) arises from the pragmatic infelicity of asking uninformative questions (Kuno and Takami 1997). The use of *ye* 'also' in (29), for example, suggests that a contextually relevant alternative individual (say Zhangsan's brother) bought the same thing as Zhangsan did. If the speaker does not know what Zhangsan's brother bought, she is not in the position to use *ye* 'also.' On the other hand, if she knows, she infelicitously asks an information-seeking question to which she already knows the answer.

4 Interaction of Focus and Exhaustivity in *wh*-questions

No existing analysis of (focus-induced) IE makes reference to the exhaustivity-based distinction of focus phrases. As such, previous analyses all fall short of the new pattern of IE that I observed in Section 3. In this section, following the spirit of Beck's (2006) analysis, I argue that focus-induced IE arises when an exhaustive focus operator "evaluates" (informally speaking) both the focus semantic value and the exhaustive interpretation of the *wh*-in-situ argument in the scope of the focus operator. In such cases, the higher Q operator associated with the *wh*-phrase has nothing to evaluate, which leads to ungrammaticality. By contrast, the focus operator associated with a non-exhaustive FP cannot evaluate the *wh*-phrase in its scope, duly leaving this job to the Q operator; hence the absence of intervention effect. I present my idea in a rather informal manner below, and leave the formal

implementation of the idea for another venue.

4.1 Background Assumptions

Several theoretical postulates are necessary for my analysis. First, focus and *wh*-questions are interpreted in a similar fashion under the Alternative Semantics framework (Hamblin 1973, Rooth 1985, 1992). According to Rooth's theory of focus, focus contributes both an ordinary semantic value and a focus semantic value. The ordinary semantic value (($[\![\Phi]\!]^{o}$)) of a sentence with an FP is the same proposition expressed by the sentence just as if the FP were not focused. The focus semantic value ($[\![\Phi]\!]^{f}$) is the set of propositions that can be obtained from the ordinary semantic value by making a substitution in the position of the FP. The ordinary semantic value itself belongs to the set of semantic alternatives.

(30) a. $[\text{John}]_F$ left. (= Φ)
b. $[\![\Phi]\!]^{o}$: λw.John left in w
c. $[\![\Phi]\!]^{f}$: $\lambda p.\exists x[p = \lambda w.x \text{ left in } w]$

Wh-phrases also introduce a set of alternatives, but different from "regular" focus, they are used to ask questions. Being interrogative in nature, they do not make an ordinary semantic contribution on their own. Rather, along the lines of Beck's (2006) proposal, it is the Q operator that evaluates the focus semantic value of a *wh*-phrase to the ordinary semantic value.

Second, I assume that a *wh*-in-situ argument question receives an exhaustive interpretation, in the sense that it asks for the complete set of individuals that meet the predication in the question.[4] Moreover, I assume that exhaustivity is encoded

[4] Beck and Rullmann (1999) and Schulz and van Rooij (2006) argued that *wh*-argument questions can receive both exhaustive and non-exhaustive readings. However, their arguments for the non-exhaustive reading of *wh*-argument questions are either pragmatic contextualization of questions, or restricted to *wh*-movement argument questions, and cannot carry over to *wh*-in-situ argument questions. One such argument comes from the observation that argument *wh*-phrases can be explicitly modified by non-exhaustivity markers like *for example* and *say*:

(i) Who, for example, was at the party last night?

However, such non-exhaustivity markers cannot modify in-situ argument *wh*-phrases. The contrast is most evident from the different grammaticality judgments of the minimal pair of French sentences in (ii). French allows both *wh*-movement and *wh*-in-situ for *wh*-questions. While the dislocated *wh*-phrase in (ii-a) is fine with being modified by *par exemple* 'for example,' the same, yet in-situ, *wh*-phrase in (ii-b) does not allow for such modification (Taylor and Pires 2009).

(ii) a. Qui par exemple (est-ce que) Pierre a invite?
Who for example did Peter invited
'Who, for example, did Peter invite?'

in the semantics of *wh*-in-situ argument questions (Higginbotham 1993, Guerzoni and Sharvit 2007), rather than being a property of their answerhood (Groenendijk and Stokhof 1984, Schulz and van Rooij 2006).

Third, *wh*-arguments consist of two components: *wh*- and an existential quantification (Baker 1970, Haspelmath 1997). In light of the Logical Form in (31), I assume that the exhaustive semantics of a *wh*-phrase is undefined. It is an operator associated with the *wh*-phrase that evaluates the *wh*-phrase from the existential interpretation to the exhaustive interpretation. There is only one operator associated with *wh*-questions, i.e., Q. It is precisely this operator that assumes the function of evaluating the existential interpretation to the exhaustive interpretation.

(31) *what* = *wh* + something

At the same time, along the lines of Beck's (2006) analysis, the ordinary semantic value of a *wh*-phrase is not defined, either. It is also the Q operator that evaluates the focus semantic value of the *wh*-phrase to its ordinary semantic value. Thus, the Q operator assumes the function of evaluating the focus semantic value of the *wh*-phrase to its ordinary semantic value, as well as the function of evaluating the existential interpretation of the *wh*-phrase to the exhaustive interpretation. The two functions are inseparable, presumably because they are the results of a single process – applying the Q operator to the focus contribution of the *wh*-phrase in its default existential form. Moreover, the exhaustive interpretation of in-situ *wh*-arguments is dependent upon their focus interpretation. Exhaustivity for an in-situ *wh*-argument amounts to selecting, from the *set of alternatives* for the *wh*-phrase, all and only the individuals of whom the relevant predicate holds true. Without the focus interpretation of the *wh*-phrase, there is no set of alternatives, and in turn, no exhaustive interpretation.

4.2 Explanation

Given the above background, we can now extend Beck's (2006) analysis to explain why exhaustive focus triggers IE, while non-exhaustive focus does not. Exhaustive FPs are associated with an exhaustive focus operator ($\sim_{exh}$). This

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b.*Pierre a invite qui par exemple?

Another argument from the above authors is that *wh*-questions can be embedded under predicates like *surprise* that do not require exhaustive knowledge of all propositions in the denotation of the *wh*-question. However, *wh*-in-situ argument questions cannot be embedded under such predicates to form a declarative sentence, as shown by the Mandarin Chinese sentence below:

(iii)	*zhangsan	jingya	(yu)	ta	didi	mai	le	shenme.
	Zhangsan	surprised	at	his	brother	buy	PAST	what

Intended: 'It surprised Zhangsan what his brother bought.'

operator, unselectively, takes as input the focus semantic value of the FP and the focus semantic value of the *wh*-phrase in its scope. Thus, it neutralizes all of the foci in its scope. At the same time, the $\sim_{exh}$ operator evaluates the default existential interpretation on the *wh*-phrase to an exhaustive interpretation. After both the alternative semantics and exhaustive evaluation of the *wh*-phrase have been "dispensed with" by the $\sim_{exh}$ operator, the higher Q operator has no appropriate input to operate on, and the resulting LF (32) is uninterpretable, leading to ungrammaticality.

(32) *[Q …[$\sim_{exh}$ [$_{\varphi}$…XP … *wh*…]]]

For non-exhaustive FPs, the associated focus operator ($\sim_{\text{non-exh}}$) is only able to evaluate the focus semantic value of the FP to its ordinary semantic value (33). It has to skip evaluating the focus semantic value of the *wh*-phrase, because, given the dependency between the focus interpretation and the exhaustive interpretation of in-situ *wh*-phrases discussed above, any operation to realize the focus interpretation of the *wh*-phrase has to realize the exhaustive interpretation of the *wh*-phrase at the same time. But the $\sim_{non\text{-}exh}$ operator cannot perform the latter function. Hence, the Q operator can duly evaluate the focus semantic value on the *wh*-phrase to the ordinary semantic value, and the default existential interpretation to the exhaustive interpretation. Nothing rules out the LF in (33); hence the absence of focus-induced IE when the FP is non-exhaustive.

(33) [Q …[$\sim_{non\text{-}exh}$ [$_{\varphi}$…XP … *wh*…]]]

Clearly, my analysis, as embodied in the schematizations in (32-33), captures the empirical pattern of focus-induced IE discussed in Section 3. It makes reference to the exhaustivity distinction of FPs and the mechanism of deriving the exhaustive interpretation for *wh*-phrases from their existential interpretation. In this respect, my proposal departs from previous analyses, including Beck's (2006).

5 Conclusions

The primary purpose of this paper is to dismiss the rather popular claim that focus phrases uniformly trigger intervention effects. With empirical data from genetically unrelated languages such as French, Japanese, Korean, Mandarin Chinese, and Tibetan, I showed that exhaustivity is a determining factor in whether a focus phrase triggers intervention effects or not. Exhaustive focus induces intervention effects for *wh*-in-situ argument questions, and non-exhaustive focus does not. No analysis of intervention effects so far has made reference to the exhaustivity distinction of focus phrases. My analysis holds that intervention effects arise when an exhaustive focus operator evaluates both the focus semantic value and the ex-

haustive interpretation of the in-situ *wh*-phrase in its scope. In such cases, the higher Q operator associated with the *wh*-phrase has nothing to evaluate, which leads to ungrammaticality. By contrast, the focus operator associated with a non-exhaustive focus phrase cannot evaluate the *wh*-phrase in its scope, duly leaving this job to the Q operator, and hence, the absence of intervention effects.

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SPECIAL SESSION
on
SPACE AND DIRECTIONALITY

Anchored to what? An anaphoric approach to frames of reference

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1. Introduction

Spatial expressions are often used to specify the location of an entity. Following Talmy (1985), that entity is called the **Figure**. In (1) the location of the ball is being specified, and therefore the ball is the Figure.

(1) The ball is behind the car.

Many spatial expressions, including *behind* in (1), specify the location of the Figure in terms of its relation to the location of another entity, known as the **Ground** (Talmy 1985). In (1), the location of the Figure (the ball) is specified in terms of its relation to the location of the car. Thus, the car is the Ground.

Spatial expressions can be classified as non-projective or projective (Herskovits 1986). **Non-projective** expressions, such as English *in* and *near*, encode non-directional spatial relations between the Figure and the Ground (see Kracht 2002

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for a detailed analysis of non-projective spatial expressions). **Projective** spatial expressions, on the other hand, relate the location of the Figure to that of the Ground in terms of a direction, as illustrated by *behind* in (1).

On one prominent reading, (1) asserts that the ball is located in a region in space in a particular direction from the car, specifically, near its back, the part where the tail lights and exhaust pipe are. The phrase *behind the car* is analyzed as denoting that region (or a set of such regions depending on the formal system; Zwarts and Winter 2000, Kracht 2008). Part of the meaning of *behind* itself is thus a function from an entity to a region. The meaning obviously must involve a direction as well, since only regions in a particular direction from the Ground can be described using *behind*. Where does this direction come from?

At least since Levinson (1996), the standard answer is that the direction comes from a frame of reference. A **frame of reference (FoR)** is a coordinate system consisting of a set of directions related to each other in particular ways. Levinson (1996, 2003) develops a typology of FoRs consisting of absolute, relative, and intrinsic FoRs, to which Danziger (2010, 2011), Bohnemeyer and O'Meara (2010), and Bohnemeyer (2011, 2012) suggest additions. In Levinson's typology, FoRs are differentiated by the ways in which their directions are determined and by which types of inference they license. In this paper, I focus on the former and ignore the latter (for discussions inference patterns associated with FoRs, see Levinson 1996, 2003 and Danziger 2010, 2011).

The entity that determines the directions of an FoR is called the **anchor**. Although Levinson (1996, 2003) assumes that only some FoRs involve anchors, Bohnemeyer (2012) argues convincingly that all FoRs require them. As an example of how anchors define FoRs, consider the intrinsic FoR, in which the Ground is the anchor and directions are determined based on its intrinsic features. Since the directions comprising intrinsic FoRs are *up*, *down*, *front*, *back*, *left*, and *right*, in order to define an intrinsic FoR, an entity must have features that can be used to define these directions. An entity like the car in (1) has such features: its canonical direction of motion, the way human users are positioned when using it, its canonical orientation with respect to gravity, etc. (see Fillmore 1975, Herskovits 1986, and Levinson 2003 for discussions direction determination). Thus, in the interpretation of (1) described above, the car is the Ground and the anchor, and the direction involved in the meaning of *behind* is part of an intrinsic FoR.

There is another reading of (1) which involves a different FoR, the relative FoR. On this reading, the region denoted by *behind the car* may not be at the car's intrinsic back. Instead, the region is near the side of the car that is farthest from the point of view of some observer, typically the speaker (consider example 1 with the continuation *so I can't see it*). On this reading, the coordinate system is defined with respect to the location of an observer looking at the car rather than features of the car itself. For example, the direction *front* is defined as the direction from the car toward the observer, *back* is defined as the direction away from the observer, etc. The two readings illustrate the difference between the intrinsic FoR, with the

Ground as its anchor, and the relative FoR, with an observer as its anchor.

In formal analyses that take FoRs into account, the meanings of projective spatial expressions are assumed to include a function from an anchor to a particular direction in a particular FoR and then another function from that direction and an entity to a region (Kracht 2008, Bohnemeyer 2012).[1] Spatial expressions are thus assumed to take anchors, not directions, as implicit arguments. Such accounts generate a new question: where does the anchor come from?

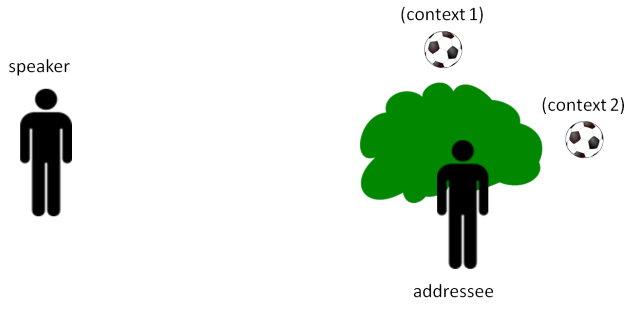
The only answer in the literature is Bohnemeyer's (2012) proposal that projective spatial expressions are indexical in the sense of Kaplan (1989), with the anchor as a parameter of the context of utterance. In this paper I argue instead that projective spatial expressions are anaphoric. I demonstrate that an anaphoric account makes better empirical predictions for projective spatial expressions in English. I then show that the anaphoric approach can be extended to account for a different type of spatial anchoring found in the meanings of non-projective spatial expressions in the Bantu language Mushunguli (Somalia).

2. Bohnemeyer's (2012) indexical analysis of spatial expressions

The difference between the two readings of (1) shows that the identity of the anchor and the type of FoR depend on the context rather than on the utterance itself. (2) also illustrates this point and demonstrates another motivation for an indexical analysis. Two contexts for (2) are depicted in Figure (3). (2) is felicitous and true in both contexts, but only on the assumption that the anchor differs from context to context.

(2) The ball is behind the bush.

(3) The speaker, addressee, Figure, and Ground in (2)



In context 1, the addressee is searching for her lost ball. The speaker, who sees the ball, utters (2) in order to help the addressee locate it, using a relative FoR with the addressee herself as its anchor. In context 2, the speaker is attempting to shoot the ball with a BB-gun, and (2) might be followed by *Please move it so that I can*

[1] In Kracht's (2008) account, the first function differs from expression to expression and takes an unspecified set of contextual factors as its argument(s). If the anchor is assumed to be the source of these contextual factors, the account is similar to Bohnemeyer's.

see it better. In context 2, the speaker is the anchor. The context dependence of the anchor and the fact that in the relative FoR the anchor is often a discourse participant (Bohnemeyer 2012) are motivations for arguing that anchors are parameters of the context, and projective spatial expressions are indexical.

2.1. Details of the indexical analysis

In the Kaplanian (1989) account that Bohnemeyer (2012) proposes, the meanings of projective spatial expressions are complex. Part of the meaning of each such expressions is a "character," or a function from contexts of utterance to contents. A context of utterance is modeled as a tuple including parameters for the speaker, the utterance time, and other elements. To this tuple, Bohnemeyer proposes to add an anchor parameter. The character of a projective spatial expression is a function that returns the value of the anchor parameter of the context, just as the character of the indexical *I* is a function that returns the value of the speaker parameter. It is this character that makes projective spatial expressions indexical.

Bohnemeyer formalizes the character of projective spatial expressions by introducing a constant, *anchor*, the denotation of which is determined by the interpretation function. In every context, the value of *anchor* is the anchor parameter of that context, c_a. Across FoRs, different expressions place different restrictions on the anchors they select, and thus on the contexts in which they are acceptable. For example, expressions involving directions from a relative FoR are said to require the anchor to be a (real or hypothetical) observer Levinson (2003: 47).

Another part of the meaning of a projective spatial expression is an "axis function," which takes the constant *anchor* as its argument and returns an ordered pair consisting of "the selected anchor and [a particular] axis projected onto the origin of the reference frame" (Bohnemeyer 2012: 25). The final part of the meaning of a projective spatial expression relates the location of the Ground to a region in space in which the Figure is located, as analyzed by Zwarts and Winter (2000). As an example of this analysis, the lexical entry for *above* is presented in (4).

(4) **above'** := $\lambda A.\lambda v.ext(v, A) \wedge c(up(anchor), v) > 0$
(Bohnemeyer 2012: 22; 25-26)

Given the space occupied by the Ground, A, (4) returns a set of vectors, v, that start at A and end external to A ($ext(v, A)$). These vectors have a component, that is parallel to the axis defined by the axis function up applied to the constant $anchor$. The component is selected using the function c applied to the axis and the vector v: $c(up(anchor), v) > 0$. Requiring the vectors v to have this component insures that each vector ends at a point that is some distance above the Ground. For Bohnemeyer, as for Zwarts and Winter (2000), a set of vectors corresponds to a region. Thus the output of (4) is a region, characterized as a set of vectors. The indexicality of the projective spatial expression is captured in the interpretation of the *anchor* constant. Bohnemeyer demonstrates that this system provides accurate

truth conditions for utterances involving a variety of FoRs including Levinson's original three types and the new "head-anchored" FoR described in Bohnemeyer and O'Meara (2010) and Bohnemeyer (2012).

2.2. Predictions of the indexical analysis

Assuming that the anchor is interpreted as a parameter of a Kaplanian context makes certain predictions. Three are listed in (5).

(5) a. The interpretation of the anchor must be determined by the context of utterance.[2]

b. Anchors cannot be quantificationally bound.

c. In a single utterance, the anchors of all projective spatial expressions must have the same interpretation.

(5a) is inherent in the definition of indexicality. (5b) is the case because parameters of the context cannot vary as quantified elements vary, the way bound variables must. Additionally, like the intensional operators (modals and temporal expressions) Kaplan (1989: 502) discusses, quantifiers are functions on contents, not contexts. (5c) is due to Kaplan's (1989: 510) prohibition against "monsters," which is his name for operators that change contextual parameters during the course of the interpretation of a single utterance. According to Kaplan, such operators do not exist in natural language.[3] Analyzing projective spatial expressions as indexicals makes the three predictions in (5). However, these predictions are incorrect, as the data in Section 2.3 demonstrate.

[2] This prediction is technically too strong. As pointed out to me by Ben Caplan (p.c.), Predelli (1998 and subsequent work) argues that the context of interpretation may differ from the context of utterance and may also be the source of the value of a contextual parameter. However, in the examples in this paper, the context of utterance and context of interpretation are identical, resulting in this simplified prediction.

[3] Recently, researchers working on languages other than English have shown that Kaplan's prohibition is too strong and have provided evidence that some operators can change parameters of the context (e.g. Schlenker 2003, Anand and Nevins 2004; Kierstead 2013; Deal to appear). Anand and Nevins (2004) and Deal (to appear) argue that some of these operators target only a single parameter of the context. The indexical account of the meanings of projective spatial expressions could be modified to include a context changing operator that targets only the anchor parameter. Bohnemeyer himself hints that such an operator may be necessary. He observes that within a single utterance different projective spatial expressions may have different anchors. He therefore proposes that each projective spatial expression is evaluated relative to a different context with a (potentially) different anchor. He does not, however, describe how the context shifts. If a context shifting operator that targets the anchor parameter exists, it behaves differently than other operators, which are often associated with propositional attitude predicates (see e.g. Kierstead 2013). Below, (9), which illustrates reference to multiple anchors in a single utterance, shows that no attitude predicate is necessary for a change in anchors to occur.

2.3. Testing the predictions of the indexical analysis

Prediction (5a) is shown to be incorrect in (6). In both examples in (6), the anchor is not an element of the context of utterance.

(6) *Context: Ernie and Jim are at school before class talking about their friends John, Marie, and Sarah, who are not present.*

a. Ernie: John told me he went bowling yesterday. When he went to the rack to choose a ball, a pink ball caught his eye, but he ultimately chose a blue ball immediately **to the right of it**.

b. Jim: Sarah told me that Marie hid her softball and bat near a large tree. Eventually, Sarah spotted the softball in a clump of grass **to the right of the tree**. The bat, on the other hand, was **behind the tree**.

Both examples in (6) involve Grounds (ball and tree) without intrinsic axes in the horizontal plane. As a result, the felicitous use of the spatial expressions *to the right of* and *behind* involve relative FoRs. On the most natural reading of (6a) the anchor is John, and the second sentence means that the blue ball was to the right of the pink one from John's perspective as he stood in front of the rack. Similarly, on the most natural reading of (6b), the bat is behind the tree from Sarah's perspective at the time at which she spotted the ball, and thus Sarah is the anchor of *behind* in (6b). In both cases, the anchor is introduced and made salient by prior linguistic content, but is not an element of the context of utterance in Kaplan's narrow sense. (6b) demonstrates that the anchor need not be mentioned in the sentence containing the projective spatial expression, provided it is mentioned previously in the discourse.

Prediction (5b) is tested in (7), which shows that anchors can be quantificationally bound.

(7) *Context: Anna is describing place settings on round tables at a dinner.*
Anna: There is a fork to the left of every plate.

In (7), as in the examples in (6), the Ground (plate) has no intrinsic axes in the horizontal plane, preventing the use of an intrinsic FoR. In the examples in (6), a single perspective can be identified, and a single relative FoR constructed, relative to which each example is true. However, in (7), because the table is round, no such perspective can be identified. There is no single location on or around the table at which an observer can be positioned such that (7) will be true of all fork-plate pairs from that observer's perspective. However, depending on how the tables are actually set, someone in the room, or even someone elsewhere who knows about the dinner, can utter (7) truthfully. This is possible only if, for each fork-plate pair, a different perspective is assumed, presumably the perspective of a hypothetical observer sitting at that place at the table. Thus, the hypothetical observer's position varies as the plate varies under quantification, suggesting that the quantification

over plates expressed by *every* binds the anchor of *to the right of*. With this quantificational binding of the anchor, the utterance is felicitous and, depending on the circumstances, true.

In addition to being quantificationally bound in single clause utterances like (7), anchor arguments can also be bound in donkey sentences. Classic donkey sentences involve a pronoun with an antecedent introduced by an NP that does not scope over the pronoun. In (8), the antecedent of the anchor of the projective spatial expression *behind* is *a farmer*, but *a farmer* does not scope over *behind*.

(8) *Context: The staff psychologist of the retirement community for farmers who have beaten donkeys at least since Geach (1962) is a guest on a television talk show. She is talking to the host about what (hallucinating) farmers see when they look out the window.*
Psychologist: Every tree that a farmer sees has a donkey behind it.

As in the examples above, the Ground in (8) has no intrinsic axes in the horizontal plane, requiring the relative FoR. The only interpretation available is the one in which a donkey is behind each tree from the perspective of the particular farmer looking at that tree. There is no salient farmer in the context of utterance, and there is no unique perspective, for example that of the speaker at utterance time, from which the direction involved in the meaning of *behind* can be defined for all relevant trees. Thus, the antecedent of the anchor is bound by the quantifier *every*. As the trees vary, the farmers vary, and so do the anchors.

Finally, (9) demonstrates that two different spatial expressions in a single utterance can involve to two different anchors, showing that prediction (5c) is incorrect.

(9) The ball is in front of the car [that is] behind the tree.

On a prominent reading of (9), the anchor of *in front of* is the car itself, yielding an intrinsic FoR, while the anchor of *behind* is a salient observer, yielding a relative FoR. This is counter to the prediction of the indexical approach, at least without an account of how the anchor parameter of the context shifts (see footnote 3). The data in this section demonstrate that indexical approach to frames of reference makes three incorrect predictions for the anchoring of projective spatial expressions.

3. An anaphoric analysis of projective spatial expressions

Instead of being interpreted indexically, I propose that anchors are interpreted anaphorically. This anaphoric analysis assumes a dynamic semantics based on the work of Kamp (1981) and Heim (1982, 1983) and its extension by Roberts (2002, 2003, 2005). In these frameworks, anaphoric expressions such as definite descriptions presuppose the existence of discourse referents. Discourse referents are informational entities present in the discourse context. As described by Roberts (2002: 16-17) the idea of discourse context in these theories is quite different from Kaplan's context of utterance, the tuple of parameters described above. The discourse

context consists of all the information that the interlocutors share, or at least purport to share. The context thus includes, for example, a set of propositions to which the interlocutors are committed and a set of discourse referents (Roberts 2012).

The presence of a perceptible entity in the context of utterance can make a discourse referent corresponding to that entity available (Roberts 2003). As a result, anaphoric expressions can have antecedents that are introduced into the context simply by being perceptible to the interlocutors. Thus, anaphoric expressions, like indexicals, can be used to refer to an individual in the context of utterance. However, unlike contextual parameters, discourse referents can also be introduced linguistically and quantificationally bound (Heim 1982, Partee 1984, 1989, Condoravdi and Gawron 1996, Roberts 2002, 2003, 2005). In addition, unlike indexicals, which select the same contextual parameters across all uses within a single utterance, anaphoric expressions can have their presuppositions satisfied by different discourse referents across multiple uses in a single utterance.

While pronouns and definite NPs are the prototypical examples of anaphoric expressions, a wide range of expressions have been shown to involve implicit arguments that are interpreted anaphorically. Partee (1984) demonstrates that the meanings of many temporal expressions, including tense, involve implicit arguments that have temporal discourse referents as antecedents. Mitchell (1986), Partee (1989), and Condoravdi and Gawron (1996) show that a wide range of open class expressions, including the locational adjective *local*, have complex meanings with anaphoric components. In (10), *local* is used to exemplify the range of antecedents available for anaphoric expressions. (10a-10c) are from Condoravdi and Gawron's (1996: 5) example (8), itself based on examples by Partee.

(10) a. A local bar is selling cheap beer.
b. A reporter from the *Times* got seriously drunk. A local bar was selling cheap beer.
c. Every sports fan watched the Superbowl in a local bar.
d. Cindy, who lives in Cleveland, watched the Buckeye game at a local bar, whereas Bill, in Cincinnati watched it at a local coffee shop.

In the examples in (10), the meaning of *local* encodes that the location of the entity denoted by its argument is proximal to some reference location, typically the location of some other entity. The meaning of local involves an anaphorically interpreted implicit argument for that reference location. In the framework assumed here, that means that the meaning of local presupposes the existence of discourse referent for the reference location.

Without any prior context, (10a) is most naturally interpreted as encoding that the bar is proximal to the location of the speaker or the speaker's home base (see Fillmore 1975 for a discussion of location at utterance time compared to home base). On that reading, the antecedent of the implicit argument of local is a discourse referent corresponding the location of the speaker, an element of the context

of utterance. On one reading of (10b), the bar is proximal to the reporter's location or home base. On this reading, the reporter's location is the antecedent. The antecedent is entailed to exist due to the existence of the discourse referent introduced linguistically by the indefinite NP *a reporter*. (10c) has a reading in which each fan watched the Superbowl in a bar that is proximal to her own location. Since fans are quantified over, the antecedent of *local* is quantificationally bound. Finally, on one reading of (10d), the implicit argument of the first occurrence of *local* is interpreted as Cindy's location, while that of the second is interpreted as Bill's location. Thus, different discourse referents satisfy the anaphoric presuppositions of different occurrences of *local*.

The similarity of the examples in Sections 1 and 2 to those in (10) motivates an anaphoric analysis of spatial expressions. On this analysis, the meanings of projective spatial expressions presuppose the existence of a discourse referent corresponding to an anchor. This analysis makes exactly the opposite predictions from those of the indexical approach given in (5), as shown in (11).

(11) a. The anchor can be introduced linguistically, and need not be determined by the context of utterance.

b. Anchors can be quantificationally bound.

c. In a single utterance, the anchors of different projective spatial expressions may have different interpretations.

These predictions are confirmed by the examples involving projective spatial expressions above. (6) confirms (11a); (7) and (8) confirm (11b); and (9) confirms (11c). The availability of anchors in the context of utterance, predicted by both accounts, is confirmed by (1) and (2).

To formalize this approach, I assume the dynamic semantics described in Roberts (2003). In that system, discourse referents are modeled as a set of numerical indices, Dom, with each index corresponding to a discourse referent. Dom is a subset of the set of natural numbers, N. There is also a set G of assignment functions, g, which are functions from N to the set of individuals. Applying an assignment function g to a discourse referent i returns an individual that verifies all of the information the interlocutors share about discourse referent i.

I analyze projective spatial expressions as presupposing the existence of a discourse referent, the interpretation of which can serve as the anchor. It is beyond the scope of this paper to determine what selectional requirements apply to anchors of particular projective spatial expressions. For example, presumably, the anchor of *west* is required to have different properties than the anchor of *behind*. As mentioned in Section 5, determining the range of such properties is the next step toward a fully developed anaphoric analysis of projective spatial expressions.

To avoid confusion and to highlight the key difference discussed here—the distinction between indexical and anaphoric interpretations of anchors—I follow Bohnemeyer in adopting Zwarts and Winter's (2000) vector space semantics, and

retain Bohnemeyer's axis functions. The lexical entry for *above* under the anaphoric analysis is given in (12).

(12) a. The use of *above* is felicitous only if there exists some $i \in$ Dom the interpretation of which can serve as an anchor, and

b. **above'** := $\lambda A.\lambda v.ext(v, A) \wedge c(up(g(i)), v) > 0$

Other than the presupposition discussed above, the only difference between (12) and the lexical entry in (4) is that in (12) the axis function up applies to the interpretation of the ith discourse referent rather than to the *anchor* constant. However, this change results in the prediction that examples (6)-(9) are acceptable, which is correct. This anaphoric analysis of the meanings of projective spatial expressions in English thus makes better empirical predictions than an indexical approach.

4. Anaphoric reference to anchors in non-projective spatial expressions in Mushunguli

In English, only projective spatial expressions presuppose the existence of an anchor. However, in the Bantu language Mushunguli (Somalia), some non-projective spatial expressions, e.g. the equivalents of English *near* and *at*, also presuppose the existence of a type of anchor.[4] In this section, I demonstrate that the interpretation of the anchors of non-projective spatial expressions in Mushunguli is best analyzed by extending the anaphoric approach developed for projective expressions in English developed above.

In Mushunguli, spatial expressions often involve the use of one or more locative morphemes (Barlew 2012; for locative morphemes in Bantu languages generally, see Ružička 1959, 1960, Ziervogel 1971, *inter alia*). Barlew (2012) demonstrates that the locative morpheme *ha-* encodes proximity between its argument, which is either the Ground or a part of the Ground, depending on the construction, and an anchor. Like the implicit argument of *local*, the anchor of *ha-* is a salient location. Obligatory proximity to the anchor is illustrated in (13), where the anchor is the location of the interlocutors.[5]

(13) *Context: A banana and a book are sitting on top of a pedestal.* ***The book is 1-2m from the interlocutors.***

i-di-boko	*di-i*	***ha-****nkhanda*	***ha-****a-i-chi-tabu*
AUG$_5$-CL$_5$-banana	AGR$_5$-COP	LOC-side	LOC-ASSOC-AUG$_7$-CL$_7$-book

[4] Mushunguli is a severely under-documented language spoken by about 23,000 people (Lewis 2009). Holman Tse p.c. observes that some native speakers find the name Mushunguli offensive, preferring the name Kizigua. However, since my consultant refers to the language as Mushunguli, I do the same. The data used in this study were collected between 2010 and 2012 during original field work in Columbus, Ohio.

[5] Mushunguli has tone, but tone has not been found to be significant for locative constructions and is not indicated in the examples here. Glosses: *agr*$_{\#}$: agreement morpheme of class #; ASSOC: associative morpheme (similar to genitive); AUG$_{\#}$: augment morpheme of class #; CL$_{\#}$: class morpheme of class #; COP: copula; LOC: locative.

'The banana is beside the book.'

(13) involves the locative phrase *ha-nkhanda ha-a-i-chi-tabu* 'beside the book' which includes two instances of the non-projective locative morpheme *ha-*, the meaning of which is similar to the meaning of English *at* but which also encodes proximity to an anchor (Barlew 2012). The first instance of *ha-* combines with the locative stem *-nkhanda* 'side' to yield the non-projective spatial relational term *ha-nkhanda* 'beside.' The proximity entailment and anchor of *ha-nkhanda* 'beside' are discussed in more detail below.

The second *ha-* combines with *a-i-chi-tabu* 'of the book,' a phrase including an NP referring to the Ground plus the associative morpheme, which is similar to the Indo-European genitive. In (13), the second *ha-* encodes proximity between the book and an anchor. Here, the anchor is the location of the interlocutors. (13) is acceptable in the context given, in which the book is 1-2m from the interlocutors, but unacceptable in a minimally different context in which the book is 25-30m from the interlocutors. A minimally different sentence without *ha-nkhanda* 'beside' displays the same pattern of acceptability across contexts.

(13) demonstrates that the anchor for Mushunguli *ha-* can be an element of the context of utterance: the location of the interlocutors. As mentioned above, such anchoring is predicted by both indexical and anaphoric accounts.

Anchoring to a previously mentioned location, predicted by an anaphoric account but not by an indexical account, is illustrated in (14). Here, the locative phrase *ku-a-u-mu-ti* 'at the tree' denotes the location of the tree, which serves as the anchor for ***ha-****a-i-di-hanshi* 'at the paper.'[6]

(14) *Context: A paper and a banana are affixed side by side to the trunk of a large tree.* ***The interlocutors have gone far enough away that they cannot see the tree.***

i-di-boko *di-i* ***ku-a-u-mu-ti*** *ha-nkhanda*
AUG$_5$-CL$_5$-banana AGR$_5$-LCOP LOC$_{ku}$-ASSOC-AUG$_3$-CL$_3$-tree LOC$_{ha}$-side
ha-*a-i-di-hanshi*
LOC$_{ha}$-ASSOC-AUG$_5$-CL$_5$-paper

'The banana is on the tree, beside the paper.'

In the context in (14), the locative phrase *ha-nkhanda ha-a-i-di-hanshi* 'beside the paper' is acceptable only when the location of the tree is mentioned in the discourse, as it is in (14). A minimally different utterance without *ku-a-u-mu-ti* 'at the tree' is unacceptable in this context. This demonstrates that the anchor of *ha-* can be a discourse referent introduced into the discourse linguistically.

The anchor of *ha-* can also be bound by quantification. This is demonstrated in (15) where the quantifier *kakila* 'always' binds the anchor argument.

[6] Unlike *ha-*, the locative morpheme *ku-* does not involve a proximity requirement. See Barlew (2012) for details.

(15) *Context: Hasani and Hamadi are at a large sale where people are selling animals. They notice that the cows and the pigs are beside each other.* ***Hasani, who has not been to one of these sales, asks Hamadi, who goes to many of them in various villages, if it is normal for the pigs to be beside the cows.*** *Hamadi responds:*

i-zi-nguluwe ***kakila*** *zi-i* *ha-nkhanda* ***ha-****a-ny-ngombe.*
AUG_{10}-CL_{10}-pig always AGR_{10}-COP LOC-side LOC-ASSOC-CL_{10}-cow

'The pigs are always beside the cows.'

In (15), there is no single location such that all of the sets of pigs and cows quantified over is proximal to it. Nevertheless, the example, with the locative phrase *ha-nkhanda ha-a-ny-ngombe* 'beside the cows,' is acceptable. This acceptability indicates that the anchor varies with each instance of pigs being beside cows.

Thus far, I have ignored the anchor of the *ha-* in *ha-nkhanda* 'beside.' (16) provides evidence that, in phrases such as *ha-nkhanda ha-a-i-chi-tabu* 'beside the book' in (13), the *ha-* in *ha-nkhanda* 'beside' does not necessarily have the same anchor as the *ha- ha-a-i-chi-tabu* 'at the book.' The context in (16) is similar to that in (13), except that instead of a banana beside a book (16) involves a cloth beside a tree. The examples differ in that in (16) the only *ha-* is in the word *ha-nkhanda* 'beside,' which allows the anchoring of that *ha-* to be investigated independently of the anchoring of the following word.

(16) *Context: An cloth is on the ground a few centimeters from a tree.* ***The speaker and the addressee are standing 30-35m from the side of the tree opposite the cloth.***

i-i ***ha-****nkhanda ku-a-u-m-ti*
AGR_9-COP LOC_{ha}-side LOC_{ku}-ASSOC-AUG_3-CL_3-tree

'It [the cloth] is beside the tree.'

(16) shows that, when the only *ha-* is in *ha-nkhanda* 'beside,' the location of the Ground may be distant from that of the interlocutors. Thus, (16) differs from (13), which has two instances of *ha-* (***ha-****nkhanda* ***ha-****a-i-chi-tabu* 'beside the book'), and which is acceptable only if the Ground is proximal to the location of the interlocutors. Assuming a unified analysis of *ha-*, the *ha-* in *ha-nkhanda* 'beside' in (16) must have an anchor. The anchor is not the location of the interlocutors but rather the only other salient location in the discourse, the location introduced linguistically by *ku-a-u-m-ti* 'at the tree.' The meaning of *ha-nkhanda* 'beside' in (16) thus encodes that the side of the tree, denoted by *-nkhanda* 'side,' is proximal to the location of the tree.

If meanings compose in the same way across examples such as (13) and (16), the fact that the anchor of *ha-* in (16) is the location denoted by *ku-a-u-mu-ti* 'at the tree' suggests that the *ha-* in *ha-nkhanda* 'beside' in (13) is anchored to the location

of the book, denoted by *ha-a-i-chi-tabu* 'at the book.' The *ha-* in *ha-a-i-chi-tabu* 'at the book,' on the other hand, is anchored to the location of the interlocutors, as shown above. Thus, taken together, (13) and (16) suggest that two instances of *ha-* in a single utterance may have different anchors, just as two projective spatial expressions in English may have different anchors, and just as is predicted by an anaphoric account.

The examples in this section demonstrate that anchors for the Mushunguli non-projective spatial expression *ha-* display the same range of interpretations as anchors of projective spatial expressions in English do. An anchor can be a salient location in the context of utterance or a location referred to previously in the discourse, an anchor can be quantificationally bound, and a given utterance can involve more than one anchor. Thus, both the Mushunguli data and the English data match the predictions of an anaphoric account rather than those of an indexical account.

5. Conclusions

In this paper, I have argued that reference to anchors in spatial expressions is anaphoric. I have demonstrated that range of interpretations possible for the anchors of spatial expressions can be accounted for by assuming the anchor argument is interpreted anaphorically, rather than indexically. However, the details of the anaphoric analysis of spatial expressions have yet to be worked out. In particular, I have not given an account of the factors that make one discourse referent more likely than another to be the antecedent of a spatial expression. In contrast, in her anaphoric analysis of English definite NPs, Roberts (2003) delineates presuppositions associated with definites which, combined with a suitable theory of discourse structure such as that in Roberts (2012), can be used to predict which discourse referent will satisfy the presuppositions of a given definite NP, given a discourse context. Discovering the details of the anaphoric presuppositions encoded by particular spatial expressions constitutes the next step in developing the anaphoric account of their meanings.

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Here and Now: Mapping Space and Time in a Four-Part Frame of Reference Typology

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1 Introduction [1]

In many languages, terminology which was originally devoted purely to space also serves in the expression of temporal or other relations (as in English *before the winter*; *distant kin*, and so on). This kind of evidence has led to the widespread conclusion that spatial representation, both linguistic and cognitive, naturally underlies and informs the representation of other domains, in a relation that is explicitly understood as metaphorical (Lakoff 1980, Langacker 1987). But the similarity between the linguistic representation of space and that of other domains may be present at the level of the nature of the relationships which are involved (Gentner 1983, Danziger 1996) rather than at the lexical level. I will demonstrate here that we may see profound analogies between the language of space and that of other domains, even when there is no vocabulary in common across the domains. The analogies in question therefore do not clearly have the status of metaphors.

I will apply the distinctions of a four-part spatial frame of reference typology (Danziger 2010) to the language of temporal sequence, arguing that the two

[1] My thanks are due to the Mopan and Chol speakers whose expertise, both explicit and implicit, informs the conclusions of this paper. I am also deeply grateful to Lydia Rodriguez for permission to publish the words and gestures of example (8). Any infelicities in the presentation or interpretation of that material are my own responsibility. A great debt is owed to the members of the Cognitive Anthropology Research Group of the Max Planck Institute for Psycholinguistics 1991-1998, and to my colleagues in the Linguistic Anthropology Seminar at the University of Virginia. Finally, I thank the organizers of the 2013 Meetings of the Berkeley Linguistics Society.

intersecting conceptual dichotomies which make up the four cells of the spatial typology have precise analogies in the literature which discusses the language of time. This means that the two-by-two matrix of the four-part spatial typology can also be used to delineate four types of temporal reference, which in turn should have logical and cognitive properties that parallel the four types of spatial reference. I'll look at an example of the gestures that accompany speech in a Mayan language, literally to see that the proposed analogies hold. I'll conclude that in the relational analogy between space and other domains, space itself does not emerge as primary or basic relative to the others. Instead it is the social-subjective situation of speech which plays this pivotal role.

2 Extrinsic and Intrinsic Frames of Spatial Reference

Consider the following simple scene: [2]

(1) Man and Tree scene

Now consider the upside-down scene below. The question is, does Figure 2 represent the same scene as the one shown in Figure 1? To solve this kind of problem, many people (Shepard and Cooper 1986) mentally rotate the second scene through an invisible medium external to it, which we can call "space." Once the two scenes are mentally oriented the same way, it is possible to visually assess them, and consider whether a spatially anchored proposition true of one scene is also true of the other: for example whether in both cases *the tree is to the left of the man*. A different strategy however (Just and Carpenter 1985), makes use of the internal parts of the scene, in a way which does not require mental rotation through any invisible external medium. In this case, the proposition to be evaluated for both scenes would be something like *the tree is in front of the man*.

[2] Figure 1 and the manipulations thereof in Figures 2 and 3 are copyright of the Cognitive Anthropology Research Group at the Max Planck institute for Psycholinguistics, and are reprinted here with permission Figures 6-8 are copyright of Eve Danziger and are printed here with permission.
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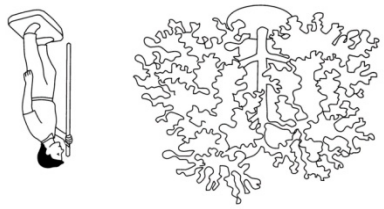
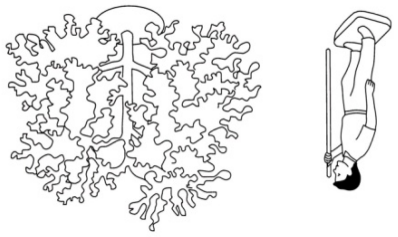
(2) Upside-down Man and Tree scene



Two alternative frames of reference can thus be used to solve the puzzle. Let's call them, respectively, Extrinsic and Intrinsic frames of reference (O'Meara and Pérez Báez 2011). These two types of frames have some components in common. In both cases, there is an item whose location is being specified (here, the tree), which we can call the Figure (Talmy 1983). And in both cases there is another item in terms of which the Figure is being located (the man), which we can call the Ground (Talmy 1983). But Intrinsic and Extrinsic frames of reference also have some interestingly different components, and consequently some different logical and semantic properties (cf. Levelt 1984). In particular, the Intrinsic strategy may yield a solution to the puzzle exemplified in Figures 1 and 2 which the view from an Extrinsic frame of reference would reject. This would happen, for example, in the case where the second, upside-down scene actually showed a mirror-image of the original (Levinson and Brown 1994, Danziger 1996, 1999). In that case, the tree might still be *in front of* the man but it would not be *to the left of* the man once the two scenes were positioned in identical orientation with respect to the viewer.

(3) Mirror-image of Upside-down Man and Tree Scene.



The mirror-image immunity of Intrinsic frames of reference is due to the fact that propositions formulated exclusively in Intrinsic frames do not make use of any reference points external to the Figure-Ground scene. Propositions framed in Extrinsic frames of reference on the other hand, criterially include a third component in addition to Figure and Ground, which is easily distinguishable from both,

and which is used (among other things) to distinguish mirror-image reflections from one another (Van Cleve and Frederick 1991). This third point is one which we can call an Anchor. It is the zero point from which the vector that runs from the Ground toward the Figure originates. So, in *the tree is to the left of the man* as applied to Figure 1, 'leftness' is calculated not from the tree or from the man, but from one of the participants in the viewing/ speaking scene. As long as that participant Anchor does not him or herself rotate, this point will remain fixed even if the components of the Figure-Ground scene undergo inversion. This is what allows for the calculation that a scene and its mirror-image reflection are distinct -- a key hallmark of Extrinsic frames of reference.

All propositions framed within Extrinsic frames of reference include the three distinct components of a Figure, a Ground, and an Anchor which is separate from both. Extrinsic frames are sometimes called "Ternary" frames for this reason. Propositions framed within Intrinsic frames of reference have Anchors too – they clearly also specify a vector from which Figure is located with respect to Ground, and this vector must have a starting point. But in Intrinsic frames, by definition, the Anchor is identified with the Ground object itself - often, as in our example, with a part or facet of the Ground entity (*front*). So propositions framed in Intrinsic terms only have two distinct components: the Figure, and a Ground which also functions as the Anchor. Sometimes Intrinsic frames are called "Binary" frames for this reason.

3 Allocentric and Egocentric Frames of Spatial Reference

As an alternative to anchoring the Extrinsic spatial proposition in a speech participant's body (*left*), a geographical landmark or an abstract cardinal point may also be used as a scene-external Anchor. We might calculate, for example, that the tree was *south* or *seawards* or *downstream* of the man in Figure 1 (Haviland 1998). Extrinsic Anchors, in short, can be either Egocentric (inside the speech situation), or Allocentric (outside the speech situation). Similarly, the spatial Anchor of an Intrinsically framed proposition may be located either outside the speech situation (Allocentric) or within it (Egocentric). Since in Intrinsic frames the Ground is by definition identical to Anchor, Allocentric Intrinsic propositions have their Anchor - and therefore also their Ground - outside the speech situation (*the tree is in front of the man*) whereas Egocentric Intrinsic propositions have their Anchor - and therefore also their Ground - within the speech situation (*the tree is in front of me*).

The insight that Extrinsic frames were to be defined on the basis of the speech-situatedness of Anchor, rather than on that of Ground has been immensely important in developing the precursors to the current typology (Levinson 1996). This operating rule means, for example, that a proposition such as *The tree is north of me* belongs in an Extrinsic frame of reference (Anchor in cardinal

direction grid: *north*), despite the fact that it makes explicit reference to a speech situation participant. But this insight was not at first extended to the Intrinsic frames of reference (Pederson et al. 1998, Levinson 2003). Researchers have for some time been operating with the three-part typology (Relative, Absolute, and 'Intrinsic') that results. But applying the logical distinction between Egocentric and Allocentric Anchors to the Intrinsic as well as to the Extrinsic frames to produce a clear two by two matrix not only accords better with the rotation sensitivities that motivate the typology (Danziger 2010), but, as we will see, clarifies the possibilities for analysis of space-time mappings.

4 A Four-Part Typology

Two separate dichotomies have been identified which distinguish among different spatial frame of reference types involving Figures located with respect to Grounds. First, the vector from Ground to Figure may be calculated from an Anchor point within the Figure-Ground scene itself (Intrinsic), or from somewhere outside that scene (Extrinsic). Second, the Anchor may be located either within the speech situation (Egocentric) or elsewhere (Allocentric). These two dichotomies are in principle independent of one another, and yield four distinct outcomes. Figure 4 maps these outcomes, using the conventional nomenclature for the Extrinsic frames of reference ('Absolute/ Relative') which has been established in the earlier, three-part versions of similarly based typologies (Pederson et al. 1998, Levinson 2003). Speech-situated deictic demonstratives and locatives (e.g. *over there!*) may in most cases be typed as belonging to the Direct frame, as long as their obligatory accompanying vector-specifying pointing gestures are considered part of the overall spatial proposition (Danziger 2010).

4.1 Spatial Language and Conceptualization

Languages differ in the extent to which the different frame of reference types are likely to be spontaneously employed in a given spatial reference context (Pederson et al. 1998). For example, Mopan Maya, an indigenous language of Eastern Central America, uses only Intrinsic Frames of Reference to refer to Figure-Ground relations which are arrayed across the speaker's line of vision (Danziger 1999). Example (5) shows a representative Mopan utterance used to describe an arrangement like that in Figure 1.

The existence of languages like Mopan demonstrates that, while Intrinsic frames of spatial reference are present in every language, Extrinsic ones are historically and typologically optional. Intrinsic frames of spatial reference in language are also early and spontaneously acquired by children, whereas Extrinsic ones – if they are acquired at all -- come later in childhood, and often require

explicit instruction (Piaget 1928, de León 1994, Danziger 1998). Of the two

(4) Table of Four Spatial Frame of Reference Types

Where's the tree?	Allocentric Figure-Ground vector is calculated from outside the speech situation	Egocentric Figure-Ground vector is calculated from within the speech situation
Extrinsic Figure-Ground vector is calculated from beyond the Ground	**Absolute** *The tree is to the east of the man.* OR *The tree is to the north of me.*	**Relative** *The tree is to the right of the man.*
Intrinsic Figure-Ground vector is calculated from within the Ground	**Object-Centered** *The tree is in front of the man.*	**Direct** *The tree is in front of me.* OR The *tree is over there (with pointing gesture).*

Intrinsic frames, encoding of Direct spatial relations (*in front of me*) is earlier (Johnston and Slobin 1979, Danziger 1998). Direct-framed deictic demonstratives acquired across languages than that of Object-Centered ones (*in front of the kettle*) and locatives are acquired earliest of all (Tanz 1980).

(5) Mopan Maya (Danziger 1999). [3] Allocentric Intrinsic Relations in Space

Ka'	*a-käx-t*	*a*	*nene'*	*tz'ub'*
COMP	2A-seek-TR	DET	little	child

'You should find the little child

a	*t-u-taan*	*ke'en-Ø*	*t'op=o*
REL	PREP-3A-chest	be_located-3B	flower=EV

who has the flower at his front.'

[3] Orthography in Mopan and Chol examples is that of the Academía de las Lenguas Mayas de Guatemala (England and Elliott 1990). Values are as in IPA except: ä = mid-central vowel; x = voiceless alveopalatal fricative; j = voiceless glottal fricative; tz = voiceless alveolar affricate; ch = voiceless alveopalatal affricate. Apostrophe denotes glottal stop after a vowel, or glottalization of the preceding consonant. Interlinear glossing conventions follow the Leipzig conventions available at http://www.eva.mpg.de/lingua/resources/glossing-rules.php. Departures from these conventions are as follows: A = actor of transitive, argument of active intransitive, or possessor; B = patient of transitive, or argument of inactive intransitive; ENCL = enclitic; EV = prosodic echo vowel; NPRF = nonperfective; PREP = preposition.

At the conceptual level meanwhile, the particular configuration of spatial frames of reference that is used in a given language is correlated, Whorf-style (1956 [1940]), with the preferred strategies for spatial problem-solving among speakers of that language (Pederson et al. 1998, Levinson 2003). It is now understood for example, (Verhaege and Kolinsky 1991, Danziger and Pederson 1998) that the perceptual intuition that forms and their mirror images should be categorized as distinct is not an automatic maturational development in childhood, but must be non-necessarily acquired through explicit teaching or other cultural experience - such as that with Extrinsic frames of spatial reference. The cognitive correlates of Mopan Intrinsic-only habits of speech, for example, include mirror-image immunity in non-linguistic perceptual categorization of both two-dimensional and three-dimensional forms (Danziger 1999, 2011).

Typological and psychological lines of evidence thus converge to suggest that systematic relations of priority obtain worldwide among the four frames of the spatial frame of reference typology. A primary identity of Anchor, Ground and Speech Situation (Direct frame) is the first to appear, and forms expressing this configuration are universal across languages. In due course, the Direct frame is universally deconstructed to allow for a Ground/Anchor that is not the situation of speech (Object-Centered Frame). Subsequently, and only if it is culturally required, Ground may be separated from Anchor, to yield one or both of the Extrinsic Frames. Primary relations of identity among several key frame-of-reference components in Direct frame usage are thus progressively exploded to yield first Allocentric and then, optionally, Extrinsic frames.

4.2 Temporal Relations

If we are to use the spatial frame of reference typology to discuss the relational analogies between representations of space and those of time, it will be necessary to find equivalents for the three crucial components of frame of reference types in space: namely Figure, Ground and Anchor. It will also be important to maintain the key insight that the speech-situatedness of Anchor rather than that of Ground is always (and not just for Extrinsic frames) criterial in the typology. Reichenbach's (1947) terminology for temporal relations provides a useful starting point. His Narrated event (E: the moment to be located) is a good analogue of the spatial Figure, and his Reference event (R: the moment with respect to which a Narrated event is located) can be seen as an analogue of spatial Ground. In the English locution in (6), making breakfast is the 'Ground' event (R), against which sweeping, the 'Figure' event (E), is temporally located (see also Jacobson 1990, Kockelman 2007).

(6) English
I swept the house after I made breakfast.

Reichenbach also provides us with another important concept – that of the Speech event (S: the moment of utterance). The grammatical past tense in example (6) temporally locates both Narrated (E) and Reference (R) events at a time prior to the moment of utterance. The vector-specifying *after* makes use of this speech-situated Anchor to locate the Figure (E: the sweeping) with respect to the temporal Ground (R: the breakfast-making). Reichenbach devotes considerable attention to working out the possibilities in which Reference event is and is not identical with Speech event in the English tense system. His work is thus especially valuable to the analogy with spatial frame of reference types, in that it makes the key typological move of clearly separating at least one value of the temporal equivalent of spatial Anchor (that is, the speech event, S) from that of the temporal equivalent of spatial Ground (R). In the terms which we have been using, Reichenbach was deeply concerned to separate Intrinsic (S = R) temporal locutions from Extrinsic ones (S ≠ R).

But Reichenbach does not discuss the possibility of an Extrinsic temporal Anchor which might be drawn from outside the speech situation (for example, perhaps a specific calendric event, or an event in mythical time). To get full compatibility with the spatial frame of reference typology, it will be necessary to add to the repertoire of Reichenbachian terms a higher-level concept, corresponding to Anchor more abstractly, of which S (speech event) will be only one possible value. Other theorists of temporal language (McTaggart 1908, Klein 2009) have seen more clearly the possibility of such a non-speech-situated temporal Anchor. McTaggart (1908), for example, famously separated the speech-situated "A-Series" of temporal expressions from the non-speech-situated "B-series," thus distinguishing what in the current terminology could be characterized as Egocentric and Allocentric frames of reference. In that tradition, however, the analogue of spatial Anchor is not always clearly distinguished from that of Ground, thus eliding the clear distinction between what we would like to call Extrinsic and Intrinsic frames of reference.

In the literature on the language of time, in short, two distinct dimensions of contrast are separately discussed (see Nunez and Cooperrider 2013 for recent review), without being brought into alignment with one another. To put it in the terms we have been using, on the one hand (Reichenbach 1947, Jakobson 1990, Kockelman 2007), the question of whether Ground is or is not identified with Anchor (the Extrinsic-Intrinsic contrast) is thoroughly investigated, but any extrinsic Anchor is always understood to be speech-situated (Egocentric). On the other hand (McTaggart 1908, Klein 2009), the question of whether the Anchor is or is not speech-situated (the Allocentric-Egocentric contrast) is closely explored, but less attention is paid to the relations of Anchor with Ground.

We can marry these two axes, thus creating a two-by-two matrix for sequence in time that is directly analogous to the four-part frame of reference typology for location in space. Figure 7 presents this arrangement. Preserving the analogy with Figure 4, notional names (Eternal, Personal, Event-related, and Instantiated) are proposed for the four temporal frame of reference types that result. (While this arrangement clearly does not exhaust the possible avenues along which the linguistics of time can be examined (Comrie's (1985) distinction between Absolute and Relative tenses for example, is not captured by Figure 7, and the question of "movement through" time (Tenbrink 2011) is also not addressed), this matrix incorporates many of the existing key understandings about language and time, while also bringing those understandings into clearer relation with one another.

(7) Table of Four Temporal Frame of Reference Types

When?	Allocentric Narrated event to Reference event vector is calculated from outside the speech situation	Egocentric Narrated event to Reference event vector is calculated from within the speech situation
Extrinsic Narrated event to Reference event vector is calculated from beyond the Reference event	**Eternal** *on February 15, 2013.*	**Personal** *after breakfast.*
Intrinsic Narrated event to Reference event vector is calculated from within the Reference event	**Event -Related** *as soon as breakfast is made.*	**Instantiated** *right now.*

I now proceed to use what is already known about spatial conceptualization in the four frames to consider whether the parallel mapping of time and space in this way has psychological reality. In particular, I follow out the consequences of the fact that in spatial reference, propositions formulated in Intrinsic frames of reference are characterized by immunity to mirror-image reversal.

5 Frame of Reference Conceptualization in the Language of Time

Temporal reference in Yucatec Maya (Bohnemeyer 1998) and in Chol Maya (Rodriguez 2014) has in recent years been fully described. In many cases of

temporal reference in these tenseless languages, the temporal Anchor from which the relation of the Reference event can be calculated to the Narrated event is located purely in the Reference event itself (Intrinsic). If, as in example (8) below, the Reference event is located outside the speech situation, the temporal locution can, in the terms of Figure 7, be characterized as Allocentric Intrinsic.

(8) Chol Maya (Rodriguez 2014). Allocentric Intrinsic Relations in Time

tyech-e-Ø *k-juch'- Ø-e* *k-sa'*
begin-TR.PRF-3B 1A-grind-INTR.NPRF-ENCL 1A-pozol
'I begin to grind corn (for) my *pozol* ('corn-based drink').'

tyech-e-Ø *k-juch'-Ø -e* *k-waj*
begin-TR.PRF-3B 1A-grind-INTR.NPRF-ENCL 1A-tortilla
'I begin to grind corn (for) my tortillas.'

Mi *kaj* *tyi* *pechom*
IPFV start PREP shape.tortilla
'I start to shape tortillas.'

Ujty-i-Ø *pechom,*
Finish-INTR.PRF-3B shape.tortilla
'Tortilla-shaping being finished,

Mu=x *kaj* *tyi* *misuj-el* *pejtyel* *jiñi*
IPFV=already start PREP sweep-NMLZ everything DET
I at once start sweeping and everything – that's it.'

Recall that when dealing with spatial representations, the mirror-image immunity that attaches to locutions like that in example (5) by virtue of its Intrinsic structure extends to the cognitive level (Danziger 1999, 2011), so that Mopan speakers like the author of example (5) intuitively classify mirror-image forms and their reflections as alike. If the frame of reference analogy extends to conceptualization in the temporal realm, then the sequential relation that connects the events of example (8) should show an analogous immunity.

Spontaneous speech-accompanying gesture that accompanies talk could be valuable in literally showing us whether this is the case. In Mayan languages as elsewhere, spontaneous gestures pattern with choice of spatial frame of reference (Haviland 1993, Danziger 2010, LeGuen 2011). And since gesture takes place in space, we can use it to identify the type of cognitive frame of reference that is in play, even when spatial language is not employed (Kita et al. 2001). It should be possible to examine the literally spatial configuration of gestures that accompa-

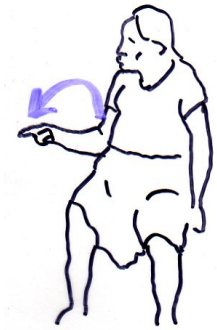
nies temporal speech for the logical characteristics which we know to distinguish among the different frame of reference types in space. More concretely, and with specific reference to (8), if the fact that tortilla-shaping comes after corn-grinding is spatialized in any one gestural direction, this should not necessarily mean that a gesture encoding the fact that sweeping comes after tortilla-shaping must continue in the same direction. A reverse direction (mirror image) would do just as well.

The Chol utterance in example (8) was in fact accompanied by a series of gestures which appear to indicate the time relations between the events (Rodriguez 2014). The gestures were not motivated by props and locations in the co-present context and do not iconically represent the activities named. The first event (*juch'* 'grinding corn') is verbalized twice (grinding corn for drink, grinding corn for food), and is accompanied by two beat gestures, made in rhythmic succession in the same location.

(9) 'I start to grind for tortillas'

The second event (*pechom* 'shaping tortillas') is gestured far to the right -- arriving there via an arc-shaped, clearly non-beat gesture.

(10) 'I start to shape tortillas'



The earlier event in the sequence (grinding) is thus depicted gesturally to the left of the later event (shaping tortillas). If this sequence shows mirror-image distinction, we would now expect that the third event, the end of making tortillas, which is coincident with the sweeping event (*misuj-el*), would be gestured even

further to the right. But this third event is actually gestured with another marked arc gesture back to the left, thus showing mirror-image immunity in the gesturing of sequential temporal relations (Figure 11).

(11) 'Tortilla-making being finished,'

This example is part of a significant corpus of similar data (Rodriguez 2014) which is dedicated to making a wider point about the nature of time concepts in Chol (see also Le Guen and Pool Balam 2012 for related data from Yucatec Maya). There are no explicit spatial metaphors in this particular example, but the gesture configuration is enough to demonstrate that this temporal locution has the logical-conceptual properties (mirror-image equivalence) which are associated with its corresponding frame of reference type (Allocentric Intrinsic) in the spatial typology.

6 Conclusion

I have shown that the heuristic of a four-part spatial Frame of Reference typology can be used to uncover profound analogies between representations of space and those of time, even where lexical metaphor is not involved. Evidence from speech-accompanying gesture suggests that the analogies so uncovered have psychological reality. But the analogy between space and time here gives no evidence that space has the privileged or basic position. Rather, the analogy is evidence of structural commonalities in how people talk and think about relationships, which go beyond the content of any one relational domain. Space emerges as only one a series of parallel domains which have in common that they exploit the intersection of two dichotomies to unpack the contrast possibilities inherent in the Egocentric Intrinsic frame of reference case -- that primal case in which Ground and Anchor both converge on the situation of speech. And that suggests, finally, that the baseline for the type of linguistic cognition we are talking about is not grounded in physiological experience of the physical world, but in interactional experience of the sociological one.

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The Expression of Motion Events: A Quantitative Study of Six Typologically Varied Languages

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1 Introduction

More than two decades of intense research on motion event typology, emanating from the influential proposal of Talmy (1991, 2000) of a universal binary classification of languages into *verb-framed* (VF), such as French, and *satellite-framed* (SF), such as English, still leaves many questions unresolved. One such question is whether serial-verb languages such as Thai should be considered a third type (Zlatev and David 2003; Zlatev and Yangklang 2004), generalized by Slobin (2004) as *equipollently-framed* (EF). The basis for this distinction is that, while VF languages readily express the semantic category PATH (or more generally, "the core schema", cf. Talmy 2000) in their main verbs, leaving MANNER to be expressed optionally, as in French (1), SF languages typically express MANNER in their verbs, leaving PATH for verb-particles or verb-prefixes, jointly called satellites, as in (2), and EF languages easily combine verbs expressing MANNER, PATH, and DEIXIS, as in Thai (3).

(1) *Il est entré dans la maison (en courant)* (French)
3SG.M AUX enter.PST in DEF house in run.PART
'He ran into the house.'

(2) *He ran into the house* (English)

(3) *kháw wîŋ khâw pay nay bâan* (Thai)
3SG run enter go in house
'He ran into the house.'

A second question is whether these two or three types should be regarded as in some sense 'distinct' (even if they have minor expression patterns conflicting the dominant, type-characteristic ones), or rather as forming continua with respect to certain dimensions, such as the propensity to express MANNER (Slobin 2004) or PATH (Ibarretxe-Antuñano 2009). A third and related question is whether the notion of language types (with respect to motion typology or in general) should not be abandoned, and languages rather be described as conglomerates of constructions and strategies, with complex overlaps (Kopecka 2006; Beavers, Levin & Tham 2010; Croft et al. 2010). We should add that, with the advent of enhanced usage-based methods such as corpus analysis and elicitation, the tendency to answer the latter two questions in the direction of continua and (even individual)[1] strategies rather than types has increased. A fourth question concerns conceptual issues, such as what exactly should be regarded as MOTION, PATH, and MANNER, since the way in which these concepts are defined, both theoretically and operationally, will inevitably affect the results from empirical investigations (Zlatev, Blomberg and David 2010; Fortis et al. 2011). A fifth and final question concerns the structural issue of satellites (Imbert et al. 2011), defined by Talmy (2000:102) as a constituent standing in a 'sister relation to the verb root.' It remains to be shown if, for instance, Germanic verbal particles (e.g. Swedish *gå* ***in*** 'to go in') function similarly to Slavic verb-prefixes (e.g. Bulgarian ***v-liza*** 'in-?'[2]).

In the research reported here, we address these questions, using an empirical approach based on elicited data from six carefully chosen languages. Two of these are the Romance languages French and Piedmontese, which can both reasonably be expected to be of the VF type.[3] We also analyzed the Germanic languages Swedish and German and the Slavic language Polish, all three typically considered as SF. Finally, we included Thai (Tai-Kadai), classified as EF by Slobin (2004). In Section 2, we describe the general theory of spatial semantics that we depart from, which provides the basis for defining the key semantic concepts we focus on: MANNER, PATH, and DEIXIS. In Section 3, we describe our methodology, and the expectations which emanate from previous research. Section 4 presents our findings with respect to the three main semantic categories,

[1] Individual variation in our data is represented in Figures (14), (15), (22), (23), (26), and (27) in section 4, which indicate standard deviations between participants, for each language.
[2] The verb **liza* (without a prefix) does not exist: the compound verb is lexicalized and partly opaque.
[3] Note, however, that some Italo-Romance dialects have been classified as SF (Iacobini 2012); there is to date no specific study on the VF or SF nature of Piedmontese.

discussing both expected and unexpected results. Finally, in Section 5, we sum up by presenting tentative answers to the questions outlined above.

2 Theory and concepts

The theoretical framework adopted here is *holistic spatial semantics* (Zlatev 2003, 2007), a theory of the linguistic expression of spatial meaning which attempts to strike a balance between (embodied) universalism and language-specificity. It claims that the minimal unit of spatial analysis is the whole (trans)locative utterance, where the meaning of the parts is dependent on the whole utterance and vice-versa. Spatial semantic categories are assumed to be based on pre-linguistic bodily experience, but language-specifically conventionalized. The theory proposes that seven universal spatial semantic categories are necessary and jointly sufficient to characterize the core semantics of a locative or translocative utterance: TRAJECTOR, LANDMARK, MOTION, REGION, FRAME OF REFERENCE (FoR), PATH, and DIRECTION. Especially relevant for present purposes are the final three.

The spatial disposition of the TRAJECTOR (FIGURE) is always situated within one or more FRAMES OF REFERENCE (FoR) defined by one or more reference points and axes. Depending on the nature of the latter, three general kinds of FoR may be distinguished (generalizations of those proposed by Levinson 2003, cf. Zlatev 2007). The VIEWPOINT-CENTERED FoR involves utterances where the main reference point is a deictic center (henceforth DC) as in (4), or else involves an explicit ("objectified") viewpoint as in (5). The OBJECT-CENTERED FoR always involves a landmark, including both landmarks with "intrinsic" orientations as in (6), and without, as in (7). The GEOCENTRIC FoR involves relatively fixed ("absolute") reference points or axes, on either the horizontal (8) or the vertical plane (9). On this basis, the category DIRECTION is defined as a vector along one of the axes provided by a FoR as in (10).

(4) *The woman is coming this way*
(5) *The house is to the left, from your point of view*
(6) *Stand in front of me*
(7) *He went into the room*
(8) *Go west*
(9) *He climbed up the stairs*

(10) *The plane is flying…*

a.	*that way*	FoR:	VIEWPOINT-CENTERED
b.	*North*	FoR:	GEOCENTRIC
c.	*towards the North pole*	FoR:	OBJECT-CENTERED

On the basis of the cross-linguistic generalization that unrelated languages systematically distinguish between (at least) three components of a motion event, PATH is defined as having one or more of the following possible values: Begin, Middle, and End, as shown in (11). As may be noted, PATH implies an OBJECT-CENTERED FoR.

(11)	*a. Bill went out of the room*	PATH: Begin
	b. Bill went through the room	PATH: Middle
	c. Bill went into the room	PATH: End
	d. *Bill went out of the office into the lecture hall*	PATH: Begin+End

The "holism" of the theory is reflected in two respects. First, the mapping between the semantic categories and the form classes expressing them (such as noun, verb, adposition, verb-prefix, verb-particle, case-marking) are in general many-to-many, thus resulting in patterns of *conflation* (Talmy 1985) and *distribution* (Sinha and Kuteva 1995). Second, the division of labor between semantics (conventional meaning) and pragmatics (contextual specification) is expected to vary from language to language, but in general the meaning of the whole utterance will not be derivable from the individual mappings, but depend on more global knowledge frames. The present study is part of a more general research project applying the general concepts and hypotheses of Holistic spatial semantics to the description of a sample of the world's languages, with the goal of obtaining a novel, theoretically and empirically consistent motion event typology.

3 Methodology

3.1 Stimuli

For the purpose of eliciting descriptions of motion events, we used a series of video-clips showing male and female agents in natural settings, engaged in actions and translocations. These clips were designed by the research group *Trajectoire* (Ishibashi, Kopecka and Vuillermet 2006). There were 76 such clips in total, including 2 warm-up clips, 55 target clips showing translocative motion events, and 19 clips showing other (non-translocative) activities.[4] The stimuli were appropriate for our purpose since they were designed to vary according to parameters such as the following: (a) PATH of motion: Begin, Middle, End; (b) DIRECTION of motion: towards the camera, away from the camera, sideways; (c) MANNER of motion: walking, running, jumping; (d) Boundary-crossing: presence

[4] Zlatev, Blomberg and David (2010) explicate the difference between translocative and non-translocative motion, which approximately correspond to "translational" and "self-contained" motion (Talmy 2000), respectively.

or absence. A full description of the elicitation tool can be found in Kopecka and Ishibashi (2011).

3.2 Languages, speakers and elicitation

Overall, 84 participants were included in the study, distributed across languages as shown in (12) below, which presents the size of collected and analyzed data (limited to target descriptions). As pointed out in Section 1, these six languages can be seen to represent the three major languages types SF (German, Swedish, Polish), VF (French, Piedmontese) and EF (Thai), which makes them a good test-bench for the questions outlined in the introduction. Elicitation was conducted in the homeland of participants, except for Thai where data was gathered in Lund, Sweden. In all cases, the investigator conducted the study using the target language, except for Piedmontese, where the study was conducted in Italian.

All participants were asked to briefly describe each scene after viewing it, telling the investigator "what had happened" in the video-clip. These descriptions were either video- or audio-recorded.

(12) The data analyzed for the present study

Type	Language	Speakers	Target descriptions	Total words
EF	Thai	14	700	7080
SF	Polish	14	699	5766
SF	German	18	968	15655
SF	Swedish	17	838	8297
VF	French	11	536	9972
VF	Piedmontese	10	486	4306
Total		*84*	*4227*	*51076*

3.3 Data analysis

An exhaustive transcription was performed, except for noises, interruptions, and comments (such as "I'm tired", "This is boring", "That's fun") on the basis of the audio or video files in the standard orthography of the language. For Thai, this was followed by an additional step of automatic transliteration into Latin orthography. Each of the descriptions was then coded manually for MANNER, PATH, and DEIXIS.

MANNER is not part of the (motion) "core schema" (Talmy 2000), but rather a qualification of the motion event with respect to aspects such as bodily locomotion: Polish *biegnący* 'running,' velocity: Swedish *raskt* 'fast,' motion

shape: French *courbe* 'curved,' motion style: German *zielgerichtet* 'aimed at the goal, decided,' *betont cool* 'very relaxed,' Polish *ostrożny* 'careful.' We coded for the presence of at least one such element in each utterance. Most MANNER expressions concerned bodily locomotion in all six languages, mostly expressed in verbs.

As explained in Section 2, a schematic notion of PATH was adopted, involving the values Begin, Middle, End, depending on whether the translocation departed from, crossed, or ended at a salient LANDMARK. When a landmark served as a "beacon" (either towards which a motion is directed, or from which it comes) this was analyzed as DIRECTION; such examples are not reported in what follows. Similarly for cases in which translocation was described as proceeding along a vertical dimension (GEOCENTRIC FoR).

The only sub-type of DIRECTION (and VIEWPOINT-CENTERED FoR) on which we focus here is DEIXIS. The most common and relevant way of expressing it in our corpus is with a deictic verb denoting motion towards the speaker. We therefore coded the presence or absence of Thai *ma*, German *kommen*, Swedish *komma*, French *venir*, Piedmontese *vene* 'to come,' as well as that of French *revenir* 'to come back' and *provenir* 'to come (from).' Verbs denoting motion away from the speaker (such as English *go*) are known to be less linked to the expression of DEIXIS (Wilkins & Hill 1995), and to take on various other meanings. Still, we also coded the presence of Thai *pai,* French *aller*, German *gehen*, Swedish *gå*, and Piedmontese *andé* 'to go,' in order to check the validity of these assumptions.[5] The presence or absence of deictic adverbs such as *here* and *there* was coded, but not included in the analysis below, since their use was most often pragmatic, temporal or discourse-oriented, especially when they were found in utterance-initial uses, as in (13).

(13) *Tutaj mamy mężczyznę który uprawia jogging* (Polish)
here have.1PL man.ACC who.M practice.3SG jogging
'Here we have a man doing his jogging' (traj037_pol12)[6]

Overall, each one of the three semantic categories MANNER, PATH, and DEIXIS could be expressed, in every scene description (which could consist of several sentences), by one or more of the following form-classes: *verb, adverb, verb-*

[5] Since Polish has no specific COME or GO verb, verbally expressed Deixis in the language could only be linked to the use of verbal prefixes, known to be partially grammaticalized into deictic markers in Slavic languages (Ricca 1993).

[6] References to examples taken from our database indicate the number of the stimulus (here "traj037"), the language (here "pol" for Polish) and the participant ID (here "12").

prefix,[7] *verb-particle, prepositional phrase, adjective, case marker, preposition,* and *pronoun*. Due to space limitations, we do not here describe the particular patterns of mapping between semantic categories and form-classes,[8] but simply report on the frequency of expression of these three semantic categories.

3.4 Expectations

In theory, SF languages should have a higher proportion of MANNER expression than VF languages. Since the place of EF languages such as Thai remains uncertain, a tentative prediction – especially from a perspective emphasizing continua – is that it would be intermediate. This difference between SF and VF can be expected to be most clear in the cases where MANNER is "unmarked", e.g. in the case of walking as opposed to jumping.

In contrast to MANNER, there is no reason to suppose large differences in PATH expression, since what varies among the languages are the preferred ways in expressing it: through verbs in Thai and the VF languages, and through satellites in the SF languages. Previous studies have reported on a much more detailed specification of PATH in SF than VF languages (e.g. Berman and Slobin 1994:118), but they included DIRECTION as a subtype of PATH. Since satellites often express DIRECTION, it is unclear if there should be any difference with respect to PATH proper.

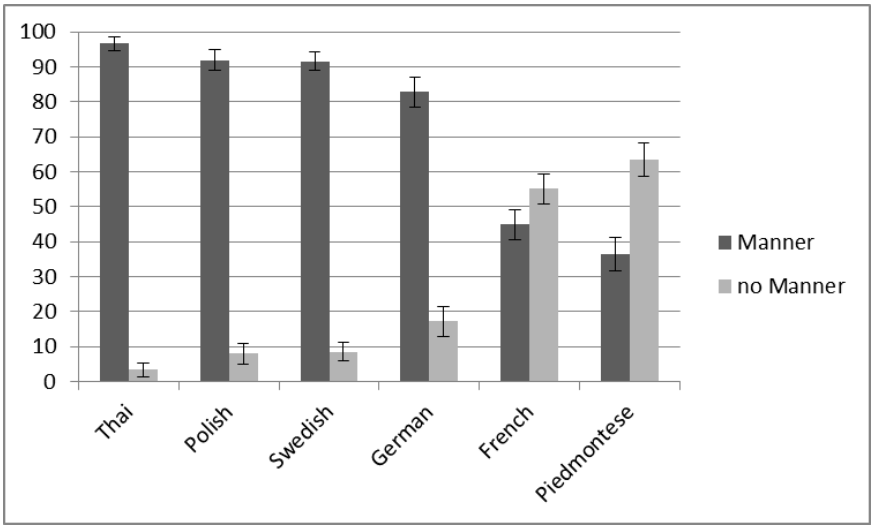
DEIXIS has been something of a blind spot in the motion event literature, at least until recently (e.g. Nakazawa 2006). In many previous studies, for instance, verbs denoting motion towards or away from the DC were not distinguished from path verbs like *cross*. Based on previous research (Zlatev and Yangklang 2004), we could expect higher proportions of DEIXIS in Thai than in the other languages, due to a dedicated "slot" for a deictic verb in the serial verb construction, as in (3). On the other extreme, Polish, which has no lexicalized deictic verb, was expected to mark DEIXIS only rarely.

4 Results and discussion

With respect to MANNER, as shown in (14), we found a clear difference in its frequency of expression between the three SF languages and the two VF languages. This difference was highly significant ($chi^2=914$, $p<.001$).

[7] The class verb-prefix covered both inseparable prefixes such as German *be-* (*betreten* 'step in', with e.g. the past form *er betrat* 'he stepped in") or Polish *w-* (*wchodzić* 'walk in') and separable prefixes such as German *ein-* (*einlaufen* 'run in(to)', with e.g. the past form *er lief ein* 'he ran in").
[8] See Blomberg (2014) for detailed descriptions of such patterns for the Swedish, French and Thai data.

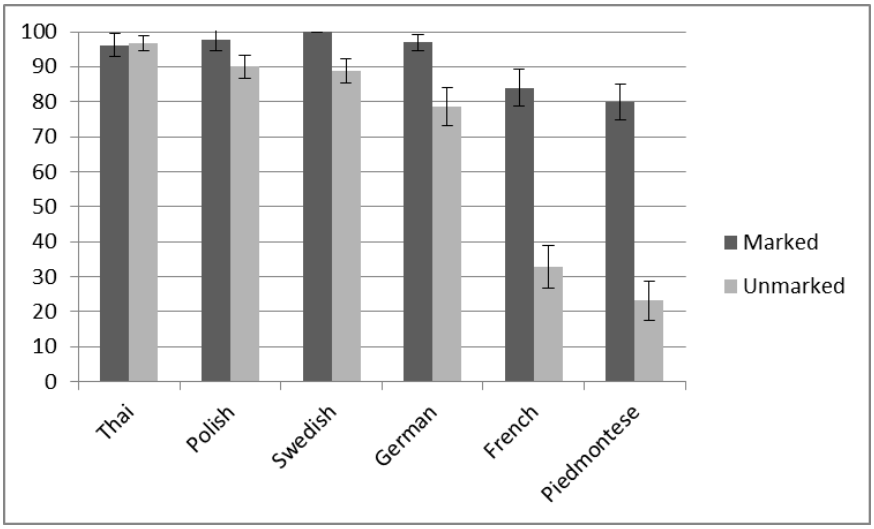
(14) Frequency of MANNER (55 scenes) in all 6 languages



Thai not only patterned with the SF languages, but appeared closer to Swedish and Polish than the latter two to German.

Distinguishing between stimuli (i.e. scenes) where MANNER was (a) of marked kind, i.e. running, jumping or a combination of these, and (b) unmarked –when the person 'simply' walked– we could confirm that the difference in MANNER expression between SF and VF languages concerned primarily (b), as shown in (15).

(15) Frequency of MANNER depending on scene type: marked (14 scenes) vs. unmarked (41 scenes) in all 6 languages



In other words, stimuli with marked MANNER typically elicited data with manner verbs both in VF and SF languages (e.g. (16)-(18)).

(16) *chłopiec w- biega do morza* (Polish)
boy.NOM in- run.3SG.M to sea.GEN
'The boy is running into the sea' (traj059_pol02)

(17) *en kvinna springer från ett träd mot kameran* (Swedish)
INDF woman run from INDF tree towards camera.DEF
'A woman runs from a tree towards the camera' (traj033_swe06)

(18) *an cit c a cur* (Piedmontese)
INDF little.boy COMP 3.SG run

andrinta a l' eva
in to DEF water
'A little boy who runs into the sea' (traj059_piem09)

An important factor claimed to play a role in the VF/SF distinction is the so-called "boundary-crossing constraint", according to which manner verbs are highly restricted in VF languages when the TRAJECTOR (FIGURE) crosses a boundary, but much less so otherwise (cf. Aske 1989; Slobin & Hoiting 1994). Our results are partly in line with this prediction: stimuli with boundary-crossing typically elicited utterances with manner verbs in SF languages (e.g. (19)-(20)), but not in VF languages (e.g. (21)).

(19) *mężczyzna wy- szedł z krzaków* (Polish)
man.NOM out- walk.3SG.M.PST from bushes.GEN
'The man walked out from the bushes' (traj055_pol01)

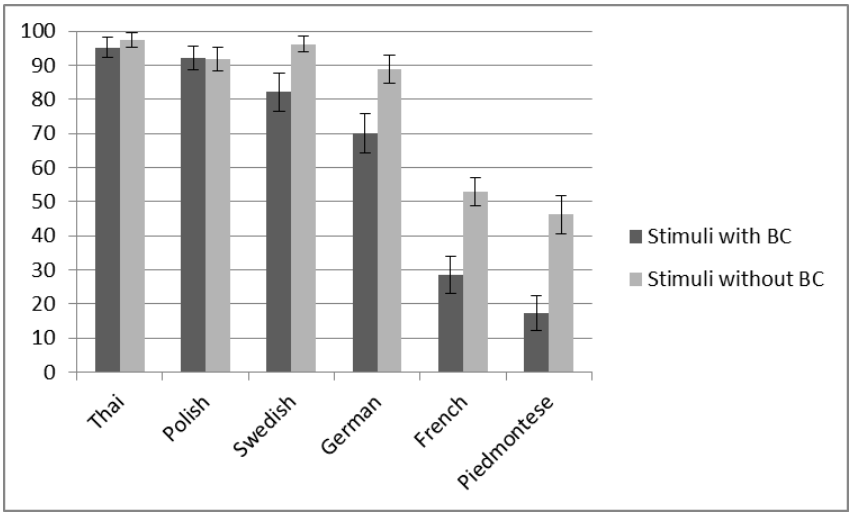
(20) *en kvinna går in i en grotta* (Swedish)
INDF woman walk into in INDF cave
'A woman walks into a cave' (traj054_swe13)

(21) *na fia c a intra nt na crota* (Piedmontese)
INDF girl COMP 3.SG enter into INDF cave
'a girl who enters a cave' (traj022_piem08)

As shown in (22), for both VF languages there was a significant difference between the two scene types (for French, $chi^2=31$, $p<.001$; for Piedmontese, $chi^2=39$, $p<.001$). However, there was also a significant difference for German

and Swedish (chi²=52, p<.001). As expected, there was no significant difference in either Polish or Thai.

(22) Frequency of MANNER depending on scene type: boundary crossing (22 scenes) and without boundary crossing (33 scenes) in all 6 languages

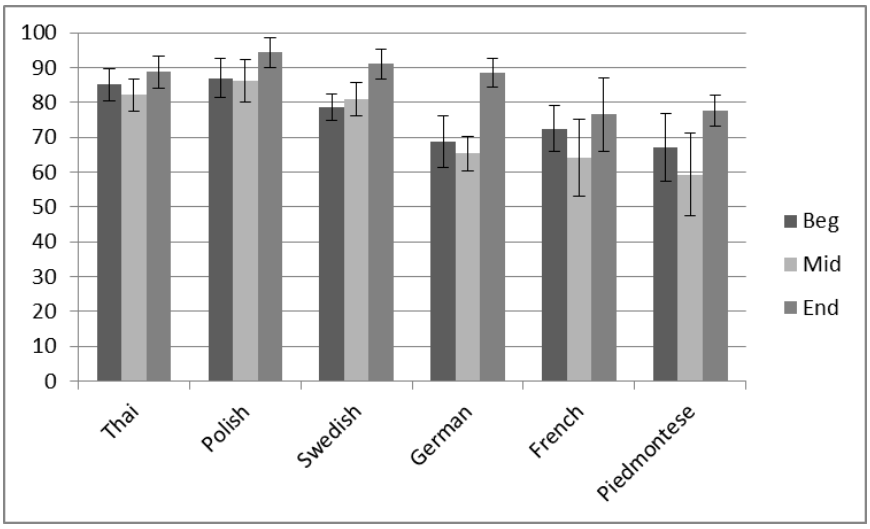


The differences we observed in patterns of expression of the PATH are not as clear-cut. PATH, it may be reminded, excludes in our analysis DIRECTION of the 'towards', 'up/down' and 'come/go' sub-types (the latter being treated under DEIXIS). We expected slight differences between SF and VF languages, but that was not the case: there was instead a significant difference between Piedmontese, French, and German on the one hand, and Swedish, Thai, and Polish on the other (the least significant of these differences being between German and Swedish: chi²=18.5, p<.001; this difference is due in turn mostly to the difference of frequency of PATH expression in median scenes, with chi²=15, p<.001).

DEIXIS was expressed much less frequently than either PATH or MANNER: the mean expression across speakers and languages was 12.6% (counting only verbs denoting motion towards the DC, which are its most frequent expression), against 74.8% for PATH and 78.6% for MANNER. As expected, Thai had a higher proportion of (verbally expressed) DEIXIS than all other languages, especially concerning the frequency of *ma* 'to come'.

As shown in (26), which presents the frequency of verbs denoting motion towards or away from the DC in the descriptions of scenes in which there was motion either toward the speaker/viewer (FRONT), away (BACK) or sideways (SIDE), five of the languages present unexpected patterns, quite contrary both to the standard divisions of motion event typology and to genealogical relations (Polish was excluded from this analysis due to the lack of deictic verbs.) There was, for instance, a very high frequency of verbs denoting motion towards the DC

(23) Frequency of PATH depending on scene type: Begin (14 scenes), Middle (16 scenes), End (15 scenes) in all 6 languages



in FRONT scenes in Thai and German, as in (24), and of verbs denoting motion away from the DC in BACK scenes in Swedish and Thai.

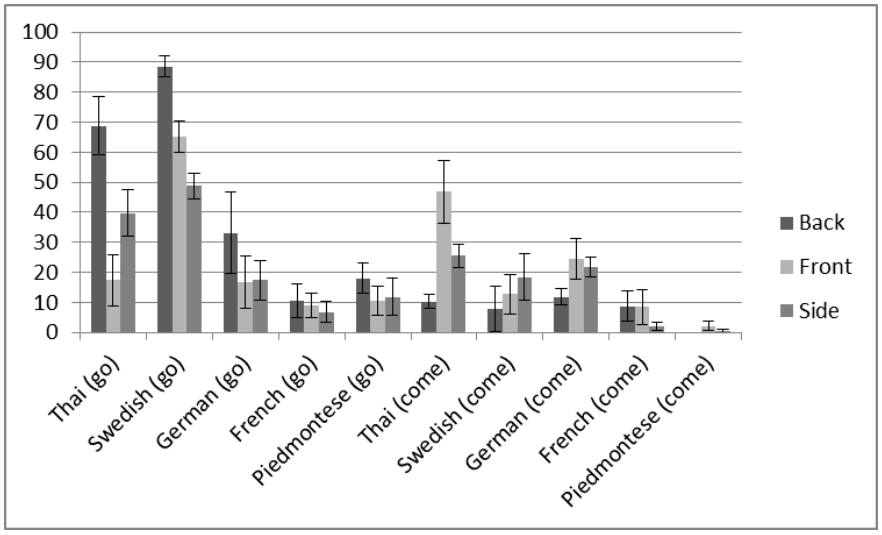
(24) *eine junge Frau die wir von vorne sehen* (German)
INDF.F young.F woman COMP.REL.F 1PL from front see.1PL

kommt von einem Baum
come.3PL from INDF.DAT tree
'A young woman comes from a tree, facing us' (traj032_ger08)

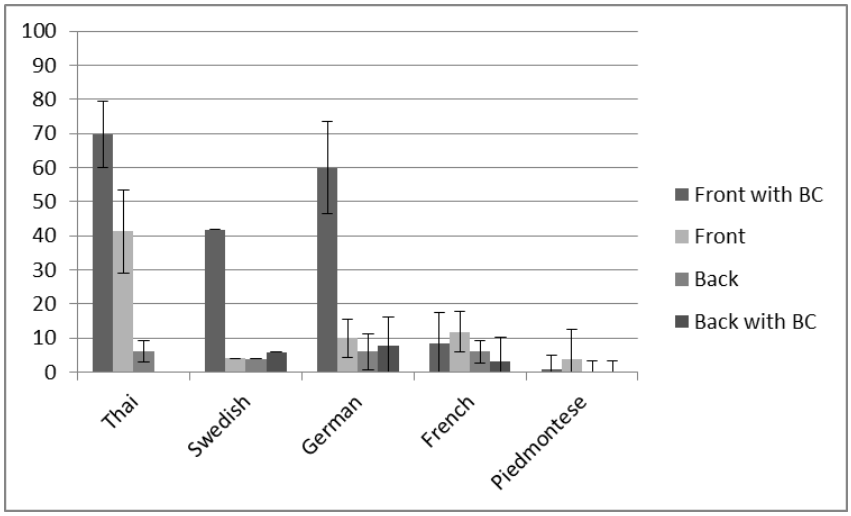
However, the congruence of verbs denoting motion towards the DC and FRONT scenes, on the one hand, and of verbs denoting motion away from the DC and BACK scenes, on the other, is not complete, and depends on the language. It is most obvious for Thai, slightly less for Swedish and German, and least so for Piedmontese and French, where *venir* was regularly used in BACK scenes as part of a more complex construction, introducing the infinitive with a partly aspectual meaning, as in (25).

(25) *là il vient la réveiller* (French)
there 3SG come.3SG 3SG.F.ACC wake-up.INF
'this time he comes to wake her up' (traj036_fr11)

(26) Frequency of verbs denoting motion towards (COME) or away from (GO) the DC depending on scene type: BACK (18 scenes), FRONT (18 scenes), SIDE (24 scenes) in 5 languages



(27) Frequency of verbs denoting motion towards the DC ('come') in four different scene types: FRONT with BC (14 scenes); FRONT without BC (12 scenes); BACK with BC (9 scenes); BACK without BC (17 scenes), in 5 languages



Looking more closely at the data, we checked for an effect of boundary-crossing on the use of verbs denoting motion towards the DC, trying to understand why participants used them in scenes without motion towards the camera. The graph in (27) shows that there was a very high correlation between

appearance on the screen and the use of such verbs, especially in Thai, German, and Swedish. For French and Piedmontese, there was no such effect.

This could be explained by the importance of boundary-crossing in these two languages: though scenes with motion towards the DC and boundary-crossing could elicit more use of deictic verbs, they seem to trigger the use of PATH verbs in VF languages, thus possibly countering the effect we observed in SF languages and Thai. Besides, in French, a number of utterances with deictic verbs are found in scenes where the figure moves away from the camera: in these cases, the explanation is probably the existence of a secondary deictic center.

5 Conclusions and further research

Returning to the questions that we began with, we can see that the results from our study are in part supportive and in part problematic for both the Talmyan (two type) and the Slobinian (three type) approaches to motion event typology. MANNER seems to be a good indicator to classify a language as VF or SF. Thai, despite expressing PATH in verbs rather than satellites, appears in this respect much more similar to the SF than to the VF type. This is also consistent with the alternative motion event typology proposed by Bohnemeyer et al. (2007), on the basis of the number of "ground elements" (landmarks) that a language-type allows in a single clause; in this respect as well, serial-verb languages like Thai belong together with typical SF languages.

PATH expression was found not to differ significantly between VF and SF languages, but between Piedmontese, French, and German on the one hand and Swedish, Thai, and Polish on the other. It should be noted again how essential the definitional aspects are, since our results are contingent on distinguishing PATH from DIRECTION, with motion DEIXIS being a special kind of the latter.

With respect to DEIXIS, we found that Thai participants, as expected, used deictic verbs more frequently than the other languages. But German and Swedish participants, especially in describing boundary-crossing (BC) scenes, were not far behind (see (27)). French and Piedmontese speakers used very few deictic verbs in boundary-crossing contexts, as could be expected, and Polish speakers did not mark DEIXIS at all, lacking full-fledged deictic verbs.

This brings us to the question of continua. While particular semantic categories such as MANNER and DEIXIS can be seen as providing the dimensions for arranging languages on a cline, our limited study suggests that the languages along these dimensions *do not* align. Further, some of the distinctions, such as the expression of DEIXIS in boundary-crossing contexts, seem more qualitative (without being 'discrete') than quantitative. This seems to be in contradiction with currently popular suggestions of lack of clear boundaries and all-pervasive gradualness.

Finally, our findings of different patterns for MANNER, PATH, and DEIXIS are consistent with proposals that motion event typology should be performed on the basis of separate constructions or strategies, rather than on language as a whole. However, this should not be interpreted as meaning that "there are no language types"; after all, constructions are not 'atoms' that a language can pick or leave at will. The next step of our investigation, conjoining form-classes and semantic categories in various conflation and distribution patterns, will hopefully contribute to a better understanding of the parameters of constructional co-variation.

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Mapping Worlds: Frames of Reference in MalakMalak

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1 Introduction*

This paper presents an analysis of spatial language, in particular, 'Frames of Reference' (FoR) utilizing elicitation, stimuli and natural discourse in fieldwork settings. The language in question is MalakMalak, a non-Pama-Nyungan Northern Daly language with eleven identified remaining speakers mainly based in the Daly River Region in Australia.

1.1 The language and its speakers

MalakMalak is spoken in the Aboriginal communities of Woolianna on the Daly River, Peppimenarti, Belyuen, Fifteen-Mile, and Bagot in the Northern Territory of Australia. Almost all speakers are also fluent in at least the Daly variety of Kriol as well as Matngele, a related Eastern Daly Language.

*I would like to gratefully acknowledge financial support from the Franklin Research Grant of the American Philosophical Society and the Endangered Languages Documentation Program IPF0189 allowing me to spend a total of over 9 months in Woolianna and surrounding areas between May 2012 and September 2013. The data collected during this fieldwork, some field recordings made between 2009 and 2012 generously shared by Mark Crocombe, and a collection of elicitation and communicative discourse material collected between 1971 and 1973 unconditionally made available by David Birk and obtained from AIATSIS in Canberra, form the basis of this study. Furthermore, I would like to specifically thank Biddy Yingguny Lindsey, Frances Mijat, Rita Pirak, Rita McGregor, Rosie Mary Magdalene Kabat, Barbara Tenblin, Michael Kunbuk, Don White, and Edward Andrews for generously sharing their knowledge of MalakMalak with me. Additional thanks go to Rob Lindsey and Joye Maddison for supporting my work with the MalakMalak people in every respect.

1.2 Frames of Reference, Deixis and Cognition

Studies into FoR systems provide insight into the relationship between language and cognition, and highlight how landscape features are reflected in language use and vice versa. They have been widely discussed from a cross-linguistic perspective. This includes the 'classic' three-part distinction between intrinsic, relative, and absolute FoR (Levinson, 2003; Pederson et al., 1998; Levinson, 1996). Additionally, some authors have argued to incorporate deixis (Danziger, 2003; 2010; Bickel, 2001; Burenhult, 2008) and gesture (Haviland, 1993) into the typology. Also, the notion of 'Orientation' (Terrill and Burenhult, 2008) accounts for instances where intrinsic facets of a figure are oriented in relation to a reference object[1]. Finally, Bohnemeyer and O'Meara (2012) claim that anchoring-types and vectors in particular provide a significant link between FoR and 'orientation' within FoR typology. Bohnemeyer (2013) furthermore argues that the use of a particular FoR can be diffused through language contact.

This paper aims to provide a detailed description of MalakMalak's Frame of Reference system addressing the intricate relationship between language, culture, landscape, and cognition described by one speaker as 'The language is like a map.'

2 Frames of Reference in MalakMalak

All observations of MalakMalak's previously undocumented FoR system result from nine months of fieldwork between 2012 and 2013. The collected data comes from elicitation stimuli such as the 'Men & Tree' (M&T) task (Levinson et al., 1992), the 'Ball & Chair' (B&C) task (Bohnemeyer and Perez Baez, 2008), and examples from narrative and conversational discourse environments.

All three 'classic' FoR types are employed. There are distinct lexical items used for vertical intrinsic (*jalk/karrarra* 'underneath/on top of') and absolute FoR (*puyunduk/kanjuk* 'down/up'), and the same lexemes are used in relative and intrinsic FoR denotations (*elimirri/angundu* 'in front/behind'; *yanbarr/jalmiyen* 'left/right'). There is a cardinal-type system based on the directions of prevailing winds blowing from the sea (*nul*) and inland (*dangid*) and a solar-system utilizing directions of the setting (*miri jalk*) and rising sun (*miri baiga*).

Deictic terms are used to denote proximal (*kinangga*) and distal (*ngunanggi*) space over a boundary. This distinction has furthermore been conventionalized to

[1] The terminology in this paper follows Talmy's (1985, 2007) distinction between a Figure (the object to be located) and a Ground (the object in relation to which the figure is located). For examples involving 'orientation', I maintain Terril and Burenhult's (2008) terminology of distinguishing between a ground (in FoR) constructions and a reference object (in orientation settings).

encode the respective riverbanks of the Daly River ('northeastern/southwestern bank'). Additionally, related demonstratives are used with proximal (*ki/kinanggi* 'here/this side') and distal (*ngun/ngunanggi* 'there/that side') meanings.

Finally, two contrasting terms *keen* and *kaduk* are accompanied by pointing gestures, denoting not strictly proximity, but person-based reference and a contrast of 'here' and 'there' space.

2.1 Strategies of spatial reference

Speakers freely switch between intrinsic (1) and (2) relative frames showing no clear preference for either.

(1) *tyung* ***angundu****–na* *muyu*
tree behind-LOC 3SG.NEU.stand.PST
'the tree stood behind (the man)'(DH12_A23_07.145)

(2) *yerra* ***jalmiyiny*** *dek* *kanjuk purrat -ma* *wuta*
PART right/straight place up jump-CONT 3SG.NEU.go.PST
'now (the ball) is on the right, jumping up (lit. jumping continuously in an upward place)' (DH12_A43_03.105)

(3) Example of (1)

(4) Example of (2)

Various body-part terms are used to orient figures with relation to reference objects (5), cardinal directions, or toponyms and result in noun incorporation with the complex predicate[2]. If no reference object is specifically named, the orientation of the figure is by default interpreted deictically.

(5) *tyed* ***mel-yen*** *wuyu*
stand calf-DIR 3SG.NEU.stand.PRES
'(the ball) is towards the calf (of the chair)' (DH12_V44_02_047)

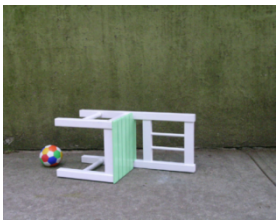
MalakMalak employs two types of specialized terms for vertical intrinsic (6) and absolute FoR (7).

[2] This is furthermore illustrated by varied word-order within the complex predicate in example (5).

(6) *dudyur-eli* ***jalk*** *ali* *wuyu*
cause.lie-PART underneath leg 3SG.NEU.stand.PST
'it is lying in an angle from the legs, underneath (the chair)' (DH12_A43_03.114)

(7) ***kinangga*** *wuyu,* *puyunduk-na*
PROX.side 3SG.NEU.stand.PST down–LOC
'(the ball is) on this side, below/down' (DH12_A43_02.104-5)

(8) Example of (6)



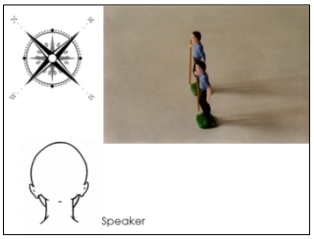
(9) Example of (7)

This has also been observed elsewhere. In Roper Kriol, adverbial suffixes and prepositions *–ap/dan* 'up/down' are used in absolute FoR only, while the adverbs *ontop/andanith* 'on top/underneath' only occur in intrinsic encodings (Hoffmann, 2011: 108-110) and in Jaminjung absolute terms are converted into intrinsic ones by ablative suffixes (Schultze-Berndt, 2006: 107).

Some of the pictures in the M&T stimuli task lack grounds within the picture setup as seen in (11). Then, speakers often make use of a set of horizontal absolute directional terms based on the direction of prevailing winds in the wet (*nul* 'northwesterly') and dry season (*dangid* 'southeasterly'), as well as the rising (*miri baiga*) and setting of the sun (*miri jalk*). Orientation may be explicitly expressed in a body-part term or more implicitly in a directional case-suffix (10).

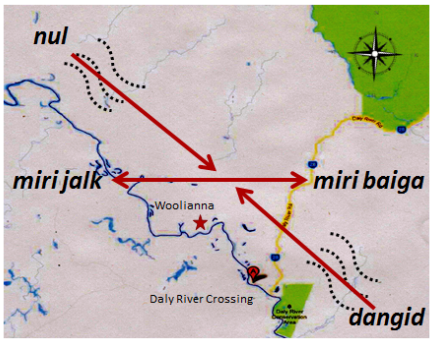
(10) ***nul-yen*** *wudyu=we*
northwesterly-DIR 3PL.stand.PST=FOC?
'they stood towards the northwesterly wind direction'
(DH12_A15_03.012)

(11) Stimuli setup for (10).



Both types of directionals are used independent of season or time of day and may therefore be considered 'absolute' and abstracted in par with Levinson (2003). The map in (12) illustrates the directionals.

(12) Absolute directionals in MalakMalak



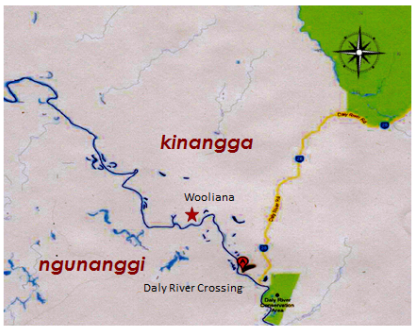
Speakers also often choose named places to orient figures in space as shown in (13). These types of expressions are, like absolute directionals, only used in orientation, but not location settings.

(13) *pud* ***Purrunyu-nen*** *nende* *wuta=we*
chest place.name-DIR person/thing 3PL.go.PST=FOC?
'the people went (with their chests) towards Purrunyu'
(DH12_A15_03.183)

2.2 Deixis and referencing

In addition to intrinsic, relative and absolute terms, MalakMalak makes extensive use of deictics and demonstratives in spatial description. A system of boundary-based proximal and distal location (*kinangga/ngunanggi*) has been conventionalized to denote the respective riverbanks of the Daly River as seen in (14). The traditional lands of the MalakMalak were located on both sides of the Daly River in the past, the majority of their settled land, however, used to lie on the *kinangga* side (Stanner, 1933; Birk, 1976).

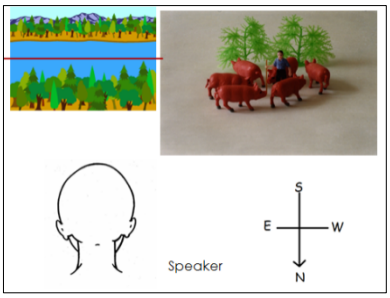
(14) The riverbank system



The terms are used deictically and mostly maintain absolute orientation to the riverbanks. In (15), in response to the setup in (16) below, the speaker is facing the river which is close, but not visible. The figure (the toy man) is described as orienting itself towards the speaker and as being *ngunanggi*. The lexeme depicts a location on the 'other' side using the gathered toy pigs as a dividing item. However, the 'absolute' direction of *ngunanggi* in relation to the river itself from the speaker's deictic center is still maintained.

(15) ***ngunanggi****-many* *pudang*
other.side/southwestern.bank-ABL chest.give
tyedali *yuyu*
stand.CONT 3SG.masc.stand.PRES
'he is facing (towards me) from the other side' (DH12_A15_04.086)

(16) Stimuli setup for (15)

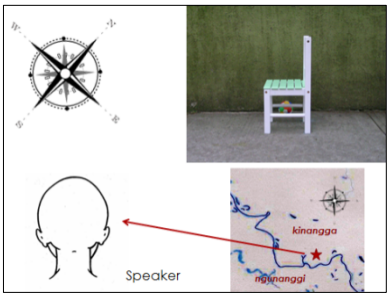


Maintaining this absolute orientation with respect to the riverbank may sometimes override the original deictic meaning of the terms. In (17) below, the speaker refers to the absolute locations denoted by the term *kinangga*. The location of the ball as shown in (18) is described as being on the *kinangga* side. Here, this relates to a location on the other side of the chair and is thus separated by it from the speaker. In absolute terms, however, the ball is located towards the *kinangga* side of the river, the same way the speaker is facing.

(17) *duk* *puyunduk* ***kinangga*** *yide* *chair=we*
place underneath northeastern.bank 3SG.masc.go.PRES chair=FOC
'it goes underneath, on this side of the chair' (DH12_V44_04.103)

This type of pattern where a deictic contrast may also involve geographical or environmental features has also been described for Dyirbal, which employs demonstrative modifiers contrasting upriver/downriver distinctions with uphill/downhill ones (Anderson and Keenan, 1985; Dixon, 2003: 85).

(18) Stimuli setup for (17)



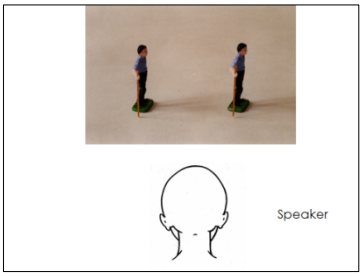
A closer look at the usage patterns for these riverbank terms reveals a tight connection between the place of utterance and denoting deictic vs. absolute location. In my collection of M&T as well as B&C recordings, I could only find one instance of absolute usage of speakers outside of Woolianna and at the same time only one example of a deictic use without maintaining the river reference for speakers within Woolianna. This suggests that the transition from deictic to absolute may be directly linked to movement patterns and resettlement of MalakMalak speakers outside their traditional homelands.

As I have shown above, these terms then, for the Woolianna location, are not abstract and fixed in Levinson's (2003) sense. Instead, they denote concrete directions bound to the landscape and a non-abstracted course of the river. This represents evidence for the type of close-knit relationship between the geomorphic features of the traditional lands and language use by its speakers.

Additionally, there are distal and proximal demonstratives derived from *kinangga* and *ngunanggi*. In (19) the location of the sticks the two toy men hold is encoded in the deictic term *kinanggi* and refers to the side the speaker is located on.

(19) *wangarri* **kinanggi** *pud* *jalmiyen*
2SG this.side chest right.hand
'to you (referring to the matcher in the Men &Tree game) (they are oriented), (the stick is) on this side (towards me, with the chest to the right)' (DH12_A24_02.089)

(20) Stimuli setup for (19)



The deictic terms may be analyzed as exemplified in (21) below. Birk (1976: 87-88) describes two (albeit verbal) deictic suffixes that denote movement or orientation towards (*-nggi*) and away from the deictic center (*-ngga*). This kind of split semantic analysis only holds true for the abstracted deictic terms, but not for the absolute riverbank terms. The interpretation is also overturned if explicit body-part terms are used to orient the figure.

(21)

ngun	*-an*	*-nggi*	*ngun*	*-an*	*-ngga*
DIST	-LOC	-DIR.towards	DIST	-LOC	-DIR.away
'being in a distant location orienting/moving towards the deictic center'			'being in a distant location orienting/moving away from the deictic center'		
ki	*-an*	*-nggi*	*ki*	*-an*	*-ngga*
PROX	-LOC	-DIR.towards	PROX	-LOC	-DIR.away
'being in a proximal location orienting/moving towards the deictic center'			'being in a proximal location orienting/moving away from the deictic center'		

Finally, *ngun* and *ki* are demonstratives denoting distance in terms of general visibility (proximity) and invisibility (distance) as in (22) only, as similarly observed for Yucatec Maya (Hank, 1990).

(22) ***ki-man*** *pi-ma* *wutangga* ***ngun***
PROX-ABL move-CONT 3PL.go.PURP DIST
anu *purrarr*
1SG.EXCL.sit.PST go.round
'from here where I sat, the water goes and becomes whirly (500 m away and invisible)' (DH12_A15_04.321)

(23) Terms along the deictic continuum

	Proximal		Distal
ki	'here/this one'	*ngun*	'there/that one'
kinanggi	'this side'	*ngunangga*	'that side'
kinangga	'this side closer to me, northeastern riverbank'	*ngunanggi*	'that side away from me, southwestern riverbank'

This type of 'boundary' deixis has also been described for other languages. In Cherokee a pair of verbal prefixes attaches to dynamic and static event utterances

and encodes locations within and outside a visible/experienced environment (Koops, 2013) which may be analyzed as a deictic boundary-based distinction[3]. Another example involves the Bantu language Mushunguli which has a set of three locative prefixes that attach to nouns in referential expressions (Barlew, 2016). Finally, in Belhare, a system of demonstratives encodes conceptual boundaries in spatial discourse and in a social/cultural context where the concept of 'boundary' is a significant rhetorical device (Bickel, 2001: 241).

The demonstratives *ki/ngun* refer to space in the general vicinity or distance to the speaker. They are never used in orientation settings. Boundary-related terms, on the other hand, denote specific locations.

Haviland (1993: 10) observes that in his corpus of Guugu Yimithirr 60% of all cardinal direction tokens co-occur with inflected forms of such explicit deictic elements as 'here', 'this', 'there', 'that', 'come' and 'go'. This high proportion suggests that cardinal directions are anchored in the same ways as deictics. In MalakMalak, for absolute terms based on the course of the sun, a similarly high proportion (57%) occurred with deictic terms. This hints at a correlation between absolute terms and deictic anchoring as observed for Guugu Yimithirr. Interestingly, this kind of correspondence was not found for the other absolute term pair *nul/dangid*. Only 16% of tokens co-occurred with deictic terms while the riverbank lexemes *kinangga/ngunanggi* (if used absolutely) were never accompanied by deictic terms. These observations suggest that the wind-based terms function differently from the ones based on the sun in terms of anchoring. When accompanied by deictics, the sun-terms are more often anchored in the speech situation in denoting the time of day with regards to light situations and time references. The wind-terms, on the other hand, are independent of current wind directions at the time of utterance. Additionally, the absence of riverbank terms with deictic elements suggests that these are inherently deictic themselves which allows for the type of meaning abstraction from deictic to absolute described above.

2.3 On the interplay of gesture and spatial reference

There are two deictic lexemes which may act as discourse markers to establish a space within which speakers interact and/or which speakers converse about. These denote specific locations mostly accompanied by gesturing. While *kaduk* 'DIST' occurs in opposition to *keen* 'PROX' only, *keen* may also act as a kind of discourse marker placing the narrative space in the here and now. In (24) the term is accompanied by a gesture and draws the orientation of the toy figure from the speech situation towards the direction of the named place that serves as the reference object in this spatial setup. Burenhult (2008: 109-110) argues that

[3] Eve Danziger suggested this kind of parallel distinction during the discussion section of the paper given at BLS39 which followed the author's own presentation on MalakMakak.

coordinate systems invoked by demonstratives involve the projection of a search domain from the deictic center (the ground) along the axial asymmetry in order to relativize the referent (the figure). These asymmetries can be fully abstract (cardinals), or locally dependent on geophysical features (e.g. river profile). This kind of analysis is underlined by findings in MalakMalak and extends the semantic range of demonstratives to stretch from directional to deictic meanings.

(24) *ki=we* ***keen-en*** ***pudang*** *tyedali*
PROX=FOC? PROX-DIR chest.give stand.CONT
yuyu *Wag Purrarr*
3SG.MASC.stand.PRES place.name
'this one he is facing towards Wag Purrarr' (DH12_A15_04.198)

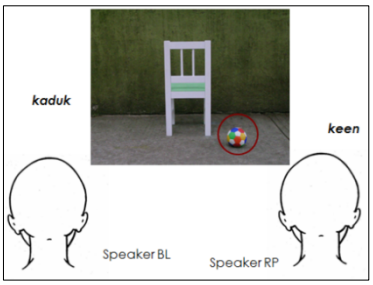
Examples (25) and (26) occurred in the same recording session in succession to one another and are descriptions of the same stimuli picture by two different speakers in a setup visualized in

.

(25) *nen* *kagak* *muyu* ***keen****-en*
thing/person far 3SG.NEU.stand.PST PROX-DIR
'the ball was far away (from the chair) (standing) towards here'
(DH12_V44_02.298, speaker RP)

(26) ***kaduk****-en* *muyu*
DIST-DIR 3SG.NEU.stand.PST
'the ball stood towards there' (DH12_V44_02.299, speaker BL)

(27) Stimuli setup for (25) and (26)



While RP in (25) describes the location of the ball as being in a location proximal to herself with *keen*, speaker BL in (26) responds to this with *kaduk* to indicate that the ball is in a location away from herself and towards RP. This indicates that these terms also encode a type of person deixis[4] where *keen* denotes

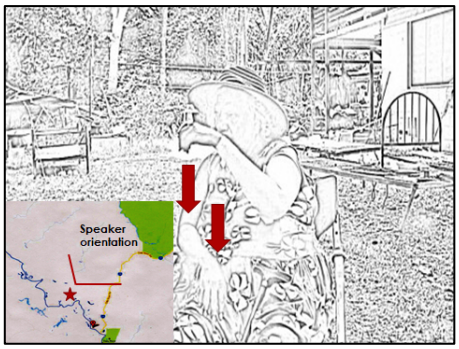
[4] Thanks are owed to Eve Danziger pointing out this possibility to me.

a location close to first person and *kaduk* to second person singular in a speech situation. Such a system has been described for Mopan Maya (Danziger, 1994). Another option (viable in situations with only one speaker) is the type of spatially elastic and contextually and pragmatically dependent perimeter anchored in the speaker as 'here-space' (*keen*) and 'there-space' (*kaduk*) (Enfield, 2003).

In discourse[5], these terms are accompanied by directed pointing[6] and gesturing. Example 0 is a direct speech act from a traditional narrative about a Tree Monitor that asks the Blue-Tongue Lizard to join him in his hole to seek shelter from a King Brown snake. Since the speaker is impersonating the Tree Monitor's speech at the moment of utterance, the location of the hole is with her and this is also where she is pointing at in a repeated downward motion of the hand with the fingers oriented downwards. In example 0 on the other hand, the speaker replies to a question the researcher has just asked about the location of a dreaming place where the story about a dingo and a Ladybug eating cheeky yam is taking place. Here, she points in the absolute direction of *ngunanggi* (the southwestern riverbank) and a location at quite some distance from the utterance location. Her fingers are pointed and a flicking movement of the hand furthermore indicates a relatively greater distance of the place described.

(28) *dim* ***keen*** *nga-na* *tyurrk* *pakang* *nunguny*
hole PROX 1SG.EXCL-ALL go.inside sit.give 2SG.go.IMPF
'you are coming and sitting down here with me in my hole'
(DH12_V36_05.085)

(29) Speaker orientation and gesture for (28)

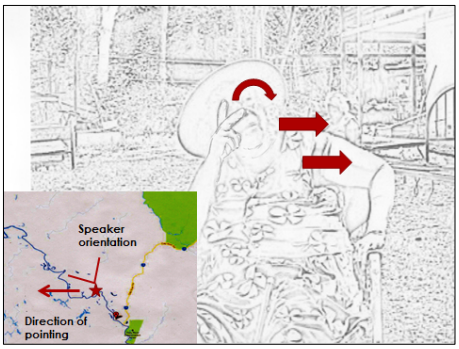


[5] From memory and fieldnotes, pointing also accompanies these terms in stimuli setups such as the B&C game with *kaduk* usually accompanied by a continuous gesture indicating greater distance and *keen* supported by smaller gestures indicating proximity. However, I do not have any video-recordings to confirm these observations at the time of writing.

[6] In fact, *kaduk* might be seen as a being semantically similar to what Bickel (2001: 234) describes in Belhare for the term *ina* which is semantically restricted to distal pointing.

(30) *dek* *ngunanggi* ***kaduk***
camp south.western.bank DIST
'the place is on the southwest side, over there'
(DH12_V36_03.194)

(31) Speaker orientation and gesture for (30)



In line with (30) above, (32) also illustrates the use of *kaduk* and *keen* in larger scale spatial descriptions. The speaker explains the direction of the river flow during outgoing and incoming tides. The choice of *keen* to denote the outgoing tide might be interpreted in terms of a stereotypical or default situation since the turn of the tides is not realized during the wet season when the water always flows from the TopEnd towards the sea. *Kaduk* is also used less frequently than *keen*[7]. As a result, this might be accounted for by Levinson's pragmatic M-Principle stating that a marked expression (*kaduk*) indicates a non-stereotypical event/situation and an unmarked one (*keen*) the stereotypical one (Levinson, 1983: 136-137).

(32) ***keen**-en* *tity* *pi* *yunguny* ***kaduk**-en*
PROX-DIR go.out move 3SG.MASC.go.IPFV DIST-DIR
im *blanga* *ontop*
3SG LOC-DIR on.top
'the water goes out (towards the sea in outgoing tide) and it goes to the Topend over there (when the tide is coming in)' (DH12_A05_01_0148)

Adding to this kind of interpretation is an explanation offered by a speaker associating *keen* with the *dangid* wind direction and *kaduk* with the *nul* direction of the wind at the beginning of June when a strong *dangid* wind was blowing

[7] In a search of 33 recordings, *kaduk* was found 62 times in 61 annotations. *Keen* on the other hand occurred 246 times in 237 annotations in the same number of recordings. While this is not a representative or systematic sample, the numbers indicate a usage preference for *keen* based on functionality.

during the recording session making this the unmarked and (at the time) dominant wind direction. In light of these two observations, the meaning of the terms then becomes directly associated with climatic, cultural, and landscape features of the speakers' environment.

3 Conclusions

Notably, the absolute terms based on prevailing wind directions are only used in orientation settings, but never in absolute FoR of the type 'the chair is *nul* of the ball'. Additionally, my corpus so far only revealed one example where the terms based on the course of the sun may be interpreted as absolute FoR ('the chair is to the east of the ball').

While the spatial terms *elimirri/angundu* and *jalmiyen/yanbarr* for horizontal direction may be used for both intrinsic and relative settings interchangeably, only the latter (albeit rarely) allow for orientation setting. For vertical direction, there is a clear distinct use of terms for absolute and intrinsic settings.

(33) Spatial terms and FoR usage

Spatial term	Translation	Type of FoR[8]				
		I	R	A	O	D
dangid/nul	southeasterly/northwesterly wind	X	X	X	√	X
miri jalk/miri baiga	west/east	X	X	(√)	√	X
elimirri/angundu	in front/behind	√	√	X	X	X
jalmiyen/yanbarr	right/left	√	√	X	(√)	X
kanjuk/puyunduk	on top/underneath	X	X	√	√	X
karrarra/jalk	down/up	√	X	X	X	X
ngunanggi/kinangga	southwestern river bank/the other side/that side – northeastern river bank/this side	X	X	√	√	√
ngunangga/kinanggi	that side/this side	X	X	X	√	√
ngun/ki	there/here	X	X	X	X	√
kaduk/keen	'over there'/'over here'	X	X	X	√	√

[8] The abbreviations in this column are as follows: I 'intrinsic FoR'; R 'relative FoR'; A 'absolute FoR'; O 'orientation'; D 'direct FoR/deixis'

I argued that the boundary-type terms *kinangga/ngunanggi*, may be used in absolute as well as deictic readings. The fundamental difference between these terms and their related counterparts *ngunangga* and *kinanggi* lies in an analysis including the deictic suffixes *–nggi* and *–ngga* as denoting orientation towards and away from the deictic center respectively. Additionally, while all these terms crucially entail a type of boundary located between the speaker and the figure, *ngun* and *ki* only denote distal and proximal location in relation to a deictic center regardless of interference or specific location, but in terms of person-reference and visibility constraints.

Finally, *kaduk* and *keen* are accompanied by pointing or a specifically expressed spatial term. While *keen* depicts the location of figures in relative proximity to the speaker, *kaduk* is reserved for more distant locations. However, distance is clearly not such a relevant factor in distinguishing these terms as is person-based deixis with *keen* referring to the 1st person (speaker) and *kaduk* to the 2nd person (addressee) as seen in smaller scale descriptions.

Interestingly, while there are many named places used in spatial reference, there are no 'ad-hoc' landmarks of the kind 'the man is looking at that rock' attested in the data so far. This observation is in line with results from wordlist elicitations showing a lack of generic landscape terms which has also been observed for other languages such as Lao (Enfield, 2008) and Yélî Dnye (Levinson, 2008). Consequently, there is a culturally significant usage pattern for toponyms.

So far, this analysis of Frames of Reference in MalakMalak leaves a number of questions unanswered. Future research aims to include a broader discourse sample and to conduct a more fine-grained gestural analysis. Additionally, it is worthwhile exploring whether there is a semantically or morphosyntactically distinguishable difference between landmark-based and cardinal-type directionals. Including, an analysis of usage patterns could reveal important insights into the relationship between directions and places, directionals and toponyms in small- as well as large-scale descriptions.

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Morpheme Order Constraints Upside Down: Verticality and Other Directions[·]

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This paper addresses a selection of languages which exhibits morphosyntactic structures that formally have little in common: Burmese and Arakanese (Tibeto-Burmese), Popti' (Mayan), Homeric Greek (Indo-European) and Mandarin Chinese (Sinitic). However, they all seem to organize the surface order of their Path-encoding elements according to two conceptual distinctions: (a) the Axiality or non-Axiality of Path, and (b) Deixis. Section 1 constitutes a brief terminological clarification about the use of the terms Path, Axiality and Deixis in this paper. Section 2 crosslinguistically observes Path-encoding elements and their surface ordering issues in two types of monoclausal constructions: multiple affixation and complex predication. Section 3 draws conclusions from this observation in view of further research. The major part of the data collection was led by my colleagues Alice Vittrant (Burmese and Arakanese); Colette Grinevald (Popti'); Mariarosaria Gianninoto, Ming Xiu, and Li Ling (Mandarin Chinese). The Homeric Greek data was collected by myself from the Perseus Digital Library (Crane 1997); finally, some Tetun Dili (Malayo-Polynesian) date is cited for purposes of comparison after Son & Svenonius (2009) The analysis of the data benefited from our collective work within the frame of the CNRS "Trajectory" Project (Typology of Path expressions) and of a forthcoming Project on Path and morpheme order.

[·] The "Trajectory" Project was coordinated by Jean-Michel Fortis, Colette Grinevald, Anetta Kopecka, and Alice Vittrant; it aimed to collectively elaborate a typology of Path expression in a diversity of languages, based on first-hand data. In addition to a number of academic publications, it produced several lexicons, questionnaires and a DVD (elaborated by Miyuki Ishibashi, Anetta Kopecka, and Marine Vuillermet in 2006) for the elicitation and analysis of Path expressions.

1 Path, Axiality, Deixis, and other terms

1.1 Path

"Path" is used in this paper as in Talmy (1985, 1991, 2000) and after the works of the "Trajectory" Project – cf. a state-of-the-art in Imbert (2012) and collaborative works such as Grinevald (2011), Imbert, Grinevald, and Söres (2011), Fortis and Vittrant (2011). The notion of Path was further detailed in the literature and given terminological extensions. Among such extensions, the notion of Telicity allows for the distinction between **atelic Path** (the boundary of the Ground is not reached, as with *toward* in *The boy ran toward the house*) and **telic Path** (the boundary of the Ground is reached or even crossed, as with *to* or *into* in *The boy ran (in)to the house*). The notion of Path was also divided into different sets of Path sub-types, or **Sub-Paths**. A commonly addressed set of Sub-Paths is that of Source (*out of*, *off*, *from*), Median (*through*, *along*, *across*) and Goal (*to*, *toward*, *into*); cf. Borillo (1998), and also the typology proposed by Bohnemeyer et al. (2007). This paper focuses on the expression of **elaborate Paths**, namely Paths segmented into several Sub-Paths and expressed through a combination of several Path-encoding elements, within a single Motion event. For instance in English, *The bird flew up into the sky*, with *up* and *into* as Path-encoding elements. The expression of an elaborate Path may be monoclausal or multiclausal depending on the language and on the construction; cf. Bohnemeyer et al. (2007) for the notion of "clausality", Ibarretxe-Antunano (2009) for the relation between the expression of elaborate Paths and the morphosyntactic toolbox of the language. Finally, some concepts are often involved in a Motion event that tend to constrain or at least to participate in the morphosyntactic organization and surface ordering of the expression of Path. Their frequent co-occurrence with Path in Motion event expressions motivates here the coinage of "Co-Path" as a good cover term. Such concepts are **Manner of Motion** (e.g. Slobin 2004), Posture and Position, and Associated Motion (Vuillermet 2012a, 2012b, to appear; Guillaume 2006, 2009).

1.2 Axiality

In this paper, the term Axiality refers to the distinction between axial and non-axial Paths. Axial Paths are overtly expressed as being organized with respect to an axis: a Vertical axis (*up* and *down*, *ascend* and *descend*), a Horizontal axis (*forward* and *backward*), or an axis which may be defined as vertical or horizontal depending on the context (*along*). Conversely, non-axial Paths are not overtly expressed as being organized with respect to an axis. The concept of "axis" acts toward Path as a plant support acts toward a plant: the directionality of Path follows an axis. Path-encoding elements such as *up* and *down*, *ascend* and *descend* specifically denote the Figure as following a Vertical axis: what is primarily encoded in such Path-encoding elements is Verticality. Path-encoding

element such as *forward* and *backward*, and for instance the English verb *recede*, specifically denote the Figure as following a Horizontal axis: the sea *recedes* at low tide, a turtle *recedes* into its shell, following the same horizontal axis that led them to high-tide level or out of their shell. This differs from the verb *return*: when one returns to a shop where they forgot their wallet, the verb *return* does not explicitly denote the presence of a directional axis acting as a support for the Path followed by the Figure. In other words, Axiality in Path is the explicit and perfect adequation between an axis and a Path; whereas Non-Axiality is the absence of explicitness regarding such a constraint.

1.3 Deixis

Deixis is the act of referring to the context of a utterance; in spatial contexts, it is the act of referring to one or the other Participant as a landmark (e.g. to the speaker, away from the speaker).[1] In the data examined in this paper, Deixis is interesting in terms of morpheme ordering: in those complex-predication and multi-affixed verbal constructions, Deixis is co-expressed with or expressed in the same slot as non-axial Paths, and consistently exhibit the same ordering pattern: elements expressing deictic non-axial Paths tend to occur in the rightmost slot of the complex predicate or in the slot farthest from the verb stem in the multi-affixed verb; whereas elements expressing axial Paths tend to occur in the leftmost slot of the complex predicate or in the slot farthest from the verb stem in the multi-affixed verb.

Two remarks are in order here. First, although Deixis is commented in the light of a certain type of Path (non-axial) in this paper, it should not be conceptually described as a "Sub-Path": it is clearly at a higher conceptual level. Second, in some languages, Deixis may also be co-expressed with axial Paths, more specifically vertical Paths, as shown by Diessel (1999:42-43).

2 The Ordering of Path Elements: A Crosslinguistic Observation

This section observes the expression of elaborate Paths in a selection of languages. It focuses on the relative ordering of Path-encoding elements in complex predication and multiple verbal affixation.

The templates shown in this section all follow the same pattern: (a) All of the templates show all the slots that may be deduced from the effective location of the Path-encoding elements in the string of verbs or affixes. (b) The first line numbers the different slots of the construction that encodes an elaborate Path, from left to right. As will be discussed, elements may appear in different slots depending on

[1] Deixis has been well-defined in the literature, cf. Fillmore (1982), Weissenborn and Klein (1982), Imai (2009), inter alia. It has been addressed as a notion separate from Path, since it is a concept of its own and it extends beyond the functional domain of space.

the context; thus, what will be referred to as "reordering" in this paper corresponds to the formal reordering of elements into slots, not to a functional reordering of the slots themselves. (c) The second line identifies which concept or set of concepts is encoded by the elements present in that slot: Manner, axial Path, non-axial Path, etc. That second line may subdivide the slot in two, denoting that the speaker is constrained to chose between two concepts when expressing elements from a slot. For instance in Burmese, Slot 2 is subdivided between Slots 2a and 2b in the second line; this means that elements in Slots 2a and 2b may not co-occur in a construction. (d) The third line lists the Path-encoding elements that were elicited during the data collection for each slot. (e) A fourth line may denote grammaticalization phenomena.

2.1 Complex predication in Burmese and Arakanese

The data was collected by Alice Vittrant based on the Frog Stories (Mayer 1969) and an elicitation video material (DVD) from the "Trajectory" Project (Ishibashi, Kopecka, and Vuillermet 2006). The collection took place in Yangon, Myanmar, in 2008 and 2010. The table in (1) shows the template for Path-encoding complex predicates in Burmese. All of these elements are still attested as verbs; however, elements occurring in Slot 3 exhibit a process of grammaticalization that may be identified as auxiliarization. These Slot 3 elements may express deictic non-axial Path as shown in table (1), as well as Aspect and Modality (Vittrant 2005). This template is fairly stable in the language; however, elements in Slot 3 may also appear in other slots in certain contexts, as discussed below.

(1) Template for Path-encoding complex predicates in Burmese[2]

1	2		3
Manner	2a Telic (Non-Deictic Non-Axial)	2b Axial	Atelic (Deictic Non-Axial)
khoN^{2} 'jump' *pye*^{3} 'run' *maɔN*^{3} 'drive'	*win*^{2} 'go in' *thwɛʔ* 'go.out'	*tɛʔ* 'go.up' *shin*^{3} 'go.down'	*la*^{2} 'come/toward' *θwa*^{3} 'go/away'
			Auxiliarization

The examples in (2a)-(2d) illustrate the template in (1); each example is labeled with the combination of slots it illustrates: for instance, example (2a)

[2] In these Burmese transcriptions, superscript numbers stand for tones; 1 notes the creaky tone, 2 the low tone, 3 the high-falling tone. The fourth tone is symbolized by the glottal stop at the end of the syllable. The first syllable in polysyllabic words is often atonal and characterized by the central vowel /ə/. Capital letters stand for consonants that are realized voiced or unvoiced depending on the context.

illustrates the combination of Slot 1 with Slot 2. The complex predicates appear in bold:

(2) a. **1+2**

kaɔN^{2}ma^{2}-le^{3}	tə=yaɔʔ	θɛ^{3}	pɔ^{2}=Ka^{1}.ne^{2}
woman-DIMIN	1=CLF:human	sand	top=from

caɔʔ.toN^{3}	pɔ^{2}=Ko^{2}	**khoN^{2}**	**tɛʔ**	=Tɛ^{2}
rock	top=OBJ	**jump**	**go.up**	=REALIS

'The young lady jumps from the sand on the rock'

b. **1+3**

θu^{2}	caɔN^{3}-Ko^{2}	Ka^{3}	**maɔN^{3}**	**θwa^{3}**	=Tɛ^{2}
3SG	school-DIR	car	**drive**	**go/away**	=REALIS

'He drove to school [away from the deictic center]'

c. **2+3**

thwɛʔ la^{2}	Piɔ^{3}.T^{1} θɔ^{3}	pɔ^{2}=Ka^{2}.ne^{2}	
go.out come/toward	SUB.TEMP	sand	top=S(ABL)

kaN^{3}.saʔ	=Ko^{2}	shiN^{3}	ne^{2}	=Te^{2}
bank	=DIR	go.down	INACC	=REALIS

'After going out [toward the deictic center], from the sand, [he] went down to the bank'

d. **1+2+3**

kəle^{3}	tə-yaɔʔ	piN^{2}.lɛ^{2}	θɔN^{2}	sɛʔ	= Ka^{1}.ne^{2}	piN^{2}.lɛ^{2}
kid	1-CLF	sea	shore	bank	= from	sea

thɛ^{3}=Ko^{2}	**pye^{3}**	**shiN^{3}**	**θwa^{3}**	=Tɛ^{2}
interior=DIR	**run**	**go.down**	**go/away**	=REALIS

'(A) kid runs down [away from the deictic center] into the sea from the seashore bank'

The table in (3) allows a comparison with the template for Burmese in (2), by showing the equivalent template for Arakanese. First, Arakanese seems to be able to express, within one complex predicate, both Telicity (Slot 2) and Axiality (Slot 3), while in Burmese Telicity (Slot 2a) and Axiality (Slot 2b) cannot occur in the same complex predicate. Second, in Arakanese, the combination 1+2+3+4 in one clause is not attested: Slot 1 (Manner) should be expressed in a different clause.

(2) Template for Path-encoding complex predicates in Arakanese

1	2	3	4
Manner	Telic (Non-Deictic Non-Axial)	Axial	Atelic (Deictic Non-Axial)
bri^{3} 'run'	*wɔN*^{2} 'go.in'	*cha*^{1} 'fall' *shoN*^{2} 'go.down' *tɔʔ* 'go.up'	*la*^{2} 'come/toward' *la*^{3} 'go/away'

Example (4) illustrates the maximal combination attested in the data (2+3+4):

(4) **2+3+4**

ye^{2} le^{2}ka^{3} thɔʔ=Ka^{1} ni^{2} pri^{3}.ke^{2} ga^{2}wan^{2}
ANAPH stairs upon=S stay SUB.TEMP gown

waʔ P(r)i^{3} **wɔN^{2}** **cha^{1}** **la^{2}** =re^{2}
wear SUB **enter** **fall** **come/toward** =REALIS
'Then, from the stairs, wearing a gown, (she) enters falling down [toward the deictic center]'

As mentioned above, in Burmese, elements occurring in Slot 3 may also occur in other slots. Example (5) shows such mobility for the Path-encoding element *la*^{2} 'come'. The sentence in (5) has two clauses: in the first clause, *la*^{2} occurs in a Slot 3 position, while in the second clause *la*^{2} occurs in a Slot 1 position:

(5) a. First clause

kaɔN^{2}ma^{2}-le^{3} tə=yaoʔ gu^{2} thɛ^{3}
woman-DIMIN 1-CLF:hum cave interior
Ka^{1} **thwɛʔ** **la^{2}**
S **go.out** **come/toward**
'After she went out of the cave [toward the deictic center]...

b. Second clause

Pi3.Tɔ^{1} ʔɛ.di^{2} chiN^{3}.taɔN^{3} =Ko^{2}
SUB.TPS ANAPH basket =OBJ

la^{2} **θɛ^{2}** **θwa^{3}** =Tɛ^{2}
come **carry** **go/away** REALIS
...the young lady came and carried [away from the deictic center] this basket'

In the first clause, *la*^{2} occurs in a Slot 3 position and functions as a deictic auxiliary. In the second clause however, *la*^{2} occurs in a Slot 1 position and

functions as a lexical verb. Note how, when occurring in a Slot 1 position, *la*^{2} 'come' may cooccur with a deictic element occurring in Slot 3 position (here *θwa*^{3} [away from the deictic center]). In other words, in the first clause, *la*^{2} occuring in a Slot 1 position gives a deictic reading to the whole predicate *thwɛʔ la*^{2} 'go out [toward the deictic center]'. In the second clause, with *la*^{2} occurring in a Slot 1 position, the complex predicate *la*^{2} *θɛ*^{2} *θwa*^{3} 'come and carry [away from the deictic center]' should be read as sequential: first the action of coming (*la*^{2} 'come'), and then the action of carrying (*θɛ*^{2} 'carry'), the whole sequence being oriented away from the deictic center (deictic *θwa*^{3}). Thus, in the second clause, the lexical verb *la*^{2} 'come' denotes an action of its own and as such does not function as a deictic auxiliary encompassing the whole complex predicate with a deictic perspective – however, the deictic auxiliary *θwa*^{3} '[away from the deictic center]' does, and is consequently placed in the rightmost slot of the combination of Path-encoding elements.

This situation in Burmese is reminiscent of what Son & Svenonius (2009) mention about Tetun Dili. Examples (6a)-(6b) illustrate this similarity. In Tetun Dili, the element encoding a deictic non-axial Path (here *b'a* 'go') in the complex predicate may occur in two different slots. It may occur to the right of the other verb of the predicate and give a deictic reading to the whole complex predicate, as shown in (6a) with the caused motion verb *lori* 'take'. Or it may occur to the left of the other verb of the predicate, in which the complex predicate should be read as sequential, as shown in (6b) with the axial Path verb *sa'e* 'ascend':

(6) a. (After Son & Svenonius 2009)

lori	hahaan	**bá**
take	food	**go**

'Take food [away from the deictic center]'

b. (After Son & Svenonius 2009, citing Hajek 2006)

nia	**bá**	(fali)	**sa'e**	iha	foho
3SG	**go**	(again)	**ascend**	LOC	mountain

nia	leten
POSS	TOP

'He went and ascended to the top of the mountain (again)'

According to Son & Svenonius, this "reordering" in the formal position of the deictic verbs in Tetun Dili complex predicates is caused by the grammaticalization of those deictic verbs: they exhibit prepositional functions, as shown in example (7) with the preposition *ba* 'to', grammaticalized from *bá* 'go':

(7) (After Son & Svenonius, citing Klinken et al. 2002)

Ami	fó-aluga	ami-nia	uma
we	give-rent	we-POSS	house
ba	malae	Tailándia	
to	foreigner	Thailand	

'We rent out our house to Thai foreigners'

Therefore, "reordering phenomena" in Burmese and Tetun Dili complex predicates occur under similar conditions: they affect the position of deictic non-axial Path-encoding elements. The latter may occur in a Slot 1 position and convey a lexical reading. Or they may occur in a Slot 3 position and convey a deictic reading encompassing the whole complex predicate. The main difference between Burmese and Tetun Dili lies is the path of grammaticalization followed by these deictic elements. In Tetun Dili, they grammaticalize into adpositions. But Burmese is a serializing language with a SOV constituent order: thus, adpositions occur in a preverbal position (namely left of the complex predicate), while the grammaticalization of the verbs contained in the complex predicate occurs from the right of that predicate. Therefore, Burmese "Slot 3" deictic verbs are not "adpositionalized", but auxiliarized.

2.2 Multiple verbal affixation in Popti'

The data was collected by Colette Grinevald (formerly Colette Craig) over several years of fieldwork. The table in (8) shows the template for Path-encoding multiple verbal affixation in Popti'. These affixes are called "directionals" by the mayanists. They are grammaticalized from verbs (cf. a summarizing table in Grinevald 2011:63), and all of them still exist as verbs in the language. Functionally, these directionals are purely adverbal and cannot work as adpositions; Popti' exhibits a separate set of adpositional elements. This template is stable in the language and the directionals cannot move between slots. All slots (1, 2, 3, 4) may be expressed together in one single construction. Interestingly in Popti', Telicity (Slot 3a) and Axiality (Slot 3b) cannot occur in the same combination; this situation is reminiscent of that observed in Burmese in Section 2.1. Note also how Slot 3b gathers both Axiality and Median.

(8) Template for Path-encoding multiple verbal affixation in Popti'

1	2	3		4
Verb stem: Motion, Manner...	Aspect	3a Telic (Non-Deictic Non-Axial)	3b Axial and Median	Atelic (Deictic Non-Axial)
	-pax iterative *-kan* durative *-kanh* 'suddenly'	*-(V)k* 'in(to)' *-(V)l 'out'*	*-(V)h* 'up' *-(V)y* 'down' -(*V)k'* 'across'	*-toj* 'away' *-tij* 'toward'

Example (9) illustrates one of the maximal combinations attested in Popti':

(9) **1+2+3+4** (Grinevald 2011:65)

x-Ø-s-muj-**kan-ay-toj**	heb'	naj	naj
ASP-him-he-bury-**ASP-down-away**	PL	CL/they	CL/him

'They buried him (once and for all down away)'

This data has been thouroughly addressed already; the reader is referred to Grinevald (2011) or Craig (1993) for numerous illustrations of the template in (8).

2.3 Multiple verbal affixation in Homeric Greek

I collected the Homeric Greek data through the Perseus database (Crane 1997), from the full texts of *the Iliad* and *the Odyssey*. The total number of words for those texts (tokens) is 199 046; the total number of types is 8214 in *the Iliad* and 3259 in *the Odyssey*. The total number of Path-encoding multi-affixed verbs in both texts is 98 tokens for 47 types: multiple verbal affixation is thus a relatively rare phenomenon. However, it exhibits a striking stability and very specific rules and constraints of affixation. The table in (10) shows the template for Path-encoding multiple verbal affixation in Homeric Greek. These affixes are called "preverbs" in the specialized literature. All slots (1, 2, 3, 4) may be expressed together in one single construction. This template has three striking features. First, within non-axial Paths, it allows the combination of elements expressing Telicity (Slot 1) and what I call here "Configuration" (Slot 2), namely detachment, containment, circumvention, location on the side, above and under. Second, Slot 3 gathers both Axiality and Median, which is reminiscent of the situation observed in Popti' in Section 2.2. Finally, there is no mention of Deixis in table (10): it is difficult to evidence in the absence of speakers, and the question is therefore left unaddressed in this paper. This template is stable in the language. No "reordering phenomena" are attested, except from the case of two verb stems which contain a fossilized Slot 3 element, on top of which multiple preverbation occurred – cf.

Imbert (2008:236-240).

(10) Template for Path-encoding multiple verbal affixation in Homeric Greek

1	2	3	4
Telic (Non-Axial)	Configurational (Non-Axial)	Axial and Median	Verb Stem: Motion, Manner...
eis- 'to' *ek-* 'out of' *epí-* 'at, onto'	*apó-* 'off' *en-* 'in' *pará-* 'beside' *perí-* 'around' *hupér-* 'above' *hupó-* 'under'	*aná-* 'up' / 'backward' *katá-* 'down' *pró-* 'forward' *diá-* 'through'	
Adpositionalization			

Examples (11a)-(11d) illustrate the template in table (10). More specifically, they show a difference in the morphosyntactic behavior of the preverbs, depending on their location in the combination (demonstrated in Imbert 2008, 2010). When the Ground is overtly expressed, it occurs most of the time to the left of the multi-affixed verb, and the leftmost affix of the combination systematically works as an adposition: namely, it morphosyntactically relates to the Ground-encoding syntactic argument.[3] Conversely, the inner prefixes of the combination systematically work as adverbal particles. This explains the fact that syntactic constructions such as [multi-affixed verb + adposition + Ground], artificially illustrated in (11e), are not attested: there is already one element functioning as an adposition within the multi-affixed verb.

(11) After Imbert (2008, 2010)

a. **2+3+4** (Il. 13.87)

toì	méga	teîkhos
DEM:NOM.PL	great:ACC	wall:ACC
huper-kat-ebe:san		homílo:i
above-down-walk:AOR.3PL		throng:DAT

'(The Trojans) who had got down over the great wall in their multitude'

[3] The Ground is overt and occurs to the left of the multi-affixed verb in 63 of the 98 occurrences of multi-affixed verbs in both texts; it is overt and occurs to the right in only 8 occurrences – and, incidentally, the leftmost affix is always the one that works as an adposition introducing the Ground, no matter where the Ground is positioned with respect to the multi-affixed verb.

b. **1+3+4** (Od. 16.449)

hê mèn ár'	**eis-ana-bâs'**
REL:NOM LNK LNK	**to-up-walk:AOR.3SG**
huperó:ïa	sigalóenta
upper_chamber:ACC	bright:ACC

'So she went up to her bright upper chamber'

c. **1+2+4** (Od. 12.306)

ex-ap-ébe:san	etaîroi	ne:ós
out-off-walk:AOR.3PL	comrade:NOM.PL	ship:GEN

'And my comrades went out from the ship'

d. **1+2+3+4** (Il. 2.267)

smôdix	d'	aimatóessa
swollen.bruise:NOM	LNK	blood.red:NOM
metaphrénou	**ex-hup-an-éste:**	
back:GEN	**out-under-up-start:AOR.3SG**	

'A bloody weal rose up on his back' (lit. 'rose **up out of** his back, from **under**')

e. [Multiaffixed verb + Adposition + Ground] (not attested)

ex-ap-ébe:san	etaîroi	***ex**	ne:ós
out-off-walk:AOR.3PL	comrade:NOM.PL	***out.of**	ship:GEN

'And my comrades went out from the ship'

2.5 Complex predication in Mandarin Chinese

The analysis for Mandarin Chinese in this paper has been inspired by Lin (2010); the data presented in the latter has been checked and extended for this paper by language specialist Mariarosaria Gianninoto and native speakers Ming Xiu and Li Ling (all three from the University of Grenoble). The table in (12) shows the template for Path-encoding complex predicates in Mandarin Chinese, based on Lin (2010)[4]. All of these elements are still attested as verbs; however, some elements occurring in Slots 3 and 4 (*lai* 'come', *qu* 'go' and *dao* 'arrive') exhibit a process of grammaticalization that may be identified as adverbalization and adpositionalization. In Chinese, Telicity (Slot 3a) and Deixis (Slot 3b) cannot occur in one complex predicate. Finally, the combination 1+2+3+4 in one clause is not attested: Slot 1 (Manner) should be expressed in a different clause.

[4] Lin (2010) proposes a terminology based on a notion of "scalar Motion Morpheme hierarchy" (SMMH). That terminology suggests an ascending "boundedness" of Path from the left to the right of the complex predicate. For the sake of coherence, the present paper applies the same terminology throughout its analyses; the reader is thus referred directly to Lin (2010) for the "SMMH" terminology and analysis.

(12) Template for Path-encoding complex predicates in Mandarin Chinese, based on Lin (2010)

1	2	3		4
Manner	Axial	Non-Axial		
gun 'roll' *pao* 'run' *fei* 'fly' *zou* 'walk'	*tui* 'recede'[5] *shang/sheng* 'ascend' *luo* 'fall' *xia* 'descend'	3a Telic *hui* 'return' *jin* 'enter' *chu* 'exit'	3b Atelic (Deictic) *lai* 'come' *qu* 'go	*dao* 'arrive'
			Adverbalization/Adpositionalization	

The template in table (12) is well illustrated in Lin (2010); examples (13a)-(13f) complement Lin (2010) in showing a few extra combinations:

(13) a. **1+4** (Ling p.c)
ke-hou xiao-peng-you-men dou **pao-dao**
class-after kids all **run-arrive**
cao-chang-shang wan-sha
playgroung-in play
'After class, the kids run to the playground'

b. **2+4** (Ling p.c)
zhe-ge yan-yuan cong-ci **tui-dao**
this-CLF actor since-then **recede-arrive**
yin-mu-hou
scenes-behind
'This actor retreated behind the scenes since then'

c. **3+4** (Ling p.c)
ni **hui-dao** wo shen bian
you **return-arrive** I body side
'You come back to me'

[5] Note the interesting slot distinction between *tui* 'recede' in Slot 2, which involves horizontal axiality (like a turtle receding into its shell), and *hui* 'return' in Slot 3a, which does not explicitly denote an axis (just an idea of "going back" to a former location or state).

d. **1+2+4** (Xiu p.c)

shi-tou	**gun-luo-dao**	zhe-li
stone	**roll-fall-arrive**	here

'The stone rolled down to here'

e. **1+3+4** (Ling p.c)

ta	cong	bei-jing	chu-fa	**fei-qu-dao**	shang-hai
he	from	Beijing	leave	**fly-go-arrive**	Shanghai

'He flew to Shanghai from Beijing'

f. **2+3+4** (Ling p.c)

ru-guo	**tui-hui-dao**	2000	ni	xiang	dui	
if	**recede-return-arrive**	2000	you	want	to	
zi-ji	shuo	shen-me				
yourself	say	what				

'If you return to (year) 2000, what do you want to say to yourself?'

The template in (12) has some counter-examples. Examples (14a)-(14b) illustrate "reordering" in the formal position of the verbs within their complex predicates (collected by Mariarosaria Gianninoto, from the Academia Sinica Balanced Corpus of Modern Chinese and the Chinese web). The elements occurring in Slots 3 and 4 in table (12) exhibit higher grammaticalization and may switch slots in certain contexts. While the combination *lai dao* 'come arrive' (3+4) has 373 occurrences in the corpus, the reverse combination *dao lai* 'arrive come' (4+3) is also attested, with 79 occurrences – however, such occurrences exhibit a bleached and/or more abstract meaning. The combination in table (12) *qu dao* 'go arrive' (3+4) only occurs 5 times in the corpus. The reverse combination *dao qu* 'arrive go' (4+3) does not occur in the corpus; however, several examples may be found on the Chinese web, with semantically bleached or altogether non spatial meanings, such as the meaning 'interpret' (14b).

(14) a. **4+3**

Hei	ye	yi ran	**dao-lai**
Black	night	already	**arrive-come**

'Night has already fallen'

b. **4+3**

Meng	**dao-qu**	guowai	luyou	shi	shenme	yisi
Dream	**arrive go**	abroad	travel	be	which	meaning

'How should one interpret dreaming of going abroad?'

3 Concluding remarks

This crosslinguistic exploration reveals striking similarities across languages that share very few formal features. Across Burmese, Arakanese, Popti', Homeric Greek and Mandarine Chinese multi-affixed verbs or monoclausal complex predicates encoding elaborate Paths, four observations can be made – knowing that the question of Deixis was left unaddressed here for Homeric Greek.

In terms of formal ordering, in all of these languages (with the exception of Homeric Greek), (a) Deixis is the concept that is expressed the farthest away from the expression of Manner of Motion; (b) the expression of axial Path occurs systematically closer to the expression of Manner of Motion than the expression of Deixis. In terms of combination constraints, (c) in Burmese and Popti', the expression of telic Path and the expression of axial Path cannot co-occur within the same construction; (d) in both Popti' and Homeric Greek, axial Path and Median cannot co-occur within the same construction.

Exploring underlying semantic and/or conceptual constraints and extending the selection of languages would shed light on these morpheme ordering issues, and in return participate in the discussions on Path, more specifically on the organization of the expression of Sub-Paths and Co-Paths in Motion events.

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The Forefinger/Thumb Alternation in Arapaho Pointing: Participation Space as a Frame of Reference

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Introduction

Pointing is a basic referential resource for human interaction, and Arapaho speakers make full use of its potential. I report on the Arapaho forefinger/thumb pointing alternation for person reference. I argue that the distinction encodes an Arapaho sensitivity to the common space created by interactional co-participants, or the "participation space" (Goodwin 2000). As co-participants often constitute themselves as such by their mutual display of a participation space, this interactional frame of reference is reflected in the Arapaho pointing alternation: Thumb pointing is used for co-participant reference when the participation space is the relevant frame of reference; forefinger pointing is used for person reference when the participation space is not the relevant frame of reference. This functional difference between the two types of pointing is highly motivated by an Arapaho language ideology and the general hand-shape iconicity distinguishing the two points. Together, these two motivators result in forefinger pointing as the highly marked alternate for co-participant reference.

1 General Background

Arapaho is an American Indian language of the Algonquian family and Great Plains region (Cowell and Moss Sr. 2008). Along with a rich polysynthetic vocal language, Arapaho speakers draw on a rich repertoire of conventional gestures. These gestures largely stem from Plains Indian Sign Language, the pre-20th

century lingua franca of the Great Plains. Although the forefinger/thumb pointing alternation has not been historically related to Plains Indian Sign Language, the phenomenon is nevertheless exemplary of the conventional gesture that is so characteristic of Arapaho language.

The data I use in this paper comes from the Arapaho Conversational Database (2011) [ACD]. This video-based corpus of Arapaho speakers has over 30 hours of day-to-day interactions amongst the Northern Arapaho on the Wind River Reservation in Wyoming. Thus, although I generally use the term *Arapaho* in this paper, the claims I maker are specific to the Northern Arapaho and their dialect (there are two closely related dialects). Additionally, all Arapaho speakers are also English speakers, but I have not yet determined whether the forefinger/thumb pointing alternation is associated with Arapaho English too.

2 Pointing and Interactional Frames of Reference

In this section, I review research that is relevant to understanding the Arapaho use of participation space as a frame of reference in pointing practices. There are two areas of relevant research. The first looks at how frames of reference are conventionalized in pointing practices. The second involves interactional space as a frame of reference encoded in spoken demonstratives. Taken together, this research supports the Arapaho encoding of an interactional space as a frame of reference in pointing.

Whether used in accordance with spoken resources or not, pointing is one of the primary conventionalized resources through which speakers instantiate one spatial frame of reference or another (Haviland 2000; Levinson 2003; Le Guen 2011). Le Guen (2011) has described the typological situation as one in which the conventionalization of frames of reference in pointing practices only applies to a "transposed" referential condition. The transposed condition is used by speakers who are describing the details of a distant (usually, not-visible) scene. The speaker transposes the reference because the figure (i.e. targeted entity or referent) of the pointing action and the ground (i.e. the spatial features of the scene used to referentially resolve the figure) are not situationally accessible to the speaker or the other interactional participants. For the transposed condition, there are two frame-of-reference types that can be encoded in pointing: An "egocentric" and a "geocentric." Egocentric encoding corresponds to what is typically called a *relative frame of reference*, and so figure-ground spatial relationships are re-created from the speaker's point of view. Geocentric encoding corresponds to what is typically called an *absolute frame of reference*, and so figure-ground spatial relationships are based on immutable geographic properties (e.g. cardinal direction, landmarks) and thus preserve actual directions and other orientational features of the involved entities. As the transposed condition is basic to human interaction, the two conventionalized systems are pervasive features of

language use. However, communities tend to be primarily either egocentric or geocentric encoders.

A big part of Le Guen's (2011) argument is that frame-of-reference conventionalization in pointing is not possible in the non-transposed condition. In this condition, the figure and ground are situationally accessible to the interactional co-participants, and so no frame of reference is needed. Thus, a speaker can use direct pointing to individuate a visible referent, an activity that all communities have in common. The author argues that in this non-transposed condition, the "origo" (or source of the pointing action) is always the speaker's body, and so there is no variable in the non-transposed condition making alternate frames of reference possible. However, Hanks (1990) argues that the origo is also variable in the non-transposed condition. Different origo configurations, then, can also be encoded in referential forms. The origo can be the speaker's body or it can be the space embodied by the interactional co-participants (among other possibilities). Thus, a referential act has the potential to highlight both a referent and an origo. The problem with this notion, though, is that Hanks (1990) was discussing the potential of spoken referentials, and there is no physical attachment between a body and a spoken referential as there is with pointing.

Enfield's (2003) work on Lao demonstratives, however, brings us a little closer to how an interactional space might be encoded as a frame of reference. He shows that with the two Lao demonstratives (similar to *here* vs. *there* or *this* vs. *that*), when there is a contextual possibility that either one is relevant, their opposing values will be based on a contextually relevant 'here space,' which is often the space embodied by the interactional co-participants (as opposed to a space based on the speaker). In general, such interactional spaces are crucial components of human interaction, as they are dynamically constructed by co-participants of an interaction, mutually positioning and orienting their bodies and gestures with respect to each other and other material in their immediate environment (*see also* Kendon 1990; Goodwin 2000; Mondada 2009). According to Enfield (2003), a *here* demonstrative will thus index the 'here-space' of the relevant interactional space, whereas the *there* demonstrative will index the 'not-here space' of the relevant interactional space. The referent of either demonstrative is indicated through direct pointing, and so a demonstrative and point work together to resolve some referent. Thus, what is indicated by one demonstrative or the other is not a referent itself, but a ground on which a referent is foregrounded. Interactional spaces, then, can also act as frames of reference, but they apply to the non-transposed condition.

For Arapaho speakers, there is a particular sensitivity to one type of interactional space: "participation space" (Goodwin 2000). A participation space is the generic space that is managed by the bodies of interactional co-participants in order to display mutual engagement. In (1), we see a typical Arapaho participation space.

(1) Side-by-side Arapaho participation space; ACD file 25A

The co-participants in this interaction have seated themselves in a side-by-side manner, creating a sort of arc so that they appear to be a segment of a large circle. This participation arrangement is typical of Arapaho interactions. Characteristic of participation spaces in general, it displays symmetry (cf. Kendon 1990). For Arapaho interaction, this symmetry translates to a center point that is equidistant from the participants. An interactant will gaze at this point as sort of a neutral or inactive state of interaction, as the participants in (1) are doing. Within this space, gestures and other bodily actions are at least within the peripheral vision of co-participants, allowing for ease of co-participant coordination.

Participation spaces are important not just for the visual coordination of interaction, but also as a means for one to demonstrate engagement in the ongoing interaction (i.e. co-participation). This use of the participation space is especially relevant when there are others present who are not engaged in the ongoing interaction. For example, in (2) and (3), two participation spaces are created, one after the other.

(2) Exclusive participation space; ACD file 14a

(3) Inclusive participation space; ACD file 14a

The woman in the pink and her husband are clearly creating an exclusive participation space with respect to the others on the stage. Moments later, a more inclusive and generic side-by-side arrangement is resumed, and a different participation space is thus created.

Similar to what Enfield (2003) found in his study Lao demonstratives, Arapaho speakers use the participation space as a frame of reference. However, for the Arapaho, the participation space is indexed not through a pair of spoken demonstratives but in a pointing alternation. The next section gives relevant background on Arapaho pointing, and the encoded sensitivity to participation space.

3 The Pointing Sensitivity to Participation Spaces

In this section, I introduce the forefinger/thumb pointing alternation as it demonstrates a sensitivity to person reference within a common participation space (i.e. for co-participant reference). The sensitivity is reinforced by a

language ideology in Arapaho concerning the appropriateness of forefinger pointing. The concern with forefinger pointing means that other types of pointing, such as thumb pointing, are not necessarily noticeable as pointing activities in Arapaho. Thus, as forefinger points are marked for co-participant reference, thumb points are not.

Arapaho speakers, like those of many other Native American communities, have a proscription against pointing. The Arapaho proscription, however, is more of a soft proscription, as there is a pervasive amount of all types of pointing amongst Arapaho speakers in interaction. A qualification, then, is needed to understand how there can be a proscription against pointing amongst those who take full advantage of pointing as a resource for interaction. First, the proscription does not extend to all types of pointing. Rather, for Arapaho speakers, pointing is ideologically most salient when it takes the form of a forefinger point. And, although professional analysts may consider other types, such as lip pointing, open-hand pointing, and thumb pointing, such gestures are not necessarily noticeable as pointing in Arapaho. Forefinger pointing is thus more of an on-record pointing activity in Arapaho than are other types of pointing.

In practice, the proscription against forefinger pointing only applies to the domain of person reference. It is never problematic to point at objects or places with a forefinger. Further, the proscription only applies to persons who are fellow interactional co-participants of the pointing person. Thus, forefinger pointing is heavily marked when the pointing person and the pointed-at person are co-structuring a participation space. More specifically, a forefinger point at a co-participant works to negate the participation space as a relevant frame of reference for the point.

Thus, a participation space has two important qualities that are salient to marked actions involving reference to a co-participant, and Arapaho speakers use the forefinger point as a resource for these actions. First, as I discussed in the prior section, co-participants generally structure participation spaces so that each member of the interaction has equal access to the visible properties of the interaction. In order for basic interaction to work, this type of equality or social symmetry must be maintained (Heritage 2008). However, in the marked action of giving a command or a directive, a social asymmetry (or power differential) in the interaction is implied, as the director attempts to control the directed. For Arapaho speakers giving directives, the forefinger point works to divorce the commanding action from the interactional equality indexed by the participation space.

The second quality of a participation space that is salient to marked actions involving co-participant reference is its use as a referential anchor. As previously discussed, the participation space is very important for the concept of 'here' for interactional co-participants. That is, the participation space is the most relevant situational anchor, and so when a speaker is transposing a reference onto a distant place or otherwise making a space outside of the participation space relevant, the

speaker must first negate the relevance of the participation space. Further, in the case that a co-participant is a character or in some other way associated with a transposed scene or distant place, a forefinger point at the co-participant negates the participation space. Thus, the transposed scene or distant place is made referentially relevant to the action. The forefinger thus works in this way by making the referred-to person's interactional identity a matter of the transposed scene or distant place, as opposed to making it a matter of the person's role in the "participation framework," such as hearer and recipient (Goodwin and Goodwin 2004). In (5), a speaker uses a forefinger to point at a co-participant for such an action.

(4) Forefinger point for place reference; ACD file 24b, 4:34

(5) Forefinger point for co-participant reference; ACD file 24b, 4:42

(6) nee'ee- nee'ee- nee'eeteihi-t
that.is- that.is- that.is.where.X.is.from-3.S
'That's where she is from'

In (4), we see that the speaker is first pointing to Boulder, Colorado, in reference

to where one of the co-participants is going to school. The referred to co-participant is a woman sitting to the speaker's right and out of the camera view. In (5) he points at this woman and explicitly states that she is from Boulder, as we see in (6). The forefinger point works to associate the woman with Boulder, as the speaker is in the process of developing the woman's association with another person through the mutual involvement that these two persons have with the school in Boulder. Thus, the focus here can be paraphrased as *Boulder, the place where the woman is from* as opposed to *the woman, who is from Boulder*. The forefinger point makes Boulder, and not the participation space, referentially relevant to the woman's interactional identity in this moment.

Thus, it is because of the social implications of using the forefinger point for person reference within the participation space (i.e. creating social asymmetries and distance from the 'here') that there is a proscription against pointing. However, when a speaker makes general reference to a co-participant, a pointing action is often necessary. So, in avoidance of forefinger pointing in such situations, the Arapaho practice is to use a thumb point. Again, a thumb point is technically a point, but in accord with Arapaho ideology a thumb point is not noticeable as a point in the same way that a forefinger point is.

The following sequence demonstrates the sensitivity of the forefinger/thumb pointing alternation for co-participant person reference. The situation involves a speaker who refers to someone next to her with first a forefinger point (see (7)) and then a thumb point (see (9)). Four people are seated side-by-side on a stage preparing to tell traditional Arapaho stories to an audience. The woman in the pink shirt and her husband turn inward toward one another. She speaks into his ear, instructing him to tell the audience that the woman in the hat will speak first. The woman in the pink shirt points with a forefinger at the woman in the hat on *nehe'* in (7) and (8).

(7) Forefinger used for non-co-participant reference; ACD file 14a, 0:10

(8)	he3eb-ei'towuun-inee	ne'-P	**nehe'**	heet-cesisi-too-tthere-
	tell.s.o.-3.IMPER	then-pause	this	FUT-begin-do-3.S
	'Tell them that this one will start'			

In their coordination, the woman in pink and her husband's participation space excludes the woman in the hat, and thus the woman in the hat is referred to with a forefinger point, as an individual distinct from the ongoing interaction. Seconds later, the woman in pink disengages from the exclusive arrangement with her husband by facing her body outward to coordinate with the others. Again, the side-by-side arrangement is not just a product of this cultural performance, it is also rather typical of Arapaho interactions. Signaling this change of participation space, the woman in pink briefly makes eye contact with the woman in the hat. At that moment, the husband vocalizes some confusion, and so the woman in pink reinforces her initial instruction to him in a repair sequence. This time, the woman in pink uses a thumb point at the woman in the hat on *neh'eeno* in (9) and (10).

(9) Thumb point for co-participant reference; ACD file 14a, 0:18

(10)	hiiko	**neh'eeno**	heet-ne'-cesisi-too-t
	no	this	FUT-then-begin-do-3.S
	'No, her, she's the one who will start'		

In (9) we see that the woman in pink turns her head to her husband and not her whole body, maintaining the inclusive participation space with the woman in the hat. The thumb point and not the forefinger point is thus used to refer to the woman in the hat.

The Arapaho forefinger/thumb pointing alternation, then, is reinforced by the soft proscription against pointing and thus demonstrates a culturally specific sensitivity to participation spaces. Specifically, these spaces are primary frames of

reference for situational distinctions in person status made through basic referential acts (cf. Hanks 1990; 2005). The next section discusses more about the forefinger/thumb alternation, especially as it relates to other properties of the Arapaho language.

4 The Relation of Form and Function in the Alternation

The following section gives further detail on the forms and functions involved in the forefinger/thumb pointing alternation. While both forefinger and thumb pointing constitute pointing in a technical sense, thumb pointing has qualities that make it particularly salient as a functional pointing resource, but one that is nevertheless unnoticeable as such from an Arapaho perspective.

Technically defined, pointing is a movement of the body that is spatially directed, and recognizably so by a co-participant. Both forefinger pointing and thumb pointing are thus types of pointing in this sense. In many languages, it is apparent that the difference between these two pointing hand shapes is a matter of anatomical convention, the thumb used for back and side pointing, the forefinger used for forward pointing. However, in Arapaho, there are instances of both forward thumb pointing as well as behind-the-back forefinger pointing (cf. Wilkins 2003). This contrasting distribution of the forefinger and thumb morphologies thus underscores the functional conditioning of the alternation.

Further, the differential functions of these two points are in large part motivated by their forms. Forefinger points have the forefinger extended and the rest of the fingers at least partially closed. The line made from the base of the forefinger to the tip of the forefinger determines the directional aim of a forefinger point. Forefinger points thus maximize visual precision in this way. With a thumb point, the thumb is protruding relative to the other fingers, which are at least slightly closed. Different from forefinger pointing, however, the thumb need not—and is often not—the source of directionality in a thumb point. In a thumb point, directionality is more often a matter of hand movement. The protruding thumb thus defines the hand shape but not necessarily the means of resolving direction. This is not much of a surprise given that thumbs are generally not as straight as forefingers. This difference in hand-shape form and use highlights how the precision of the forefinger point makes it a more exemplary and noticeable type of pointing.

However, the difference in hand-shape form and use are also iconic of the informational qualities of these points (cf. Enfield, Kita, and De Ruiter 2007). This iconicity is important for understanding how the thumb point has come into position as the unmarked form for co-participant person reference. The best display of the underpinnings of this iconic relationship occurs in the use of the forefinger/thumb pointing alternation for non-person reference (cf. Kendon and Versante 2003). In this domain, the forefinger point is generally used to

individuate places and objects that are well defined from the perspective of the pointing person and other co-participants. In the visual range, things that can be foregrounded and focused on as well-defined entities are referred to with a forefinger point. This includes a wide range of things. At close range it can include objects such as chairs and trees, while at a more distant range it could include a building. It would not include, however, a building that a speaker is standing right next to, for example, as the building could not be focused on as a well-defined entity from that person's perspective. Places that are out of the visual range are also treated with a forefinger point if they can be conceived of as singularities from the perspective of participants. For example, a town that is twenty miles away would be identified by pointing with a forefinger to its most central area. The forefinger is thus used to individuate entities, whether within view or within the broader landscape that is commonly understood by co-participants. With forefinger points, then, a participant doesn't discriminate whether an entity is visible or not, only whether or not it can be visually foregrounded.

In non-person reference, the thumb point is used to refer to backgrounded spaces, especially regions and entities that are blurred from the perspective of co-participants. Because of this, thumb points are usually used to refer to spaces that are not too distant from participants. For example, a thumb point is used to refer to near patches of land or a broad area of a locality. Additionally, if one is making reference to a building or its interior space, they will use a thumb point in the case that they are standing next to it. Such spaces are either too close to be individuated or are too close to have well-defined centers from the perspectives of participants.

In sum, forefinger pointing is more precise, and this precision iconically motivates its use to foreground entities that can be perceived (or construed) as well defined and bounded from the co-participant perspective. In contrast, thumb pointing is less precise, and this low precision iconically motivates its use to display an area as less defined or out of focus, a region from the perspective of co-participants. Thus, thumb pointing in Arapaho is essentially a low-fidelity means of reference.

In the domain of co-participant reference, this low-fidelity nature reinforces thumb pointing as the appropriate alternative to forefinger pointing. One can thumb point in the general direction of a person without the pointing action itself being noticeable as a point. Additionally, for co-participant reference, the iconically-motivated informational difference between forefinger and thumb pointing is underscored by the speech that co-occurs with each type of pointing. Forefinger pointing often co-occurs with the demonstrative *nehe'*, which is used as the general demonstrative for person reference. Thumb pointing, however, very often co-occurs with the demonstrative *nehe'eeno*, which is also a demonstrative for person reference, but it has the added meaning that the referent is moving

around or otherwise difficult to identify with clarity. It is only in the domain of co-participant reference that *nehe'eeno* is regularly used to refer to persons who are not difficult to identify with clarity. Thus, the low-fidelity informational nature of thumb pointing is supported by the demonstrative it regularly occurs with. However, whether it co-occurs with the demonstrative or not, such regular "affiliation" (Schegloff 1984) between the two forms strengthens the use of thumb pointing as the unnoticeable pointing resource for co-participant reference.

Conclusion

Although participation spaces are essential to human interaction, Arapaho speakers demonstrate a particular sensitivity to it. This sensitivity is manifest in how participation spaces are used in pointing practices as frames of reference for referring to co-participants and others in the vicinity of the interaction. A speaker uses a forefinger point to individuate someone outside of the participation space (i.e. a non-co-participant). A speaker also uses a forefinger point to refer to a co-participant for situations in which the participation space is not the momentary relevant frame of reference. Such a use, however, is marked, and the markedness is reinforced by an Arapaho proscription against pointing in certain contexts. For co-participant reference, speakers use thumb pointing. Because thumb pointing is iconic of low information, thumb points are generally unnoticeable as pointing activities in Arapaho, and so the use of a thumb point does not fracture the interactional equality indexed by the structure of the participation space. The forefinger/thumb pointing alternation for co-participant reference in Arapaho thus serves to maintain the integrity of participation space as a primary frame of reference.

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Ways of Going 'Back': A Case Study in Spatial Direction[1]

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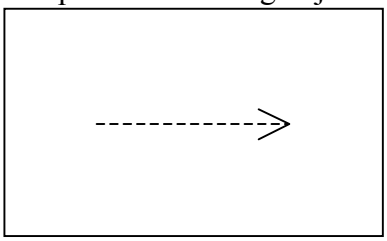
1 Introduction

Suppose the arrow in (1) represents the path of a moving object. How would we describe the direction in which that object is moving?

(1) The path of a moving object



It depends. For you as a reader the object is going *to the right*, but if you are looking at a map it is going *east*. The object is also going *away from* the left-hand border and going *straight ahead*. Clearly, there are different ways to describe the direction of a moving object, depending on the properties of the moving object or its environment that we base our description on (see, for instance, Talmy 2000).

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Some of these path directions are based on a reference frame, a notion that figures prominently in the study of prepositions like *under*, *behind*, *left of*, *east of*, that express static relations between two objects defined on the basis of a particular axis (e.g. Levinson 1996). Such an axis can be determined by the intrinsic orientation of the reference object (like the front and back of a car), by an observer (like the front and back of a tree from her point of view), or by the environment (like gravitation or the compass).

This paper is about the role that axes play in defining paths of motion. In spite of the rich literature on both domains (axes and paths) there is no explicit account of the relation between them. Almost all of the linguistic and psychological work on reference frames or axes concentrates on their role in determining static, locative relations between two objects (e.g. Levinson 2003, Van der Zee and Slack 2003, Svenonius 2006), but we do not yet have a good idea of how a dynamic path of motion can be based on an axis. I hope to show that it is worthwhile to develop a simple, though explicit, model of how paths can relate to reference frames, because it turns out that the path domain is actually richer than the place domain, both conceptually and lexically. I will demonstrate this by constructing a semantic map (Van der Auwera & Plungian 1998, Haspelmath 2003) that shows the different ways of going 'back' in Dutch, as a case study.

The structure of this paper is as follows. In order to get the bigger picture, I start with a general overview of the types of direction of motion that can be distinguished (section 2), then I formulate a simple formal model for axis-based directions (section 3), that I then apply to the different ways of going 'back' in Dutch (section 4).

2 Types of Direction

The direction of a path can be distinguished from its *shape* (Talmy 2000, Van der Zee et al. 2010). The shape or curvature of a path is invariant under geometric transformations. A straight, zigzagging, or circular path remains straight, zigzagging, or circular when you rotate it, translate it, or change its size. This is not necessarily true for the direction of a path. The reason is that the direction of a path is not an intrinsic, structural notion (which shape is), but it depends on the frame (in a broad sense) that forms the background of the path. For instance, the upward direction of a path is not a property that is invariant under rotation, because it depends on the gravitational frame.

In this paper I only consider paths of *motion*, although I am well aware of the role of paths in a variety of non-motion configurations, including so-called *fictive motion* (Talmy 2000). I hope that what I have to say here extends to non-motion paths, but it would go beyond this paper to discuss that in any depth.

The first type of path direction that I consider is *absolute direction*, which is determined by an absolute frame of reference, given by a local or global

environment, e.g. compass points (*go north*), gravitation (*go up*), or the front-back axis inside an object (*go to the back*, in a church, classroom, or bus, Fillmore 1975). As is well known, the same frames can be used to determine places (*the lake north of the village*, *the painting over the fireplace*, *the seats in the front of the bus*).

Intrinsic direction is determined by distinct sides of a movable object with canonical orientations, like a human being, animal, or vehicle. We can see them most clearly at work in the horizontal plane (Fillmore 1975):

(2) a. He walked backwards from the Queen.
b. Crabs walk sideways.

Again, the same frames are used to determine places (*the noise behind me*, *the shell beside the crab*).

Relative frames of reference can also form the basis for paths, when a direction is projected from the point of view of an observer:

(3) I saw the tornado move to the right.

Here the movement of the tornado is described in terms of the right-hand side of the subject of the sentence. This is analogous to the description of places, like *the cow to the left of the tree*.

These three types of direction (that I collectively refer to as *reflexive* direction) are based on three very familiar frames. Much less familiar is the type of direction described in Schmidtke et al. (2003), which I refer to as *phasal direction*. In this case the direction of a path is described in terms of the path of the same object in an earlier 'phase'. Let's assume that the moving object first followed a path p', which then creates a reference frame for the subsequent path p of the same objects that starts from the end point of p'. If p is going in the same direction as p', then the object is going *straight ahead*. If p is going in an opposite direction to p', then its direction is *back*. Intrinsic and phasal direction are clearly distinct although they might be aligned. One can go back backwards (alignment of phasal and intrinsic back), but that is not necessary.

A well-known type of direction is what I will call *modal direction* (borrowing the term *mode* from Kracht 2002). The direction of the path of motion is determined by an object that serves as a landmark or reference point. It can be the starting point or source ('from'), the end point or goal ('to'), or and intermediary point ('via'). This is the kind of directionality that is characteristic for the contrasts that we see in adpositional and case systems (Pantcheva 2011). Each of

these three modes can be combined with each of the three classical frames of reference, as illustrated in the following Dutch examples.[2]

(4) *Absolute reference frame*

a.	De muis kwam van onder de tafel. The mouse came from under the table	Source
b.	De muis rende onder de tafel door. The mouse ran under the table through	Route
c.	De muis kroop onder de tafel. The mouse crept under the table	Goal

(5) *Relative reference frame*

a.	De kat kwam van achter de boom. The cat came from behind the tree	Source
b.	De kat rende achter de boom langs. The cat ran behind the tree along	Route
c.	De kat sprong achter de boom. The cat jumped behind the tree.	Goal

(6) *Intrinsic reference frame*

a.	De cameraman kwam van achter de camera. The cameram came from behind the camera	Source
b.	De cameraman liep achter de camera langs. The cameraman walked behind the camera along	Route
c.	De cameraman stapte achter de camera. The cameraman stepped behind the camera	Goal

This is because source, route and goal directions are based on places (like under the table, behind the tree, behind the camera) that are defined on the basis on axes. The direction of the paths of motion in (4)-(6) is independent of the directions of the axes; what counts is what part of the path of motion intersects with the axis.

Much less common is a type of direction that I call *centripetal*, because it involves motion towards an implicit point of view:

(7) a. A voice came from behind.
b. The tree was approached from the left.
c. a northerly wind (i.e. coming from the north)

The path in these examples is aligned with (but opposite to) an axis of the object that is approached. In (7b), for example, the path is not only directed towards the tree (which is like modal direction), but more specifically to the relative left of the tree. There is sometimes a superficial similarity with modal direction sturctures,

[2] The advantage of Dutch examples is that they encode the distinctions between the modes more explicitly than English does.

but the crucial difference is that the object of the preposition can never be made explicit in centripetal direction constructions. Compare the sentences in (8).

(8) a. The victim was approached from behind.
b. The victim was approached from behind a tree.

(8a) is centripetal direction, (8b) modal direction. (8a) describes the path relative to the victim, (8b) describes the path relative to the tree. The centripetal type of direction can be based on absolute, relative, and intrinsic frames, as shown in (7). (7a) is based on an intrinsic axis, (7b) on a relative axis, (7c) on an absolute axis.

In the last type of direction that I discuss here, the reference frame for one moving object is defined by another moving object (Bogaert et al. 2008). Since two objects move with respect to each other, I call this *reciprocal direction*. There are many different possibilities, only some of which might be expressed in natural language, for instance in the adpositional system of Dutch. The two objects can move towards each other (9a) or maintain a constant relation, with the reference object preceding (9b) or following (9c). The adpositional constituent is indicated with square brackets.

(9) a. Esau rende [Jakob tegemoet].
Esau ran Jacob to-meet
'Esau ran to meet Jacob.'
b. Laban ging [achter Jakob aan].
Laban went after Jacob on
'Laban went after Jacob.'
c. Lea ging [voor Jakob uit].
Lea went before Jacob out
'Leah went ahead of Jacob.'

At first blush this reciprocal direction is based on the intrinsic axes of the reference object, Jacob. However, it is not so much the intrinsic, body-based axes of Jacob that count, but rather the axes that are defined by his direction of motion. Suppose Tony and Cherie walk away backwards from the queen, then (10) clearly does not mean that Tony is looking at Cherie's back, but that Cherie is preceding Tony.

(10) Tony liep achter Cherie aan.
Tony walked after Cherie on
'Tony went after Cherie'

We can see a similarity now between phasal direction and reciprocal direction. In both cases the frame of reference is a path of motion. In phasal direction it is an

earlier path of motion of the moving object, in reciprocal direction it is the path of motion of *another* moving object. In other words, in addition to an absolute, intrinsic, and relative frame of reference, we can also recognize a dynamic frame of reference, determined by motion.

The different types of path direction that we have seen in this section can be divided along two dimensions. One dimension concerns the type of axis involved, with a main division between the three traditional, static axes (absolute, intrinsic, relative) and the motion-based, dynamic axis. The other dimension concerns whether there is only one object at stake (which we can call the *figure*, following Talmy 2000) or whether a second object plays a role as the reference object (the *ground*) for the figure. This division corresponds more or less to the grammatical distinction between adverbs and adpositions. Within the second, adpositional group we can distinguish between modal, centripetal, and reciprocal directions. Table (11) gives an overview of these types of direction.

(11) Types of direction

	Only figure	Figure and ground
Static axis	Reflexive direction	Modal and centripetal direction
Dynamic axis	Phasal direction	Reciprocal direction

As we see, one and the same type of axis can figure in different types of direction. In the next section I analyze how this is possible by modeling axes, paths, and directions in a more formal way, with *vectors* as building blocks.

3 Axis-based direction

Building on Zwarts & Winter (2000), Kracht (2002), and Bohnemeyer (2012), I assume that an axis is a function that assigns to an object a free unit vector at a time t.[3] For example, there is the **up** function that assigns to every object x at time t a unit vector $\mathbf{up}_t(x)$ that represents the upward direction from x. This is an absolute axis, which means that it is the same for all times and objects. The **up** axis has an opposite axis, that can be defined using the vector inversion operator: $-\mathbf{up}_t(x)$ is the downward direction from x at time t (if we want to assume that the upward direction is primary). Another example of an absolute axis is **north**, which assigns to every object a unit vector pointing north. The **up** and **north** functions are constrained to yield vectors that are perpendicular to each other.

Intrinsic axes differ from absolute axes in being much more variable and partial across objects and times. For instance, we represent the intrinsic front of an

[3] A *unit* vector is a vector of length 1. It is used to abstract away from the property of length, because for the representation of axes only the direction of a vector is relevant. A *free* vector is a vector that only represents length and direction and abstracts away from location.

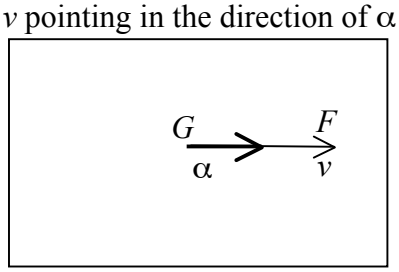
object x at time t through the unit vector $\mathbf{front}_t(x)$. People that face the same direction have the same **front** vector. When they turn around, their **front** vectors change over time. People have an intrinsic **front** and also an intrinsic **top**, but for many objects these functions are not defined, because they lack intrinsic backs or fronts. Because of that, **front** and **top** are partial functions. It is possible to define the **top** function in terms of the **up** function: the top of an object is that side that is usually up. As we already saw with the absolute axis **up**, the inversion operator **–** can be applied to give us **–front** (the back) and **–top** (the bottom). For a given object x, **front** and **top** are always perpendicular to each other and to the third intrinsic axis, **right** and its opposite **–right**.

A relative axis is defined with respect to an observer. For this we need a function with an additional argument: $\mathbf{face}_t(x,o)$ gives a vector that points from x to a person o who is observing x. In other words: $\mathbf{face}_t(x,o) = \mathbf{-front}(o)$, but see the next section for a more general formulation. Notice that the relative axis of the observed object, $\mathbf{right}_t(x,o)$, is identical to the intrinsic axis of the observer, $\mathbf{right}_t(o)$.

Although the temporal parameter is important in capturing the variable nature of intrinsic and relative axes, I will omit them in the remainder, thereby abstracting away from the way objects can rotate (leading to the variability of intrinsic axes) or points of view can change (the variability of relative axes).

The unit vectors create a *coordinate system* around an object G that can be used to define locations and directions in terms of G and its axes. To keep things simple, I abstract away from the volume of objects and treat them as points. Suppose that v is an arbitrary (non-zero) vector that is located in such a point-sized object G and pointing in the same direction as an axis α of G, as graphically illustrated in (12). There is then a positive real number s (a *scalar*) such that $v = s\alpha(G)$. For convenience, I write this as $v_{\alpha(G)} = s$.

(12) v pointing in the direction of α



For example, if α = **up**, then v is an upward pointing vector if and only if $v_{\mathbf{up}(G)} > 0$.[4]

[4] Obviously, this simplified notion of 'pointing in the same direction' is too strict. We would ultimately also want to count vectors as 'upward' that form a relative small angle with the axis vector **up**. See Zwarts & Winter (2000) for details.

The vector v in (12) can be used to represent the locative relation between object G (functioning as the ground) and another object F (the figure), following Zwarts & Winter (2000). Assume that **place**(G,F) represents the located vector pointing from G to F, then (13) formulates the condition for *F is in front of G*:

(13) $\mathbf{place}(G,F)_{\mathbf{front}(G)} > 0$

F is in front of G because the vector pointing from G to F is a positive scalar multiple of the intrinsic frontal axis of G, as illustrated in (12). Replacing **front** with one of the other axial functions that we introduced above allows for the definition of other locative relations:[5]

(14) a. *F is behind G*: $\mathbf{place}(G,F)_{-\mathbf{front}(G)} > 0$
b. *F is above G*: $\mathbf{place}(G,F)_{\mathbf{up}(G)} > 0$
c. *F is in front of G*: $\mathbf{place}(G,F)_{\mathbf{face}(G,o)} > 0$

(14a) defines *behind* as the inverse of *in front* by inverting the intrinsic axis of the ground. (14b) gives *above* as an example of a relation based on the absolute axis **up**. (14c) shows that *in front* also has a reading that is based on the relative axis **face**, which is pointing from the ground to the observer.[6]

Now consider what happens when the figure F is *moving* with respect to the ground G. I represent such a path of motion as a continuous function, designated by **path**(G,F), from moments of time to vectors pointing from G to F (cf. Zwarts & Winter 2000). It will be useful to restrict such a path to a particular time interval $[t_0,t_1]$. Then we can distinguish the points in (15).

(15) $\mathbf{path}(G,F)(t_0)$ is the starting point (source) of the path
$\mathbf{path}(G,F)(t_1)$ is the end point (goal) of the path
For every t, $t_0 < t < t_1$, $\mathbf{path}(G,F)(t)$ is an intermediate (route) point of the path.

The conditions in (15) define paths with respect to the absolute down axis, assuming that the time interval $[t_0,t_1]$ is the 'running time' of the event being described in the sentence.[7]

[5] Of course, as Herskovits (1986) and much later work has showed, non-geometric factors also have to be taken into account, in addition to these geometric conditions.
[6] All by itself, this definition is too weak, because it allows F to be 'behind' the point of view. I assume that there are pragmatic principles at work that restrict the application of relative *in front* to positions of the figure *between* the ground and the point of view.
[7] The examples in (16) are adapted from Jackendoff (1983:163,166). See Zwarts (2005) for more precise definitions of a wide range of path prepositions.

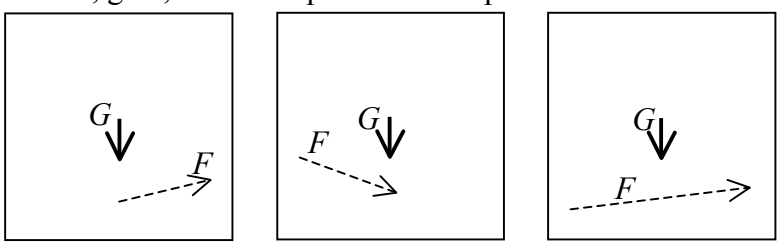
(16) a. The mouse ran from under the bed. Source
$\mathbf{path}(\mathbf{b},\mathbf{m})(t_0)_{\text{-}\mathbf{up}(\mathbf{b})} > 0$

b. The mouse went under the bed. Goal
$\mathbf{path}(\mathbf{b},\mathbf{m})(t_1)_{\text{-}\mathbf{up}(\mathbf{b})} > 0$

c. The mouse went under the bed. Route
There is a t, $t_0 < t < t_1$, such that $\mathbf{path}(\mathbf{b},\mathbf{m})(t)_{\text{-}\mathbf{up}(\mathbf{b})} > 0$

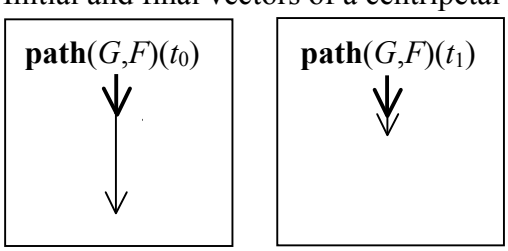
Similar definitions can be given for modal directions with respect to intrinsic or relative directions, as in (5) or (6) above. (17) gives a graphical illustration of the three modes.

(17) Source, goal, and route paths with respect to an axis



As we can see in (17), with modal motion the path of the figure is 'orthogonal' to the axis of the ground. This is different with centripetal motion, which is characterized by a path leading towards the ground *along* a particular axis, as schematically illustrated in (18):

(18) Initial and final vectors of a centripetal path 'from below'



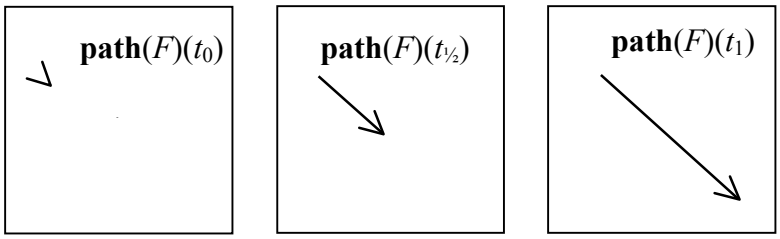
Centripetal motion requires that the final vector is shorter than the initial vector along the relevant axis. This can be represented in the following way for F coming from below with respect to the implicit ground G:

(19) $\mathbf{path}(G,F)(t_0)_{\text{-}\mathbf{up}(G)} > \mathbf{path}(G,F)(t_1)_{\text{-}\mathbf{up}(G)} \geq 0$

The initial and final vector both point downward, but the initial vector is longer than the final vector. (19) formulates symbolically what (18) represents geometrically. Centripetal directions can be defined in this way for any type of axis.

All of the path expressions that we have analyzed until now involve a binary path **path**(G,F), a dynamic relation holding between a moving figure and a ground. There is also a unary path predicate, **path**(F), which applies to a single moving figure F and maps each moment of time t from the interval $[t_0,t_1]$ to a vector pointing from the position that F occupies at t_0 (i.e. **path**(F)(t)) to the position that it occupies at t. The position **path**(F)(t_0) always corresponds to the zero vector. This is graphically illustrated in (20).

(20) 'Snapshorts' from a unary path over the interval $[t_0,t_1]$



Since the final vector of the path represents the final position of the figure with respect to its starting point, we can represent absolute, intrinsic, and relative motion through a simple condition on the final vector with respect to the relevant axis:

(21)	a.	go up $\mathbf{path}(F)(t_1)_{\mathbf{up}(F)} > 0$	Absolute
	b.	go forward $\mathbf{path}(F)(t_1)_{\mathbf{front}(F)} > 0$	Intrinsic
	c.	go to the right $\mathbf{path}(F)(t_1)_{\mathbf{right}(F,o)} > 0$	Relative

Notice that in these cases the figure F moves in the direction of its own axis. Hence the term *reflexive* motion as a cover term for these.

For reciprocal motion it is essential that both figure and ground are moving. Their motions define axes that are used to locate their movements in relation to each other. If **path**(G) is the path of an object G in motion, then **dir**(**path**(G)) represents the unit vector that represents the direction in which G is moving.[8] With this axis we can represent whether F and G move in opposite directions (22a) or in the same direction (22b,c). Moreover, in order to distinguish (22b) from (22c) we need additional locative conditions that represent whether F is behind G or in front of G:

[8] For motion in a straight line, **dir**(**path**(G)) is that unit vector v such that $\mathbf{path}(G)(t_1)_v > 0$.

(22) a. Esau rende [Jakob tegemoet].
Esau ran Jacob to-meet
'Esau$_F$ ran to meet Jacob$_G$.'
$\mathbf{dir}(\mathbf{path}(F)) = -\mathbf{dir}(\mathbf{path}(G))$

b. Laban ging [achter Jakob aan].
Laban went after Jacob on
'Laban$_F$ went after Jacob$_G$.'
$\mathbf{dir}(\mathbf{path}(F)) = \mathbf{dir}(\mathbf{path}(G))\ \&\ \mathbf{path}(G,F)(t_1)_{-\mathbf{dir}(\mathbf{path}(G))} > 0$

c. Lea ging [voor Jakob uit].
Lea went before Jacob out
'Leah$_F$ went ahead of Jacob$_G$.'
$\mathbf{dir}(\mathbf{path}(F)) = \mathbf{dir}(\mathbf{path}(G))\ \&\ \mathbf{path}(G,F)(t_1)_{\mathbf{dir}(\mathbf{path}(G))} > 0$

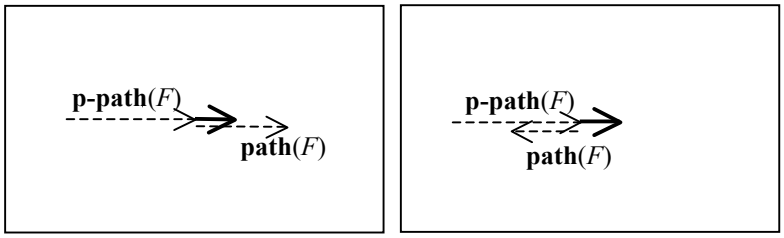
Finally, phasal direction involves the comparison of the present path of a figure *F* with its previous path. If we represent that previous path as **p-path**(*F*), then **dir**(**p-path**(*F*)) gives us the direction of that previous path in the form of a unit vector. That allows us to formulate phasal directionals like *ahead* and *back* as follows:

(23) a. go (straight) ahead
$\mathbf{path}(F)(t_1)_{\mathbf{dir}(\mathbf{p\text{-}path}(F))} > 0$

b. go back
$\mathbf{path}(F)(t_1)_{-\mathbf{dir}(\mathbf{p\text{-}path}(F))} > 0$

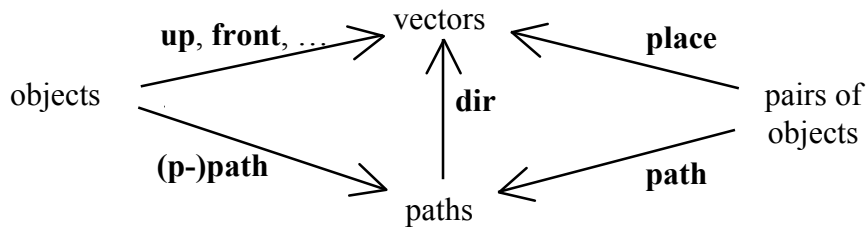
The two figures in (24) illustrate this graphically.

(24) Going ahead and going back



A variety of functions has been introduced in this section. Figure (25) gives an overview of the different ontological domains (objects, pairs of objects, vectors, and paths) and the mappings between them.

(25) Domains and mappings



Furthermore, the table in (26) summarizes the analyses of the types of direction that we have seen in this section.

(26) Analyses of types of direction

	Only figure	Figure and ground
Static axis	Reflexive $\mathbf{path}(F)(t_1)_{\mathbf{axis}(F)} > 0$	Modal $\mathbf{path}(G,F)(t_i)_{\mathbf{axis}(G)} > 0$ Centripetal $\mathbf{path}(G,F)(t_0)_{\mathbf{axis}(G)} >$ $\mathbf{path}(G,F)(t_1)_{\mathbf{axis}(G)} \geq 0$
Dynamic axis	Phasal $\mathbf{path}(F)(t_1)_{(-)\mathbf{dir}(\mathbf{p\text{-}path}(F))} > 0$	Reciprocal $\mathbf{path}(G,F)(t_1)_{(-)\mathbf{dir}(\mathbf{path}(G))} > 0$

One important distinction is whether the axis is based on the figure itself (reflexive and phasal direction) or on the ground (modal, centripetal, and reciprocal direction); the other important distinction is whether the axis is of the traditional, static type (reflexive, modal, centripetal direction) or dynamic (phasal and reciprocal direction). Nevertheless, underlying all these different types of direction is one single 'calculus' of directions, (25). This general representation of axes and directions not only reveals the system of directionality, but, as I will show in the next section, it also allows us to compare lexicalization patterns in this domain in a more systematic way.

4 Going 'back' in Dutch

Different axes can sometimes be closely related to each other (Clark 1973, Fillmore 1975, Allan 1995). For instance, the intrinsic top side of an object is usually also up in the absolute sense. The intrinsic front of an object is also usually the side that is leading when the object is moving. These relations are important because they help to explain why the same expressions are often used for meanings based on different but related axes. The preposition *above*, for instance, can be used with intrinsic, absolute, or relative frames.

In this paper, I focus on the cluster of axes that are related to the notion 'back' (Allan 1995), but I start with the more fundamental opposite notion 'front'. My

starting point is the partial function **front** that assigns to an object x a unit vector that indicates where its 'interactive' side is if it has one (e.g. eyes, mouth, reproductive organs for a a human being, buttons and screen for certain artefacts, entrance for buildings, etcetera). Some rooms (classrooms, buses, churches) get a front-back axis because of the way they are used by human beings. The front of a classroom is the side that the people that use it are facing. We can postulate a function **CU** (for 'canonical use') that defines an absolute axis on the basis of an intrinsic axis:

(27) If α is an axis, s a confined space, and x an object in s, then $\mathbf{CU}_s(\alpha)(x)$ is that unit vector v such that for every human being y using s in the canonical way, $\alpha(y) = v$.

The relative front axis is defined on the basis of the intrinsic front axis of the observer by an operation that I call **CE** (for 'canonical encounter', Clark 1973):

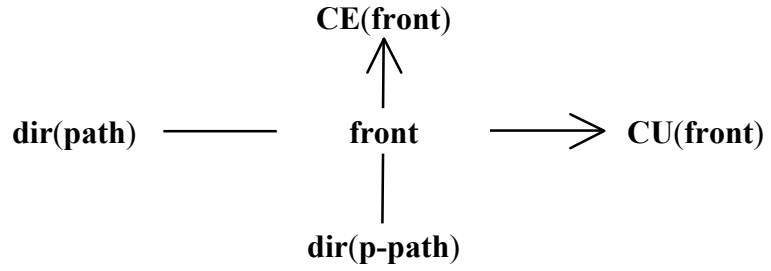
(28) If α is an axis of an observer o and x an object observed by o, then $\mathbf{CE}_o(\alpha)(x)$ is that unit vector v such that for every object x, v is a reflection of $\alpha(o)$ through the vertical plane between o and x.

Axes are assigned to x by treating x as a person that the observer o is seeing through a mirror, metaphorically speaking. The up-down and left-right axes remain invariant, but the front-back is inverted.

If an object x moves, then this creates a unit vector **dir**(**path**(x)), as we saw. If x has an intrinsic front axis, then often **dir**(**path**(x)) = **front**(x), because the normal way for people to move (but also for animals and vehicles) is with their intrinsic front as the 'leading edge', as Allan (1995) calls it. This establishes a close connection between the motion axis and the intrinsic front axis. If an object x made a previous movement, then we get a unit vector **dir**(**p-path**(x)). In the normal course of events, this axis will again have the same direction as **front**(x), i.e. **dir**(**p-path**(x)) = **front**(x). In other words, we are usually facing in the direction of places that we have not been to yet.

Taking all these different axis together, we can construct the diagram in (29) that shows how the intrinsic front axis relates to other, similar axes:

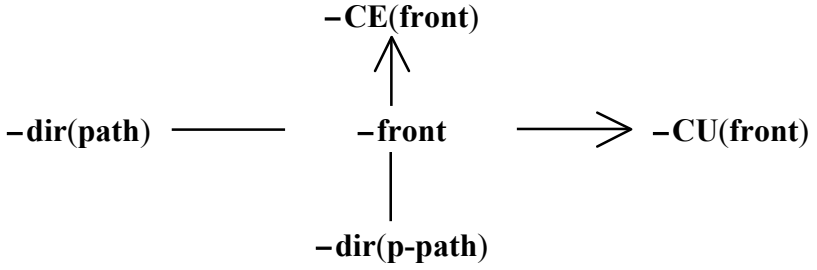
(29) The relations between 'front' axes



The arrows correspond to functions that derive axes from the basic **front** axis; the lines correspond to canonical alignments. Remember that **path** represents the path of motion in the *current* phase while **p-path** represent the path of motion in the *previous* phase.

If we apply the inversion operator we get a diagram that represents the different 'back' axes and their relations, in (30).

(30) The relations between 'back' axes



We can view this diagram as a *semantic map* in the sense of Van der Auwera & Plungian (1998) and Haspelmath (2003), that is, a structure that shows how close certain meanings are to each other and which meanings are more likely to be expressed by the same form. The semantic map approach operates under the assumption that the meanings expressed by one form have to be *contiguous*. In other words, the set of meanings covered by one form has to correspond to a connected subgraph. But even apart from this important constraint, a structure like (30) is useful for studing paradigmatic lexicalization patterns. Let us turn to Dutch now to see how various types of 'back' expressions relate to this system of back axes.

Let us start with those types of direction that involve only a moving figure, i.e. what we called the reflexive and phasal direction in the previous section and represented through the general formula $\mathbf{path}(F)(t_1)_{\alpha(F)} > 0$ for a particular axis α. Not all of the back axes in (30) participate in this formula: obviously, α cannot be **−dir**(**path**) because an object cannot move into a direction opposite to the direction in which it is actually moving. For the remaining four axes we find three different adverbial expressions:

(31) a. *achteruit*: a compound of *achter* 'behind' and *uit* 'out'
b. *naar achteren*: a PP headed by *naar* 'to' with *achter* 'behind' as complement, with an adverbial suffix *–en*
c. *terug*: a lexicalized PP consisting of the preposition *te* 'to' and the noun *rug* 'back'

The examples in (32) show the primary uses of these expressions:

(32) a. Alex liep achteruit. α=**–front**
Alex walked behind-out
'Alex walked backwards.'
b. Alex ging naar achteren. α=**–CE(front)**
Alex went to behind-EN
'Alex went to the back.'
c. Alex ging terug. α=**–dir(p-path)**
Alex went to-back
'Alex went back.'

With relative back (α=**–CU(front)**) the situation is not so clear, probably because it is most natural to describe such a situation with the adverb *weg* 'away' instead of one of the 'back' adverbs in (31), but *achteruit* 'backwards' and *naar achter* 'to the back' seem acceptable for this meaning, while *terug* 'back' is definitely not.

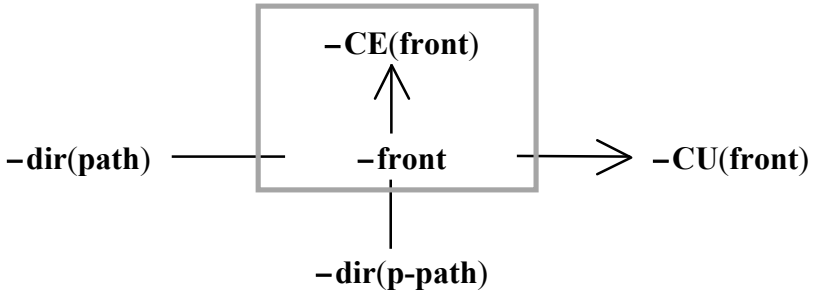
(33) a. ?De bal rolde achteruit.
The ball rolled behind-out
'The ball rolled away from me.'
b. ?De bal rolde naar achteren.
The ball rolled to behind-EN
'The ball rolled away from me.'
c. #De bal rolde terug.
The ball rolled to behind-EN / behind-out / away
'The ball rolled away from me.'

Interestingly, there is some overlap in the use of the words in (31) with the verb *deinzen* 'shrink (back)'. Here all three are possible, describing intrinsic motion.

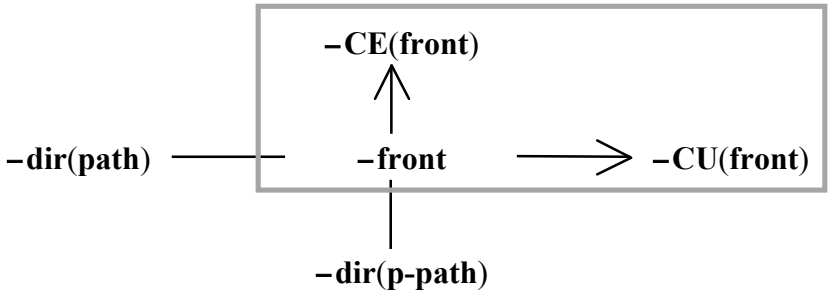
(34) Ik deinsde achteruit/ naar achteren/ terug van schrik. α=**–front**
I shrunk behind-out/to behind-EN/back with fear
'I backed away with fear.'

These data now suggest that the words in (31) are polysemous, covering regions of the diagram, as shown in (35)-(37).

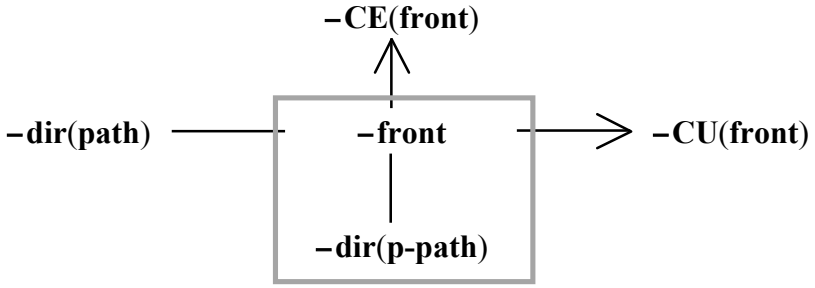
(35) *achteruit* on the map of back axes



(36) *naar achteren* on the map of back axes



(37) *terug* on the map of back axes



Notice that each of the expressions covers a connected portion of the graph, as expected by the contiguity constraint of the semantic map approach. The intrinsic axis **−front** always forms the connecting link within polysemous categories, which is not surprising, given its basic status in this domain.

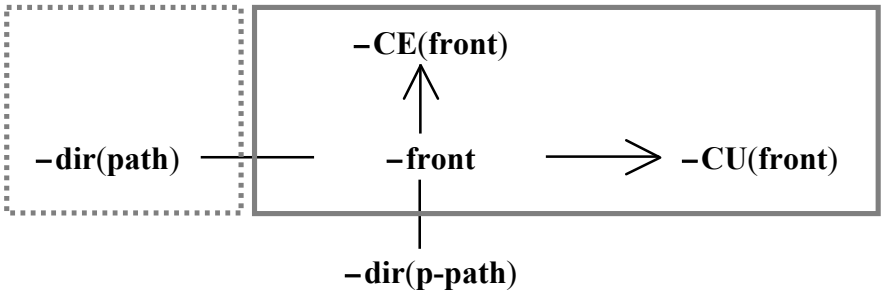
More important than the contiguity of the path expressions in (31) is the fact that they are sensitive to the distinctions between axes. This is surprising, because most other 'back' expressions, namely the ones that involve a ground object, do not show this sensitivity. Static location, modal direction, and centripetal direction always use the same form for all the axes over which they are defined, in Dutch

(with the form *achter*) and English (*behind*). We find lexical differentiation only for reciprocal motion, i.e. for the **−dir**(**path**(*G*)) axis. In Dutch, there are three different, but equivalent, ways of describing the reciprocal back direction corresponding to **path**(*F*,*G*)(t_1)$_{\textbf{-dir(path}(G))}$ > 0:[9]

(38) 'Laban went after Jacob.'
  a. Laban ging <u>achter</u> Jakob <u>aan</u>.
     Laban went after Jacob on
  b. Laban ging Jakob <u>achterna</u>.
     Laban went Jacob behind-after
  c. Laban ging Jakob <u>na</u>.
     Laban went Jacob after

The motion axis **−dir**(**path**(*G*)) is therefore lexically distinguished from the other axes in Dutch. The same is true for English, which has *after* instead of *behind* here, see (39).

(39) The division between *after* and *behind*



Notice that the phasal axis **−dir**(**p-path**(*G*)) does not seem to play a role as an axis for binary paths. The reason might be that it is hard to describe the place or path of a figure *F* in terms of the path of another object *G* in an earlier phase.

5 Conclusion

The domain of direction is much richer than the well-known prepositional source-goal pattern and the intrinsic, relative, and absolute frames of reference, even when we are only looking at English or Dutch. There is a range of different types of direction in those languages that can be analyzed in terms of a small number of basic elements and functions. I zoomed in on the 'back' direction, showing that one dimension of this domain consists of a radially organized network of 'back' axes and another dimension consists of the different place and path functions that

[9] Apart from the fact that (38c) is archaic and restricted to certain verbs, no other clear differences suggest themselves between these forms.

operate on these axes. These two dimensions together account for the rich lexical patterns that we find in this domain. It turns out that the language of motion makes distinctions between axes that the language of location does not make, at least in the 'back' domain in Dutch. Whether this observation extends to other directions, other conceptual domains, and other languages is a topic for future research, as well as the question what might be functional or other reasons for such an asymmetry between the language of motion and the language of location.

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