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Universitat Pompeu Fabra, Barcelona

Miriam Butt, Jamie Y. Findlay, Ida Toivonen (eds.)

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Editors' note

This year's Conference on Lexical Functional Grammar was held at the Universitat Pompeu Fabra in Barcelona. The program committee for LFG'25 were Tina Bögel and Stephen Jones. We would like to thank them for coordinating the review process and working with the local organisers, Alex Alsina and Nuo Xu, to put together this year's programme. We would also like to thank Alex and Nuo for organising a wonderful walking tour of the Gothic parts of Barcelona, which started the conference off in style.

This year's conference featured an engaging panel discussion on Arguments and Challenges for Lexicalism, which was organised by Ash Asudeh and Nadeem Siddiqi and led to a spirited and provocative discussion. Thank you to Ash and Nadeem for putting this together.

Lastly, we would also like to thank the Executive Committee, without whom the conference planning would not have been possible.

As usual, submission to the proceedings was open to all papers, posters, workshop and panel presentations, and invited talks given at the conference. Some of these presentations were not submitted to the proceedings. For these, we suggest contacting the authors directly. We note that all of the abstracts were peer-reviewed anonymously (double-blind reviewing) and that all of the papers submitted to the proceedings underwent an additional round of reviewing with the possibility of rejection from the proceedings. We would like to express our heartfelt thanks to all of the anonymous reviewers for the donation of their expertise and effort for detailed and constructive reviews in what is often a very short turn-around time.

Finally, we (Jamie & Ida) would also like to note that this is the final year for Miriam Butt as an editor of the LFG Proceedings. As she lays down the mantle she has worn so indefatigably for 30 years, we wish to express our deepest professional and personal appreciation for her hard work and dedication. Thank you, Miriam! You will be missed!

— Miriam Butt, Jamie Y. Findlay, Ida Toivonen
Editors, LFG'25

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Verb focus in Ossetic: an L(r)FG approach

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Abstract

We propose an LFG treatment of the verb focus construction (which consists of a participle and a light verb) in Ossetic and model the complementary distribution of this construction and focalized complex predicates. We build on the analysis of the Ossetic clause presented by Belyaev (2022) enriching the rule for the focus position in the verbal complex and supplying i-structure annotations. We also sketch an LrFG analysis to account for the placement of preverbs in complex predicates.

1 Introduction

This paper explores two periphrastic constructions in Ossetic, an East Iranian (< Indo-European) language mainly spoken in parts of the Caucasus.† We mainly concentrate on the verb focus construction (VFC) and its complementary distribution with complex verbs and provide a lexicalist analysis of the patterns observed, but also sketch a non-lexicalist version of it. We compare the verb focus construction and complex predicates with other constructions as a way of potentially extending the lexicalist analysis.

Data without a cited source were collected during fieldwork in the city of Vladikavkaz (North Ossetia-Alania, Russia) in July & October, 2024, and July, 2025. Additional examples were drawn from the Ossetic National Corpus (ONC) and the Oral Corpus of Ossetic (OC).

2 The puzzle

In the context of narrow verb focus, simple verbs of Ossetic optionally participate in the formation of the so-called **verb focus construction** (VFC):

(1) Context: What has Zalina done to the floors? They are so clean!

zalinз	*p'ol-tз*	***зxš-gз***	***nək-kod-ta***
Zalina	floor-PL	clean-PCVB	PV-do-PST.3SG

'Zalina HAS WASHED the floors.' (Podgornaia 2025: 164)

The construction is formed with a *-gз*-participle (which we gloss as PCVB) and the verb *kзnən* 'to do' carrying the TAM markers. According to Belyaev & Vydrin (2011), The participle itself can be used both as a participle, i.e. an adnominal modifier, and as a converb, i.e. the verb heading embedded adverbial clauses in the sense of the term popularized by Haspelmath (1995).

†Research conducted by Danil Alekseev has been supported by RSF grant No. 24-18-00199 "Clause structure and positional phenomena in SOV languages." We are indebted to our consultants of Ossetic. We would also like to express our sincere gratitude to members the LrFG lab, who attended two preliminary versions of this talk in February and March, 2025, and the audiences of the 30th International LFG Conference in Barcelona, especially Ash Asudeh, Oleg Belyaev, Miriam Butt, John Low, and Dan Sidiqqi, for their valuable questions and comments. Additional thanks should go to the reviewers of the LFG proceedings, as their reviews helped significantly improve all aspects of this paper. The remaining errors and misinterpretations are our own.

Cross-linguistically, constructions with 'do' as the light verb are frequently restricted to certain syntactic and pragmatic environments (Jäger 2006). In Ossetic, the VFC is infelicitous in environments other than narrow verb focus. For example, it cannot be used when the whole VP is in focus (2).

(2) Context: What has Zalina done? The room looks fresh.

#*zalinɜ*	*p'ol-tɜ*	*ɜxš-gɜ*	*nək-kod-ta*
Zalina	floor-PL	clean-PCVB	PV-do-PST.3SG

Intended: 'Zalina HAS WASHED THE FLOORS.' (Podgornaia 2025: 164)

The VFC is only formed with simple verbs, which form a closed class. A lot of other verbal meanings are expressed using complex predicates. These consist of a nominal component and a light verb.

Crucially for the purposes of this paper, the VFC is incompatible with complex predicates, which we understand as "items that appear to be distinct morphological and syntactic words, but show deeper signs of integration, such as sharing a single argument structure" (Andrews 2023: 268). Consider (3a), which features the complex predicate *gɜp: kɜnən* 'to jump'. The light verb is in its past tense form, and perfectivity is contributed by a preverb, in this case *a-*, which in (3a) attaches to the non-verbal component of the complex predicate. Now, (3b) is a version of (3a) with verb focus: here the preverb is attached to the LV. In the next section we will demonstrate that in such configurations the non-verbal component is located in a higher structural position compared to (3a), which explains variable preverb placement.

(3b) is the only way of focusing a complex predicate: (3c) shows an infelicitous attempt to form the verb focus construction with the same complex predicate.[1]

(3) a.

bɜx	*a-gɜp:*	*kod-ta.*
horse	PV-jump	do-PST.3SG

'The horse jumped.'

b.

bɜx	*gɜp:*	*a-kod-ta.*
horse	jump	PV-do-PST.3SG

'The horse JUMPED.'

c.

**bɜx*	*gɜp:-gɜn-gɜ*	*a-kod-ta.*
horse	jump-do-PCVB	PV-do-PST.3SG

Intended: b=c

This is the puzzle at the heart of this paper: complex predicate focalization, involving non-verbal component displacement, and the verb focus construction are in complimentary distribution.

[1]The initial segment of the LV stem *kɜn-* undergoes voicing to *gɜn-* in *gɜp:-gɜn-gɜ* 'jumping' (3c). This is a known morphonological process in Ossetic.

3 The data

3.1 Basic facts and clause structure

The basic word order in Ossetic is SOV, although under certain information-structural conditions all permutations of the word order are possible. The alignment is nominative-accusative. Ossetic is a discourse configurational language (Belyaev 2022) with a very well structured preverbal area (Lyutikova & Tatevosov 2009; Erschler 2012; Belyaev 2022; Borise & Erschler 2023). This characterization has far-reaching consequences for clause structure: one prominent area is the so-called "verbal complex", which features several structural positions. These are summarized schematically in (4).[2] Elements which lie outside the verbal complex and precede it can only be non-focal. Postverbal elements have looser restrictions on their information structural content.

(4) Foc — Wh — Neg — V

Closest to the verb in the preverbal area are negative indefinites (5). They are in complementary distribution with sentential negation (5a), meaning this is a so-called "negative spread" system (Erschler 2010).[3]

(5) a. *žawər-ə* ***ni-či*** *(*nɜ=) žon-ə*
Zaur-GEN NEG-who NEG know-PRS.3SG
'No one knows Zaur' (Belyaev 2022: ex. 6a,c)

b. **ni-či žawər-ə žon-ə*
NEG-who Zaur-GEN know-PRS.3SG

Wh-words (and phrases including wh-words) are strictly preverbal and precede negative indefinites:[4]

(6) a. ***či*** *ni-sə žon-ə*
who NEG-what know-PRS.3SG
'Who knows nothing?' (Belyaev 2022: ex. 11a-b)

b. **ni-sə* ***či*** *žon-ə*
NEG-what who PRS.3SG

Narrow foci, if they occur before the verb, follow topical material and precede wh-expressions, cf. the position of a constituent modified by *ɜrmɜšt* 'only' (7). Belyaev (2022) also takes it to be possible for narrow foci to recur.

[2]This pattern is sometimes complicated by the intrusion of adverbs in the comparative form into the preverbal area after wh-phrases (Erschler 2012: 678; Belyaev 2022: 45).

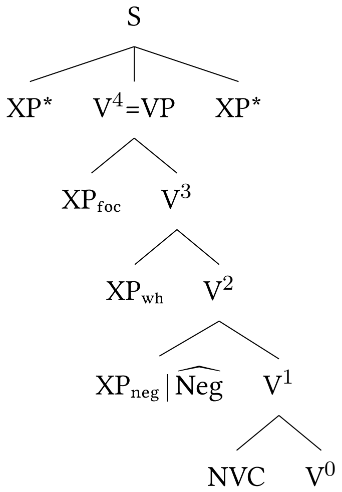
[3]Note that negative pronouns can trigger negative concord when placed in the postverbal position (Belyaev 2022: fn. 7).

[4]However, wh-items precede the verbal complex in the multiple partitive construction, see Belyaev (2022: fn. 7).

(7) a. ***зrmзšt žawər-ə*** *či* *fet:-a*
only Zaur-GEN who see-PST.3SG
'Who saw only Zaur?' (Belyaev 2022: ex. 13a,c)

b. **či* ***зrmзšt žawər-ə*** *fet:-a*
who only Zaur-GEN see-PST.3SG

We follow Belyaev (2022: 55) in the LFG analysis of the Ossetic clause structure. Preverbal material is introduced as daughters of different V-bar levels (including above 2), represented in (8). The VP itself is the daughter of an S node, its right sisters represent topical material, and there is also an unstructured post-verbal area to the left (both the left peripheral and the post-verbal material is abbreviated as XP* for simplicity).

(8)


In (8), the non-verbal component of a complex predicate is structurally a V^0 complement. Later, we will suggest an alternative to this.

3.2 The verbal system of Ossetic

The Ossetic conjugation is quite complex, built upon two stems (traditionally labeled "present" and "past") and several sets of personal endings, making for a total of 8 unique TAM-paradigms, see Abaev (1964: § 92–161) for an overview. The basic morphological pattern for verbs includes perfectivizing preverbs with aspectual and spatial semantics and suffixal TAM-markers:

(9) preverb (PV) - √ - agreement/tense marker

Simple verbal roots constitute a rather small closed class. Similarly to other Iranian languages, many verbal meanings are expressed by complex predicates (CPrs). A complex predicate consists of a light verb (LV), which carries agreement and tense markers, and a non-verbal component (NVC), which can originate from a noun or an adjective. Most complex predicates feature *kзnən* 'to do' as the light verb, as in (10).

(10) a. *ɜž* *dwar* *nɜ=* ***ba-jgom*** ***kod-ton***
1SG.NOM door NEG=PV-open do-PST.1SG
'I did not open the door.' (Grashchenkov 2018: 80)

b. **ɜž* *dwar* *nɜ=* *gom* *ba-kod-ton*
1SG.NOM door NEG= open PV-do-PST.1SG

Some other verbs can be used marginally as light verbs as well (see Section 4.3). The verb *wɜvən* 'to be' is used with prefixed intransitive adjectival CPrs, while *kɜnən* 'to do' is used elsewhere, cf. (11). For the purposes of this paper, we abstract away from this alternation, but see Lyutikova & Tatevosov (2013) for a transformationalist analysis thereof. It is important to note that CPrs with *kɜnən* do not show preference for agentive subjects, being compatible with patientive subject such as in (11a).

(11) a. *don* ***wažal*** ***kod-ta*** / **iš.*
water cold do-PST.3SG EXST
'The water was cooling down.' (Lyutikova & Tatevosov 2013: 82–83)

b. *don* ***nəw-wažal*** ***iš*** / **kod-ta.*
water PV-cold EXST do-PST.3SG
'The water cooled down.' (Lyutikova & Tatevosov 2013: 82–83)

Example (11b) above, as well as (10a), illustrates one of the most crucial language specific properties of CPrs: they act as a single unit with regards to placement of preverbs (except when focalization is involved, more on that below). This contrasts them with superficially similar constructions with a lexical verb *kɜnən* 'to do' and an unmarked direct object, where preverb placement on the nominal is ruled out.

(12) a. *siw-tæ* *axšton* *š-kod-toj.*
bird-PL nest PV-do-PST.3PL
'Birds built a nest.' (Grashchenkov 2016: 108)

b. **siw-tæ* *š-axšton* *kod-toj.*
bird-PL PV-nest do-PST.3PL
Intended: a=b

Other "integrative" properties of complex predicates include both parts of a CPr acting as a single unit for stress assignment and the rigid linear order of the two elements (Grashchenkov 2010, 2018).

Semantically, the nonverbal component contributes most of the meaning and determines the argument structure. Noun-based CPrs exhibit a certain degree of lexicalization. Consider (13a), where *fižonɜg*, a noun meaning 'grilled meat, kebab' (also called 'shashlik' in the Caucasus), is intended to appear as an NVC in a CPr *fižonɜg kɜnən* 'to grill'. Only half out of the 10 speakers consulted found this example acceptable, while more transparent combinations like (13b), which are judged as acceptable across-the-board. All in all, this suggests that this CPr might have been developed quite recently.

(13) a. *%alan ziza š-fižonзg kod-ta.*
Alan meat PV-kebab do-PST.3SG
'Alan grilled the meat.'

b. *alan ziza-jз fižonзg š-kod-ta.*
Alan meat-ABL kebab PV-do-PST.3SG
'Alan made shashlik from the meat.'

There are properties that are indicative of the non-atomic nature of complex predicates. The non-verbal component of a CPr can act as a landing site for 2P-clitics (14), whereas NPs are impenetrable for them (15):

(14) *nəx-xatər=**mən** =**зj** kзn-зd Zəts:a*
PV-sorry =1SG.DAT=3SG.GEN do-OPT.3SG Zitsa
'let Zitsa forgive me' (OC: *Aguzarova Izeta*, 160.1)

(15) *[žaur-ə *=dзm rзšuğd *=dзm čənz]=dзm ba-zərd-ta*
Zaur-GEN beautiful bride=2SG.ALL PV-speak-PST.3SG
'The beautiful bride of Zaur called for you.' (Lowe & Belyaev 2015: 223)

The NVC can undergo focalization, and in that case it can be separated from the verb by wh- and negative expressions, see below.

3.3 Verb focus in Ossetic

As mentioned in the previous section, the expression of verb focus in Ossetic depends on whether the predicate is simple or complex: simple predicates optionally participate in the verb focus construction (16), complex predicates instead exhibit NVC focalization (17).

(16) *wəjaš nзma wəd-tзn sзmзj =sз **fəš-gз** **nək-kзn-on**.*
so_much not_yet be-PST.1SG in.order.to =3PL.GEN write-PCVB PV-do-SBJV.1SG
'I wasn't old enough to WRITE them DOWN.' (OC: *Fatima Aguzarova*, 49.1)

(17) *зž **moj** nз= **š-kзn-zənзn**.*
1SG.NOM husband NEG= PV-do-FUT.1SG
'I will not MARRY.' (OC: *Tale about love*, 4.1)

The two constructions exhibit parallel structural properties. In both cases, preverbs invariably attach to the light verb rather than to the participle or the non-verbal component of a complex predicate:

(18) *alan* ***kuš-gɜ*** ***a-kod-ta*** / **a-kuš-gɜ* *kod-ta.*
Alan work-PCVB PV-do-PST.3SG PV-work-PCVB do-PST.3SG
'Alan HAS WORKED for some time.' (Podgornaia 2025: 157)

Syntactic diagnostics show that both the participle in the VFC and a focalized NVC of a complex predicated are located in the focus position: in (19a), the -*gɜ*-participle strictly precedes *kʷə* 'when', a preverbal temporal subordinator; inverse order is impossible (19b). The same goes for the non-verbal component *arfɜ* 'thank' of *arfɜ kɜnən* 'to thank', which is focalized in (20a), cf. (20b).

(19) a. *don* *fəs-gɜ* ***kʷə*** *fɜ-kɜn-ə* *wɜd* *ag* *təng* *tɜvd*
water boil-PCVB when PV-do-PRS.3SG then pot very heavy
vɜjj-ə
be.HAB-PRS.3SG
'When water boils, the pot can be very hot.' (Podgornaia 2025: 162)

b. **don* ***kʷə*** *fəs-gɜ* *fɜ-kɜn-ə* *wɜd* *ag* *təng* *tɜvd*
water boil-PCVB when PV-do-PRS.3SG then pot very heavy
vɜjj-ə
be.HAB-PRS.3SG

(20) a. *alan* *xisaw-ɜn* *arfɜ* ***kʷə*** *ra-kod-ta* *wɜd* *ra-səd.*
Alan host-DAT thank when PV-do-PST.3SG then PV-go.PST[3SG]
'It is exactly when Alan had thanked the host (and not at any other point in time) that he left.'

b. **alan* *xisaw-ɜn* ***kʷə*** *arfɜ* *ra-kod-ta* *wɜd* *ra-səd.*
Alan host-DAT when thank PV-do-PST.3SG then PV-go.PST[3SG]

A -*gɜ*-participle and an NVC can even be coordinated in emphatic coordination using *dɜr* 'too' (21), on which see Belyaev & Khomchenkova (2022).

(21) *birɜ* *šk'olazaw-tɜ* ***axʷər****=dɜr* ***kuš-gɜ*** *=dɜr* *kɜn-ə* *žɜrdiagɜj.*
many pupil-PL study=ADD work-PCVB=ADD do-PRS.3SG diligently
'Many school students both study and work diligently.'

This reaffirms that the VFC and NVC in complex predicates displacement are in complementary distribution: the VFC is only used with simple verbs, whereas the NVC displacement occurs in complex predicates under focalization. Importantly, this is not a morphological constraint: -*gɜ*-participles are productively formed from complex predicates, cf. (22).

(22) ***diš-gɜn-gɜ*** *=jɜ* *ba-farš-ta* *k'ošta.*
wonder-do-PCVB =3SG.GEN PV-ask-PST.3SG Kosta
'{"Why, I wonder?"} Kosta asked him with wonder.'
(ONC: *Æsægælon arvy byn* [Under a foreign sky]. K'æbyšty U., 2010)

In the next section, we present an attempt at modelling the distribution of the verb focus construction and complex predicates in the LFG framework.

4 Analysis

To recapitulate the previous section, there are several key properties an LFG analysis of the Ossetic data should capture:

1. A focalized NVC and a *-gз*-participle in the VFC occupy a designated structural position in the clause;
2. They are incompatible with any focus types other than narrow verb focus;
3. *-gз*-participles derived from complex verbs cannot participate in the VFC.

In what follows we discuss two analyses of these facts: a lexicalist one within standard LFG, and a non-lexicalist one in LrFG (Asudeh & Siddiqi 2023: 883–892).

4.1 Lexicalist analysis

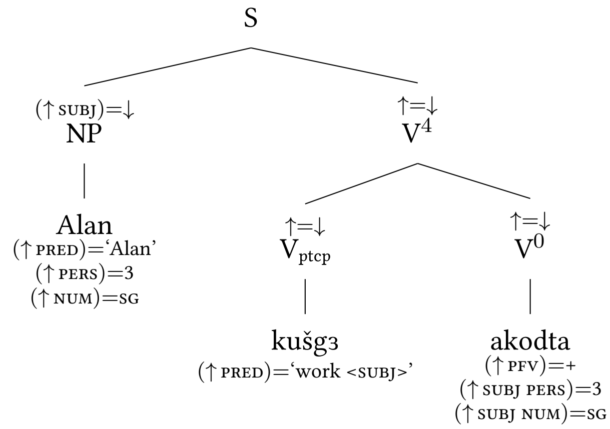
We propose that *-gз*-participles form from simple verbs have a complex lexical label, namely V_{ptcp} (standing for 'participle').

(23) *kušgз* V_{ptcp} (↑PRED)='work'

Two different usages are available to these participles. In the VFC, the participle presumably acts as a daughter to V^4 (we will discuss the V^4 rule later), see (24).[5] Note that we skip intermediate V-bar levels between 4 and 0, see (8).

(24) a. *alan kuš-gз a-kod-ta.*
Alan work-PCVB PV-do-PST.3SG
'Alan has worked for some time.' {=18}

b.



[5]The V_{ptcp} node should perhaps be non-projecting here, to avoid explicit double-headedness.

Note that by assumption the light verb is PREDless, much in line to the approach to complex predicates by Lowe (2016). While this simplifies the representations we give here, there can also be more substantive arguments for this. One is lexical restrictions on part of the non-verbal component: as shown in (13), certain nouns exhibit intraspeaker variation regarding their usage in complex predicates. The other is the nature of the light verb in Ossetic: the distinction between *kзnən* 'do' and *wзvən* 'be' is morphosyntactic rather than semantic in nature, see Lyutikova & Tatevosov (2013); Grashchenkov (2016), as well as example (11) and the discussion above it.

An alternative is the linking approach stemming from Alsina (1993) and Butt (1995), see also Butt (1995, 2014); Butt, Carnesale & Ahmed (2023); Butt & Bano (2024), among others. Another approach is PRED fusion by Asudeh & Rafiee Rad (2023). Andrews (2023: 289–291) provides an overview of competing approaches to complex predicates, including Lowe (2016).

Converbal clauses are different. They have internal structure, but do not seem to have a postverbal area. For instance, in (25) below, the PP *televizorə sur* 'in front of the TV' cannot appear after the verb *badgз* 'sitting'. Thus, the participle appears as a rather low, projecting V head.

(25) a. ***televizor-ə sur*** *зnafon-mз bad-gз, rajšom-зj nз= šə-št-zənз*
TV-GEN close_to late-ALL sit-PCVB morning-ABL NEG=PV-stand-FUT.2SG
'Watching television up until late, you will not get up early in the morning.'
(Belyaev & Vydrin 2011: 123)

b. **зnafon-mз bad-gз* ***televizor-ə sur,*** *rajšom-зj nз= šə-št-zənз*
late-ALL sit-PCVB TV-GEN close_to morning-ABL NEG= PV-stand-FUT.2SG

The participle can indeed be said to head a VP here, since the dependents of the converb cannot be scrambled out of the converbial clause, and Ossetic does not allow such types of scrambling out of constituents.

(26) a. *rajšom-зj nз= šə-št-zənз* [*televizor-ə sur зnafon-mз bad-gз*]
morning-ABL NEG=PV-stand-FUT.2SG TV-GEN close_to late-ALL sit-PCVB
'Watching television up until late, you will not get up early in the morning.'
{=25}

b. #*rajšom-зj televizor-ə sur nз= šə-št-zənз* _ *зnafon-mз bad-gз*
morning-ABL TV-GEN close_to NEG= PV-stand-FUT.2SG late-ALL sit-PCVB
'You will not wake up near the TV early in morning if you watch (TV) up until late.'

Participles formed from complex predicates are similar and have the same lexical label as those formed from simple verbs. However, they have an additional f-structure annotation which restricts them to non-finite adjunct clauses, i.e. embedded adverbial clauses.

(27) *dišgɜngɜ* $\mathrm{V}_{\mathrm{ptcp}}$ $(\uparrow \textsc{pred})=\text{‘wonder’}$
$(\neg\ \textsc{tns})$
$(\textsc{adj}\uparrow)$

In (24), we have already provided the c-structure for VFC clauses in Ossetic, but we are yet to list the c-structure rules licensing this structure, specifically the rule for the fourth VP level, V^4, which in the analysis of Belyaev (2022) houses focalized material. We propose that this rule takes the following form:

(28) $$\mathrm{V}^4 \rightarrow \left\{ \begin{array}{c} \mathrm{XP} \\ (\uparrow \textsc{agfs})=\downarrow \\ \downarrow_\sigma \in (\uparrow_{\sigma\iota}\ \textsc{focus}) \end{array} \middle| \begin{array}{c} \mathrm{V}_{\mathrm{ptcp}} \\ \uparrow=\downarrow \\ (\uparrow_{\sigma\iota}\ \textsc{focus})=\{\downarrow_\sigma\} \end{array} \middle| \begin{array}{c} \mathrm{NVC} \\ \uparrow=\downarrow \\ (\uparrow_{\sigma\iota}\ \textsc{focus})=\{\downarrow_\sigma\} \end{array} \right\} \left\{ \begin{array}{c} \mathrm{V}^3 \\ \uparrow=\downarrow \end{array} \middle| \begin{array}{c} \mathrm{V}^4 \\ \uparrow=\downarrow \end{array} \right\}$$

This rule is quite complex and needs unpacking. The right-hand side contains two disjunctive sets, and we will go over them one-by-one. The first set introduces the focal material itself. These can be focalized noun phrases, quantifier phrases or other types of constituents (represented by XP). Alternatively, *-gɜ*-participles ($\mathrm{V}_{\mathrm{ptcp}}$) or non-verbal components of complex predicates can end up in this position. Note that the NVC is not a special lexical label, but rather an abbreviation for $\widehat{\mathrm{N}}$ & $\widehat{\mathrm{Adj}}$.

Now, recall that the VFC and focalized NVCs are not compatible with other types of focus other than narrow verb focus, but XPs are. We capture this with i-structure annotations in the phrase structure rule in (29). For this, we utilize the i-structure framework of Dalrymple & Nikolaeva (2011). Note that there are other LFG approaches to the formalization of information structure and its effects, see Zaenen (2023) for a recent overview.

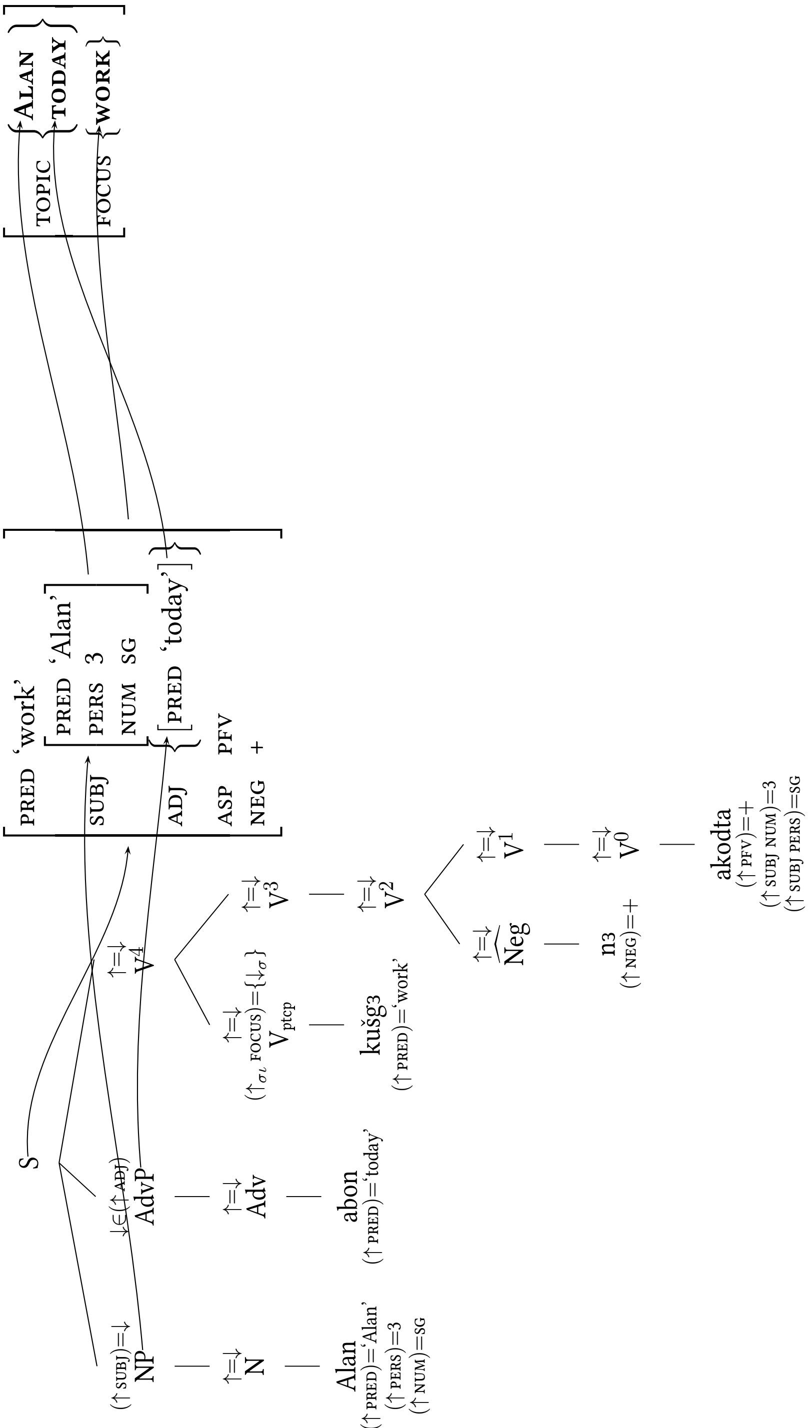
A focalized XP adds its Glue meaning constructor to the FOCUS set at i-structure, while a *-gɜ*-participle (as $\mathrm{V}_{\mathrm{ptcp}}$) and a focalized NVC **restrict** the FOCUS set to contain only its meaning constructor. The right set $\left\{ \begin{array}{c} \mathrm{V}^3 \\ \uparrow=\downarrow \end{array} \middle| \begin{array}{c} \mathrm{V}^4 \\ \uparrow=\downarrow \end{array} \right\}$ is also there to account for the possibility of multiple foci, and the rule is hence recursive.

Given everything discussed above, we are now ready to represent c-structure, f-structure and i-mapping (30) for a VFC instance such as (29).

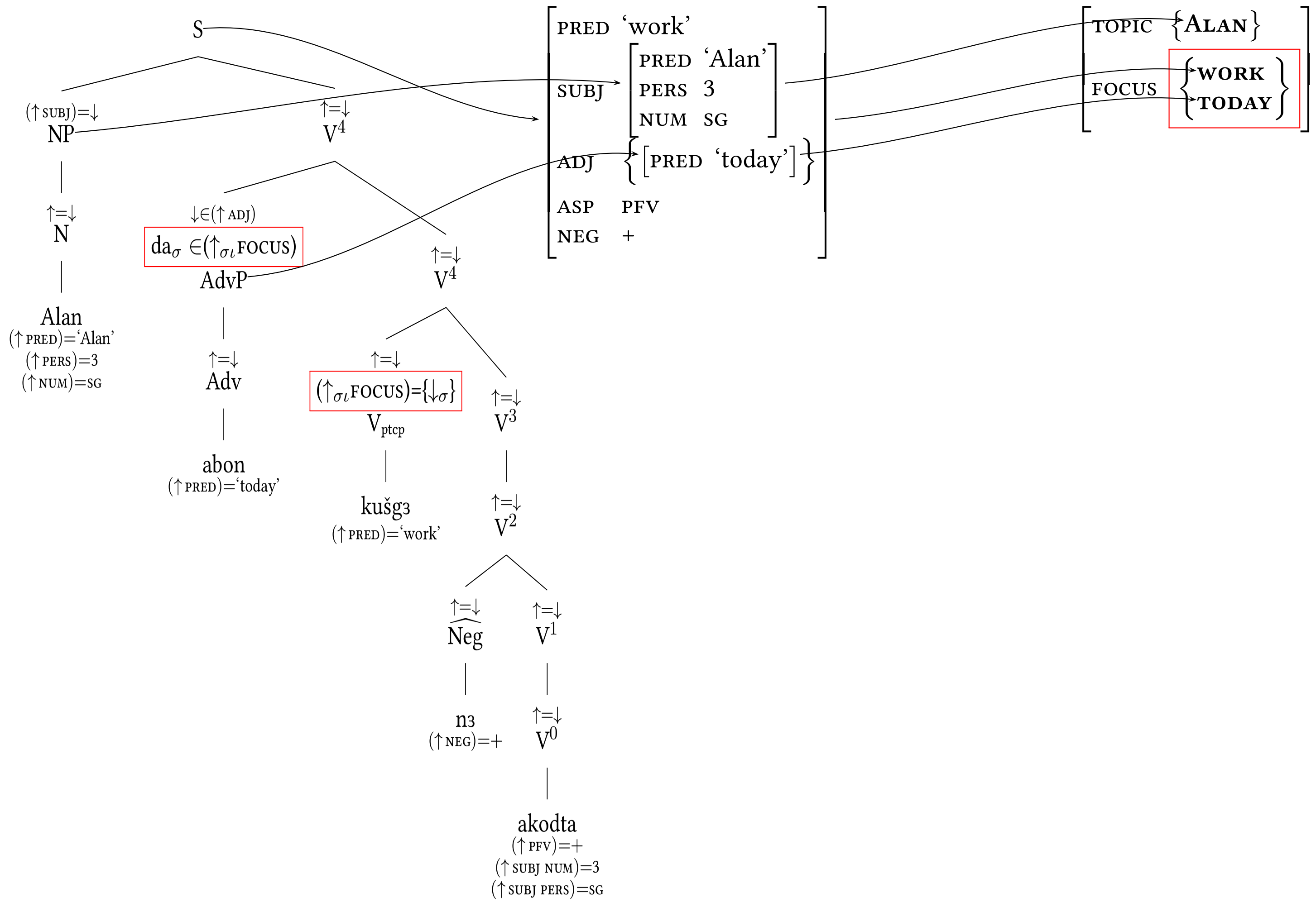
(29) *alan abon kuš-gɜ nɜ= a-kod-ta.*
Alan today work-PCVB NEG= PV-do-PST.3SG
‘Alan did not WORK today.’

If, for example, *abon* ‘today’ is interpreted as being inside V^4 and part of the focus set (yielding the meaning ‘It is not the case that Alan worked today {⇒ he instead worked yesterday}’), the VFC would be infelicitous. Our analysis captures this type of ungrammaticality, cf. (31) with conflicting constraints highlighted in red boxes.

(30)



(31)


S
(↑ SUBJ)=↓
NP
↑=↓
N
Alan
(↑ PRED)='Alan'
(↑ PERS)=3
(↑ NUM)=SG
↑=↓
V4
↓∈(↑ ADJ)
daσ ∈(↑σι FOCUS)
AdvP
↑=↓
Adv
abon
(↑ PRED)='today'
↑=↓
V4
↑=↓
(↑σι FOCUS)={↓σ}
Vptcp
kušg3
(↑ PRED)='work'
↑=↓
V3
↑=↓
V2
↑=↓
Neg
n3
(↑ NEG)=+
↑=↓
V1
↑=↓
V0
akodta
(↑ PFV)=+
(↑ SUBJ NUM)=3
(↑ SUBJ PERS)=SG
PRED 'work'
SUBJ
PRED 'Alan'
PERS 3
NUM SG
ADJ
PRED 'today'
ASP PFV
NEG +
TOPIC
ALAN
FOCUS
WORK
TODAY

4.2 Potential for a non-lexicalist analysis

The current analysis needs a mechanism to control for preverb placement. Displaced NVCs cannot appear with preverbs: the preverb is left behind on the verb. This is illustrated in (32a–b), which shows that it's impossible to attach the preverb to a non-verbal component in the focus position before negation (32b).

(32) a. *ɜž* *dwar* ***gom*** *nɜ=* ***ba-kod-ton***
1SG.NOM door open NEG= PV-do-PST.1SG
'I did not open the door.' (Grashchenkov 2018: 80)

b. **ɜž* *dwar* *baj-gom* *nɜ=* *kod-ton*
1SG.NOM door PV-open NEG= do-PST.1SG

In a lexicalist setting, a noun with a preverb is a separate item in the lexicon. It would require another parametric label (Frank & Zaenen 2002) in order to account for the fact that nouns do not appear with preverbs outside complex predicates. Thus, a noun like *fižonɜg* would have three separate lexical entries: one corresponding to its usage as a common noun meaning 'grilled meat', and two to its usage as part of a complex predicate, prefixed and unprefixed.

(33) a. *fižonɜg* N (↑ PRED) = 'grilled meat'

b. *fižonɜg* N (↑ PRED) = 'grill <SUBJ OBJ>'

c. *šfižonɜg* N_{pv} (↑ PRED) = 'grill <SUBJ OBJ>'

In order to avoid the proliferation of lexical entries, the analysis should be interfaced with morphology in some way. We present one possible option within Lexical-Realizational Functional Grammar (LrFG), see Asudeh & Siddiqi (2023: 883–892) a.o.[6]

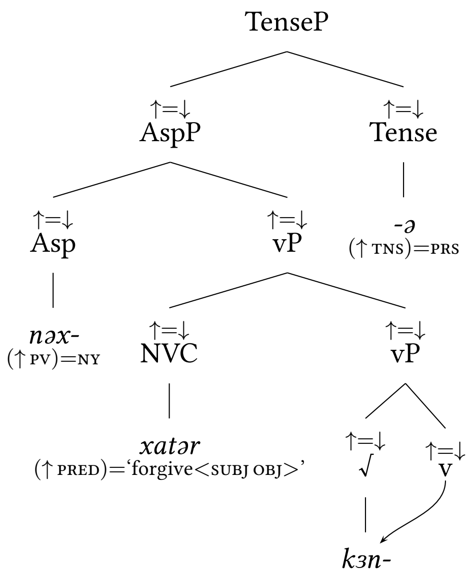
In our view, the key is to structurally uncouple the preverb from its hosts. Its position is then fixed in the tree as head of the Asp projection below Tense.[7] We assume that the NVC is a non-projecting adjunct to vP, where v is the label for the verbalizer head in LrFG. At the same time, *kɜn-*, the stem of the LV 'to do', is a PRED-less realization of the verbalizer head. Consider (34), the representation of a finite complex predicate *nəxxatər kɜnə* '(he/she) forgives' from example (14), repeated below for convenience.

[14] *nəx-xatər=mən* *=ɜj* *kɜn-ɜd* *Zəʦ:a*
PV-sorry =1SG.DAT=3SG.GEN do-OPT.3SG Zitsa
'let Zitsa forgive me' (OC: *Aguzarova Izeta*, 160.1)

[6]We present the analysis in LrFG, instead of using other, perhaps more traditional approaches to morphology in LFG, since we are interested in exploring the possibility of an analysis in a realizational morphosyntactic framework that realizes purely syntactic information without a separate encapsulated morphology and morphological features.

[7]The preverb contributes an f-structural feature which directly corresponds to its type. This is required to account for preverb selection on the part of the NVC (Grashchenkov 2010).

(34)

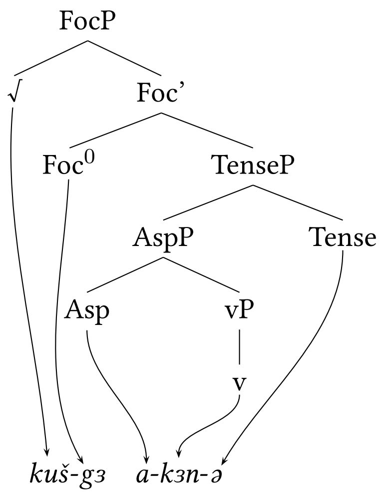


We take *-gз* to head its own projection, FocP, which essentially corresponds to V^4 above. LrFG allows us to position the verbal root directly in Spec,FocP, accounting for the VFC.[8] This position also houses focalized NVCs and focused noun phrases.

(35) a. $$\text{FocP} \rightarrow \left\{ \begin{array}{c} \surd \\ \uparrow=\downarrow \\ (\uparrow_{\sigma\iota}\ \textsc{focus})=\{\downarrow_{\sigma}\} \end{array} \;\middle|\; \begin{array}{c} \text{NVC} \\ \uparrow=\downarrow \\ (\uparrow_{\sigma\iota}\ \textsc{focus})=\{\downarrow_{\sigma}\} \end{array} \;\middle|\; \begin{array}{c} \text{XP} \\ (\uparrow \textsc{agfs})=\downarrow \\ \downarrow_{\sigma}\in(\uparrow_{\sigma\iota}\ \textsc{focus}) \end{array} \right\} \begin{array}{c} \text{Foc'} \\ \uparrow=\downarrow \end{array}$$

b. $$\text{Foc'} \rightarrow \begin{array}{c} \text{Foc}^0 \\ \uparrow=\downarrow \end{array} \begin{array}{c} \text{TenseP} \\ \uparrow=\downarrow \end{array}$$

(36) **C-structure and VI-mapping for *kušgз akзnə* ‘(he/she) is WORKING’**



The root itself is barred from appearing both high (in Spec,FocP) and low (in vP as a sister to the verbalizer) due to a PRED clash. But we also have to restrict *-gз* to appear

[8]We thank Dan Sidiqqi for this suggestion.

with verbal roots only. There are two ways of approaching this. In the earlier versions of the LrFG formalism, cf. Asudeh & Siddiqi (2023: 887), this could be achieved with a HOST [TYPE VERBAL] specification in the vocabulary item entry for *-gз*:

(37) $\begin{bmatrix} \textsc{phonrep} & /\text{gз}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{host} & \begin{bmatrix}\textsc{type} & \textsc{verbal}\end{bmatrix} \end{bmatrix}$

However, the LrFG theory later moved away from using the TYPE feature at v-structure. The required restriction can still be achieved through a $\lambda \circ \nu^{-1}$ mapping, constraining the syntactic category of the host at l-structure (Kaplan 1995).[9]

(38) $\langle [\text{Foc}], \underset{\langle\langle \lambda\circ\nu^{-1}(\bullet\,\textsc{host}) \notin \{\text{N,Adj}\}\rangle\rangle}{-} \rangle \rightarrow \begin{bmatrix} \textsc{phonrep} & /\text{gз}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{host} & \begin{bmatrix}\textsc{ident} & +\end{bmatrix} \end{bmatrix}$

The restriction comes in form of a constraining equation on the f-structural content of *-gз*. There is no actual contribution that *-gз* itself makes to f-structure, which is why no second member of the tuple pair is listed in (38), but it is conditioned by its host (●HOST) c-structure node (ν^{-1}; ν itself is a mapping from terminal nodes to vocabulary items) not having an N or Adj category at l-structure (λ-mapping).

4.3 Beyond the VFC and CPrs

Ossetic has a number of other periphrastic constructions / non-atomic syntactic units realizing a single predication.

Light verbs besides *kзnən* 'do' and *wзvən* 'be' have been reported to be rarely used in complex predicates with idiomatic meanings, which we call minor light verbs. An example *kзšən* 'to look' in *kommз kзšən* 'to obey' (lit. 'to look in the mouth') (39). Importantly, preverbs here can also attach to the nominal component (40).

(39) *alan-mз jз= fərt nз= kom-mз kзš-ə.*
Alan-ALL POSS.3SG=son NEG=mouth-ALL look-PRS.3SG
'Alan's son does not obey him.' (lit. 'does not look into his mouth')

(40) *alan-mз jз= fərt nз= **ba**-kom-mз kašt.*
Alan-ALL POSS.3SG=son NEG=PV-mouth-ALL look.PST[3SG]
'Alan's son did not obey him.' (lit. 'did not look into his mouth')

Another CPr with a minor LV *daryn* 'to hold' is *qəgdaryn* 'to disturb':

(41) *ni-kзj qəgdard-ta.*
NEG-who.GEN disturb-PST.3SG
'He didn't disturb anyone.'

Certain speakers do not even recognize the meaning of this unit if in its written form it appears with a space and attempt to understand it compositionally.

[9]This has been suggested to us by Ash Asudeh, for which we are grateful.

(42) *ni-kʒj* *qəg* *dard-ta.*
NEG-who.GEN trouble hold-PST.3SG
'He didn't took offence from anyone.' (lit. 'didn't hold anyone's trouble')

Qəgdaryn 'to disturb' can even participate in VFC formation, suggesting a high degree of lexicalization:

(43) ***qəgdar-gɜ*** *=mɜ* *kɜn-ut.*
disturb-PCVB=1SG.GEN do-PRS.2PL
'You are disturbing me.'
(ONC: Max dug, 3, 1997; cited after (Podgornaia 2025: 159))

The modern intransitive preterite is also periphrastic in origin, being the combination of the past participle and the verb *wɜvən* 'to be' (Abaev 1964: 51, 68):

(44) a. *səd-əštə* <go-PST.3SG> '(they) went'
b. *səd* <go.PTCP.PST> 'movement, moved'
c. *štə* <be.PRS.3PL>

A potential avenue for expanding the lexicalist analysis is combining data from different diagnostics (preverb placement, availability of NVC displacement) and explicating how and what is stored in the lexicon (and how this evolved in the history of Ossetic), since all the constructions described above clearly lie on a "lexicalization–univerbation" scale.

5 Conclusions

In this paper, we have proposed an LFG analysis for the Ossetic periphrastic verb focus construction and accounted for its complementary distribution with focused complex verbs. Following the previous proposals, we consider a *-gɜ*-participle in the VFC and a NVC in a focused CPr to occupy the structural position for focal elements in the verbal complex, and a light verb (generally *kɜnən* 'to do') to be the PREDless locus of TAM-marker attachment. We built upon the treatment of Ossetic clause structure proposed in (Belyaev 2022) by expanding the rule for the focus position and supplying it with the i-structure annotations in order to model the distribution of the VFC and focalized complex predicates. Additionally, we extended the analysis to preverb placement in LrFG. Much in line with the goals of this framework, we are able to account for all the data within the confines of syntactic modules without resorting to a separate encapsulated morphology. However, the lexicalist approach also has its merits in being better suited to potentialy take into account other periphrastic constructions of Ossetic.

References

Abaev, Vasiliy. 1964. *A grammatical sketch of Ossetic.* Bloomington: Indiana University.

Alsina, Alex. 1993. *Predicate composition: A theory of syntactic function alternations.* Ph.D. thesis, Stanford University.

Andrews, Avery D. 2023. Complex predicates. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 267–308. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185946.

Asudeh, Ash & Siavash Rafiee Rad. 2023. Persian perception verbs. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 conference*, 45–65.

Asudeh, Ash & Daniel Siddiqi. 2023. Morphology in LFG. In Mary Dalrymple (ed.), *The handbook of Lexical Functional Grammar*, 855–901. Berlin: Language Science Press.

Belyaev, Oleg. 2022. Phrase structure and configurationality in Ossetic. In *Proceedings of the LFG'22 conference*, 41–60.

Belyaev, Oleg & Irina Khomchenkova. 2022. Noun phrase conjunction in Ossetic. *Rhema* (4). 32–54. https://doi.org/10.31862/2500-2953-2022-4-32-54. In Russian.

Belyaev, Oleg & Arseniy Vydrin. 2011. Participle-converbs in Iron Ossetic. In Agnes Korn, Geoffrey Haig, Simin Karimi & Pollet Samvelian (eds.), *Topics in iranian linguistics*, 117–134. Wiesbaden: Dr. Ludwig Reichert Verlag.

Borise, Lena & David Erschler. 2023. Flexible syntax–prosody mapping of Intonational Phrases in the context of varying verb height. *Phonology* 1–42. https://doi.org/10.1017/S0952675723000015.

Butt, Miriam. 1995. *The structure of complex predicates in Urdu.* Stanford, CA: CSLI Publications.

Butt, Miriam. 2014. Control vs. complex predication. *Natural Language & Linguistic Theory* 32(1). 165–190. https://doi.org/10.1007/s11049-013-9217-5.

Butt, Miriam & Saira Bano. 2024. Iranian perception predicates revisited: evidence from Hazaragi. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 conference*, 115–140.

Butt, Miriam, Lucrezia Carnesale & Tafseer Ahmed. 2023. Experiencers vs. agents in Urdu/Hindi nominalized verbs of perception. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 conference*, 90–113.

Dalrymple, Mary & Irina Nikolaeva. 2011. *Objects and information structure.* Cambridge: Cambridge University Press.

Erschler, David. 2010. Negative pronouns in Ossetic: areal and typological features. *Voprosy jazykoznanija* (2). 84–105. In Russian.

Erschler, David. 2012. From preverbal focus to preverbal "left periphery": The Ossetic clause architecture in areal and diachronic perspective. *Lingua* 122(6). 673–699. https://doi.org/10.1016/j.lingua.2012.01.009.

Frank, Anette & Annie Zaenen. 2002. Tense in LFG: Syntax and morphology. In *How we say when it happens: Contributions to the theory of temporal reference in natural language*, 17–52. Berlin, Boston: De Gruyter.

Grashchenkov, Pavel. 2010. Slozhnye glagoly v osetinskom yazyke. In *Vostokovednye chteniya 2008*, 115–131. Moscow: Institute of Oriental Studies RAS.

Grashchenkov, Pavel. 2016. Osetinskie slozhnye predikaty v tipologicheskoj perspektive: obshchie cherty i harakternye osobennosti. *Izvestiya SOIGSI* 22(61). 105–112.

Grashchenkov, Pavel. 2018. Between lexicon, syntax, phonology, semantics: The interface phenomena in the ossetic complex predicates. *Typology of Morphosyntactic Parameters* 1. 73–87.

Haspelmath, Martin. 1995. The converb as a cross-linguistically valid category. In *Converbs in cross-linguistic perspective*, Berlin, New York: Mouton de Gruyter.

Jäger, Andreas. 2006. *Typology of 'do'-constructions*. Bochum: Universitätsverlag Dr. N. Brockmeyer.

Kaplan, Ronald M. 1995. The formal architecture of Lexical-Functional Grammar. In Mary Dalrymple, Ronald M. Kaplan, John T. Maxwell III & Annie Zaenen (eds.), *Formal issues in Lexical-Functional Grammar*, 241–274. Stanford, CA: CSLI Publications.

Lowe, John. 2016. Complex predicates: an LFG+glue analysis. *Journal of Language Modelling* 3(2). 413–462. https://doi.org/10.15398/jlm.v3i2.125.

Lowe, John & Oleg Belyaev. 2015. Clitic positioning in Ossetic. In *Proceedings of the LFG15 conference*, 229–249.

Lyutikova, Ekaterina & Sergei Tatevosov. 2009. The clause internal left edge: Exploring the preverbal position in Ossetian. In *International conference on Iranian linguistics*, vol. 3, 11–13.

Lyutikova, Ekaterina & Sergei Tatevosov. 2013. Complex predicates, eventivity, and causative-inchoative alternation. *Lingua* 135. 81–111. https://doi.org/10.1016/j.lingua.2013.02.006.

Podgornaia, Anastasia. 2025. The verb focus construction in Iron Ossetic. *Indo-Iranian Languages* 1(1). 152–172. https://doi.org/10.30842/30346800.2025.1.1.7.

Zaenen, Annie. 2023. Information structure. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 823–853. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185972.

Animacy effects in Tamil

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Abstract

Animacy is reflected in multiple grammatical phenomena in Tamil. Several of these phenomena (e.g., accusative case marking and verbal agreement) reflect a distinction between humans and others, while locative case marking reflects a distinction between animates and inanimates. This paper describes the relevant phenomena, and proposes an analysis in terms of syntactic features in Lexical-Functional Grammar. The paper also raises questions about differences among animacy systems and suggests that some differences regarding cut-off points in the animacy hierarchy are due to the multifaceted nature of animacy.

1 Introduction

Animacy influences the morphology and syntax in many languages, perhaps all.[†] For example, long passives in Norwegian show a strong preference for inanimate over animate subjects (Lødrup 2022), some reflexives in Mandarin and Cantonese require animate antecedents (Lam 2021), and KiSwahili object marking is optional on inanimates but obligatory on animates (Morimoto 2002). See Santazilia (2023) for a large number of additional examples. Animacy effects do not always distinguish between animates and inanimates. Sometimes the line is instead drawn between human referents on the one hand and animals and inanimates on the other. In Maltese, for example, human objects are typically marked with the accusative marker *lil*, but non-human objects are unmarked (Camilleri & Sadler 2012). In other words, grammatical animacy effects do not uniformly reflect the same cut-off point in the animacy hierarchy. A simple version of the animacy hierarchy is provided in (1):[1]

(1) HUMAN > ANIMATE > INANIMATE

The current paper investigates animacy in the grammar of Tamil, where the distinction between animate/inanimate and between human/non-human both play a role. Section 2 introduces the Tamil animacy data and states the relevant descriptive generalizations. Section 3 spells out a proposal for how to capture the generalizations formally in Lexical Functional Grammar (LFG). Section 4 raises the following question: *Why* do different languages and different phenomena show sensitivity to different cut-off points in the animacy hierarchy? Section 5 offers a brief summary of the paper.

[†]We would like to thank the Tamil speakers who lent us their expertise. We especially thank JeyaBalaji Samuthiravelu, Kalaivani Babu, and Parthiban Azhaganantham. We are also grateful to all the reviewers for their time and expertise. Our paper has benefited greatly from the three abstract reviews and the two reviews of the full paper. We thank Jamie Findlay for his very helpful feedback on both content and form. Thanks are also due to Thora Asudeh for lending a keen eye to the paper. Finally, we thank Raj Singh for extensive discussion and insightful comments on a draft. All remaining errors are exclusively our own.

[1]See Silverstein (1976), and for an overview and discussion of the animacy hierarchy and further references, see Yamamoto (1999: ch. 1). It has become standard to use the term ANIMATE in the hierarchy rather than, e.g., NON-HUMAN ANIMAL. Humans are of course also animate, and in the remainder of the paper the term *animate* is used for humans as well as animals.

2 Animacy in Tamil

Most animacy effects in Tamil differentiate between humans and others. The locative case system, however, reflects a distinction between animates and inanimates. The human vs. non-human effects are described in Section 2.1, and the animate vs. inanimate effect (locative case) is described in Section 2.2.

The examples and generalizations provided in this section come from a variety of sources, including the following descriptive grammars and pedagogical materials: Lehmann (1989); Schiffman (1999); Asher & Annamalai (2002); Schiffman (2004); Lockwood (2007). We have also consulted a number of Tamil speakers, and the first author is a Tamil speaker. However, it is important to note that Tamil has millions of speakers in many different geographical areas and countries, and there is rich and interesting dialectal variation.

2.1 Humans vs. non-humans

Tamil shows sensitivity to the human/non-human distinction in its pronominal system (Section 2.1.1), verbal agreement paradigm (also Section 2.1.1), number marking (Section 2.1.2), and accusative case marking (Section 2.1.3).

2.1.1 Pronouns and agreement

The third person pronouns are shown in Table 1. The human vs non-human distinction is reflected in both singular and plural. The singular human pronouns distinguish between honorific, masculine and feminine, but there is only one non-human singular pronoun. The plural pronouns distinguish between human and non-human only.[2]

	SINGULAR	PLURAL
MASCULINE	*avaṉ*	
FEMININE	*avaḷ*	*avargaḷ*
HONORIFIC	*avar*	
NON-HUMAN	*atu*	*avai*

Table 1: Third person nominative pronouns

The verbal agreement paradigm echoes the pronominal system. In the singular, the verb displays a three-way split for human subjects (masculine, feminine, honorific), and it has a single agreement morpheme for non-human subjects. When the subject is plural, the verbal agreement distinguishes between human and non-human. The third person present tense forms for the verb *ooḍu* 'to run' are given in Table 2 (adapted from Lockwood 2007: 20).

The examples in (2)–(11) below contain the forms listed in Tables 1–2. Examples (2)–(4) include human singular subjects:

[2] The form *avargaḷ* is sometimes also used as alternative form for the singular honorific. There is other variation in form as well, and there are many differences between standard written Tamil and more casual spoken Tamil. We mainly use the standard written forms in our paper, and for the most part we do not report on alternate forms.

	SINGULAR	PLURAL
MASCULINE	*ooḍugiṟ-aaṉ*	
FEMININE	*ooḍugiṟ-aaḷ*	*ooḍugiṟ-aargaḷ*
HONORIFIC	*ooḍugiṟ-aar*	
NON-HUMAN	*ooḍugiṟ-atu*	*ooḍugiṉṟ-aṉa*

Table 2: Third person present tense forms for *ooḍu* ‘to run’

(2) Maaṇavi puttakatt-ai paṭitt-**aaḷ**. **Avaḷ** paciyuṭaṉ irunt-**aaḷ**.
student(female) book-ACC read.PST-3SG.F she hungry be.PST-3SG.F
‘The (female) student read a book. She was hungry. ’

(3) Maaṇavaṉ puttakatt-ai paṭitt-**aaṉ**. **Avaṉ** paciyuṭaṉ irunt-**aaṉ**.
student(male) book-ACC read.PST-3SG.M he hungry be.PST-3SG.M
‘The (male) student read a book. He was hungry.’

(4) Vimaṉi puttakatt-ai paṭitt-**aar**. **Avar** paciyuṭaṉ irunt-**aar**.
pilot book-ACC read.PST-3SG.HON 3SG.HON hungry be.PST-3SG.HON
‘The pilot read a book. S/he was hungry.’

Examples (5)–(7) contain non-human singular subjects. The examples show that animals, plants and things pattern alike with respect to pronominal forms and agreement marking. *Naay* ‘dog’ in (5) is an animal, *maa maram* ‘mango tree’ in (6) is a plant, and *katavu* ‘door’ in (7) is an inanimate object:

(5) Naay kuraitt-**atu**. **Atu** paciyuṭaṉ irunt-**atu**.
dog bark.PST-3SG.¬HUM it hungry be.PST-3SG.¬HUM
‘The dog barked. It was hungry.’

(6) Maa maram vekamaaka vaḷarnt-**atu**. **Atu** aẓakaaka
mango tree fast grow.PST-3SG.¬HUM it beautiful
irunt-**atu**.
be.PST-3SG.¬HUM
‘The mango tree grew fast. It was beautiful.’

(7) Katavu tiṟant-**atu**. **Atu** niila niṟattil irunt-**atu**.
door open.PST-3SG.¬HUM it blue color be.PST-3SG.¬HUM
‘The door opened. It was blue.’

The human vs. non-human distinction is reflected in the plural morphology as well, but gender and honorificity is not. The examples below include subjects which refer to humans (8), animals (9), plants (10) and inanimates (11):

(8) Maanavargaḷ puttakatt-ai paṭitt-**aargaḷ**. **Avargaḷ** paciyuṭaṉ
student.PL book-ACC read.PST-3PL.HUM 3PL.HUM hungry
irunt-**aargaḷ**.
be.PST-3PL.HUM
‘The students read a book. They were hungry.’

(9) Naaykaḷ kuraitt-**aṉa**. **Avai** paciyuṭaṉ irunt-**aṉa**.
dog.PL bark.PST-3PL.¬HUM 3PL.¬HUM hungry be.PST-3PL.¬HUM
'The dogs barked. They were hungry.'

(10) Maa maran-kaḷ vekamaaka vaḷarnt-**aṉa**. **Avai** aẓakaaka irunt-**aṉa**.
mango tree-PL fast grow.PST-3PL.¬HUM 3PL.¬HUM beautiful be.PST-3PL.¬HUM
'The mango trees grew fast. They were beautiful.'

(11) Katavukaḷ tiṟant-**aṉa**. **Avai** niila niṟattil irunt-**aṉa**.
door.PL open.PST-3PL.¬HUM 3PL.¬HUM blue color be.PST-3PL.¬HUM
'The doors opened. They were blue.'

The agreement marking and the pronoun in (8), which has a human subject, differ from the non-human agreement and pronouns in (9)–(11).

2.1.2 Plural marking

When nouns refer to more than one entity, plural marking is obligatory on human nouns (12) but often optional on non-human nouns (13)–(14), especially when plurality is independently indicated by a quantifier (Ramasubramoney 2019; Lehmann 1989: 20–21).

(12) Avaṉ niṟaiya peṉ-**kaḷ**-ai partt-aaṉ.
3SG.M many girl-PL-ACC see.PST-3SG.M
'He saw many girls.'

(13) Avaṉ muuṉṟu {maaṭu/maaṭu-**kaḷ**} partt-aaṉ.
3SG.M three cow.SG/cow-PL see.PST-3SG.M
'He saw three cows.'

(14) Avaṉ niṟaiya {puttakam/puttakan-**kaḷ**} paṭitt-aaṉ.
3SG.M many book.SG/book-PL read.PST-3SG.M
'He read many books.'

The omission of the number marking on non-human nouns is especially common in the modern spoken language.

2.1.3 Accusative case

The human vs. non-human distinction is evident in the marking of accusative case. When the direct object has an indefinite interpretation, the accusative case marker is obligatory for human nouns (15)–(16), but optional for non-human nouns (17)–(19):

(15) Kumaar oru paiyaṉ-**ai** paartt-aaṉ
Kumar a boy-ACC see.PST-3SG.M
'Kumar saw a boy'

(16) *Kumaar oru paiyaṉ paartt-aaṉ
Kumar a boy see.PST-3SG.M
'Kumar saw a boy'

(17) Kumaar oru aamaiy(-**ai**) vaankin̠-aan̠
Kumar a turtle(-acc) buy.PST-3SG.M
'Kumar bought a turtle'

(18) Kumaar oru puuv(-**ai**) par̠itt-aan̠
Kumar a flower(-acc) pluck.PST-3SG.M
'Kumar plucked a flower'

(19) Kumaar oru peṭṭiy**(-ai)** vaankin̠-aan̠
Kumar a box(-acc) buy.PST-3SG.M
'Kumar bought a box'

Driemel (2023: ch. 4) discusses the exact conditions under which the accusative marker is omitted for non-human indefinites. The details are complex, but specificity is relevant: specific objects are more likely to be case-marked than non-specific objects. This is not surprising, since specificity plays a similar role in differential object marking in many languages.[3] The specificity effect will be reflected in our formal analysis in Section 3, but other considerations which also play a role are set aside. For example, our consultants seem to be more likely to use accusative case on indefinites in writing than in speech, and we do not attempt to capture this. The important point for our purposes is that there is a clear difference between human and non-human direct objects.

When the object has a definite interpretation, there is no animacy effect. Definite direct objects are obligatorily marked with accusative case, regardless of the animacy of the object noun. Examples (20)–(23) are intended to be interpreted as definite. The accusative case marker *-ai* is then obligatory in both the human example in (20) and the non-human examples in (21)–(23):

(20) Ram Priyav-**ai** kaatalikkir̠-aan̠
Ram Priya-ACC love.PRES-3SG.M
'Ram loves Priya.'

(21) Kumar kutirai-**ai** cuttappaṭutti-n̠aan̠
Kumar horse-ACC cleaned.PST-3SG.M
'Kumar cleaned the horse.'

(22) Kumaar puv-**ai** par̠itt-aan̠
Kumar flower-ACC pluck.PST-3SG.M
'Kumar plucked the flower.'

(23) Avaḷ itliy-**ai** caappitt-aaḷ
3SG.F idli-ACC eat.PST-3SG.F
'She ate the idli(s).'

Taken together, examples (15)–(23) show that definite objects are marked with the accusative case, and so are indefinite human objects. Non-human indefinite objects are not obligatorily case marked. The marking of indefinite objects is thus sensitive to whether the noun has a human referent.

[3]This is the case in, for example, Turkish (Krause & von Heusinger 2019), Tigrinya (Kifle 2007), and Hindi/Urdu (Butt 2025, and references therein).

2.1.4 Exceptional cases

Although Tamil nouns are almost always classified as grammatically human or non-human based directly on the actual biological humanness of the referent, there are some exceptions. We argue that some of the mismatches between biological and grammatical humanness are best explained as lexically specified exceptions, and others are best explained as an alternative conceptual construal of the relevant entity (e.g., personification). The exceptions described below can each be covered by one or the other of these explanations.

In traditional Tamil grammars, the distinction we have referred to here as *human* vs. *non-human* is instead referred to as *rational* vs. *irrational*. The reason for this seems to be that there are some cases where human referents can trigger neuter (non-human) morphology, and these are cases where the referents can be thought of as "irrational". The terms human and non-human are adopted here rather than rational and irrational in order to conform to the more general linguistic literature on animacy. However, it is true that the distinction between entities that are typically considered rational or irrational aligns almost exactly with the human/non-human split. The following quote is from Sarveswaran (2024: 4):

> "[...] all nouns in Tamil can be categorised into *uyartiṇai* (rational) and *aḥṟiṇai* (irrational). Entities marked as rational are those perceived as being able to think on their own, while the rest are termed as irrational. For instance, animals, trees, furniture items, and infants are considered irrational, while humans and gods are categorised as rational. This (ir)rationality based marking differs from splits in terms of human vs. non-human, or animacy. For instance, infants are considered irrational just as animals or inanimate objects, even though infants are human and animate. An adult human entity can also still be marked as irrational if they behave in an insane manner."

There seems to be some disagreement in the judgments of what counts as an irrational adult. This difference might be due to dialectal variation. According to our consultants, non-human morphology on nouns referring to adults is only possible if the intention is to insult those adults. Based on our information, there are no specific nouns referring to human adults that consistently take non-human morphology (although such nouns may exist dialectally). We propose that when non-human morphology is used as an insult, it is a way of signalling an opinion that the person in question should be grouped with – or reconceptualized as – animals rather than fellow respectable humans. This can be compared to the cross-linguistically common practice of insulting people by calling them, for example, pigs or donkeys.

Our consultants do agree with Sarveswaran about infants. Accusative case is not obligatory on the noun *kuḻantai* 'baby' (24), and *kuḻantai* is also compatible with non-human morphology (25)–(26):

(24) Eṉakku kuḻantaikaḷ piṭikkum.
 I baby.PL love.PST.1SG
 'I love babies. '

(25) Kuẓantai aẓut-atu. Atu paciyuṭan irunt-atu.
baby.SG cry.PST-3SG.¬HUM 3SG.¬HUM hungry be.PST-3SG.¬HUM
'The baby cried. It was hungry.

(26) Kuẓantaikaḷ aẓut-aṉa. Avai paciyuṭan irunt-aṉa
baby.PL cry.PST-3PL.¬HUM 3PL.¬HUM hungry be.PST-3PL.¬HUM
'The babies cried. They were hungry.'

However, if the same noun *kuẓantai* refers to a gendered infant, it is compatible with human morphology:[4]

(27) Kuẓantai aẓut-aaḷ. Avaḷ paciyuṭan irunt-aaḷ.
baby cry.PST-3SG.F 3SG.F hungry be.PST-3SG.F
'The baby girl cried. She was hungry.'

(28) Aaṇ kuẓantaikaḷ aẓut-aargaḷ. Avarkal paciyuṭan irunt-aargaḷ
male baby.PL cry.PST-3PL.HUM 3PL.HUM hungry be.PST-3PL.HUM
'The male babies cried. They were hungry'.

In the formal analysis in Section 3, *kuẓantai* is lexically specified with a negative HUMAN feature, and it also has an alternative a positive HUMAN feature which is connected to GENDER. It is not always possible to determine the reason why specific lexical items are idiosyncratically marked, but in this particular case it is worth noting that singular human nouns are morphologically male, female or honorific, and none of those classifications are appropriate for a baby when the gender is unknown.

Another exceptional case is gendered pets. Although animals are typically not compatible with human morphology, gendered pets that have names may trigger human morphology:

(29) Eṉ naaiyiṉ peyar Brownie. Avaṉ tuuṅkikkoṇṭirukkiṟ-aaṇ.
my dog name Brownie 3SG.M sleep.PRES-3SG.M
'My dog's name is Brownie. He is sleeping.'

(30) Eṉ naaiyiṉ peyar Brownie. Atu tuuṅkikkoṇṭirukkiṟ-atu
my dog name Brownie 3SG.¬HUM sleep.PRES-3SG.¬HUM
'My dog's name is Brownie. It is sleeping.'

The subject in examples (29)–(30) is a named pet that is male. Both (29) with human morphology and (30) with non-human morphology are acceptable and natural. This is a case of personification. It involves the conceptualization of a non-human referent as human. As will be discussed in Section 3, this reconceptualization is captured formally by the assignment of a grammatical [HUMAN +] feature to the relevant noun, here *naaiyiṉ*.

Note that animals that are not close pets and are not named trigger non-human morphology even if they are inherently gendered:

[4] It is well known that socially constructed gender is not strictly binary, and it cannot be equated with biological sex, which is also not strictly binary. In reality, sex and gender distinctions are complex and nuanced, but we abstract away from these important nuances in our discussion.

(31) Koẓi muṭṭaikaḷ iṭṭ-atu
hen eggs lay.PST-3SG.¬HUM
'The hen laid eggs'

(32) Maṭu paal koṭukkiṟ-atu.
cow milk give.PRES-3SG.¬HUM
'The cow gives milk'

The subjects of (31)–(32), *koẓi* 'hen' and *maṭu* 'cow', refer to animals that are biologically female, but since they are animals, they nevertheless do not trigger human agreement (unless they happen to be very close pets). Similarly, *ceeval* 'rooster' and *kaalai* 'bull' in (33)–(34) refer to male animals, and the agreement marking is non-human:

(33) Ceeval kuuvikkoṇṭirunt-atu
rooster crow.PST-3SG.¬HUM
'The rooster was crowing'

(34) Kaaḷai sanṭaiyiṭṭ-atu
bull fight.PST-3SG.¬HUM
'The bull fought'

The examples in (31)–(34) show that nouns with animal referents typically trigger non-human morphology, even when the biological sex is known. Examples involving pets (e.g., (29) above) can thus not be fully explained by the fact that the sex is known.

Let us summarize this subsection. There are some cases where nouns with human referents can trigger non-human morphology. The noun *kuẓantai* 'baby' can be used with non-human morphology if the gender is unknown. If the gender is known, it triggers human morphology: male, female or plural according to what is appropriate. We treat the 'baby' case as an instance of idiosyncratic lexical marking. Sometimes non-human morphology can be used with adult humans as an insult. Named pets whose gender is known and who are intimately familiar optionally trigger human morphology. We hypothesize that the insults and personification are cases of reconceptualization of the referents as belonging to an animacy group distinct from the actual biological animacy group.[5]

2.2 Animate vs. inanimate

Section 2.1 provided numerous examples showing that animacy is grammatically relevant in Tamil. Specifically, the distinction between human and non-human referents is evident in the pronominal system, verbal agreement marking, and accusative marking of direct objects. This section turns to locative case marking, which is also sensitive to animacy. However, locative case does not differentiate between humans and non-humans, but instead between animates (humans and animals) and inanimates (plants and inanimate objects), as noted by Schiffman (1999: 31–32), Schiffman (2004), Lehmann (1989: 39), and others.

There are two locative case markers which differ in form and distribution: *-itam* and *-il*. The suffix *-itam* (*-gitte* in spoken Tamil) occurs only with animate nouns (35)–(37),

[5]For discussion of the tripartite distinction between linguistic, conceptual and biological animacy, see Bayanati & Toivonen (2019); Trompenaars et al. (2021); Toivonen (Forthcoming).

and *-il* (*-le* in spoken Tamil) occurs with inanimate nouns (38)–(39):[6]

(35) Uṅkaḷ-**iṭam** paṇam irukkaa?
2SG-LOC money have.PRES.Q
'Do you have any money (on you)?'

(36) Kumaar appaav-**iṭam** vant-aan.
Kumar father-LOC come.PST-3SG.M
'Kumar came to father.'

(37) Nari-**iṭam** koẓi irunt-atu
fox-LOC chicken have.PST-3SG.¬HUM
'The fox had a chicken'

(38) Kuruvi maratt-**il** uṭkkar-kiṟatu
sparrow tree-LOC sit.PRES-3SG.¬HUM
'The sparrow is sitting in the tree.'

(39) Kumaar oru vaaratt-**il** intap pustakattaip patitt-aan.
Kumar one week-LOC this book.ACC study.PAST-3SG.M
'Kumar read this book in a week.'

The locative case marker has many functions: for example, location, goal, and temporal duration. The locative is also part of more complex case markers, such as the ablative, illustrated in examples (40)–(42) (from Lehmann 1989: 42):

(40) Kumaar appaav-**iṭam**-iruntu vant-aaṉ.
Kumar father-LOC-ABL come.PST-3SG.M
'Kumar came from (his) father.'

(41) Kumaar appaav-ai oru puli-**iṭam**-iruntu kaappaaṟṟin-aaṉ.
Kumar father-ACC a tiger-LOC-ABL protect.PST-3SG.M
'Kumar protected father from a tiger.'

(42) Kumaar appaav-ai nerupp-**il**-iruntu kaappaaṟṟin-aaṉ.
Kumar father-ACC fire-LOC-ABL protect.PST-3SG.M
'Kumar protected father from fire.'

Note that 'father' in (40) and 'tiger' in (41) which are both animates take the same locative marker *-iṭam*, contrasting with *-il* on the inanimate 'fire' in (42).

In the singular, *-il* is only used with inanimates. However, as noted by Lehmann (1989: 40) and others, *-il* is used with both inanimates and animates when the noun is in plural and denotes a group within which specific individuals are singled out (identified or extracted). With this interpretation, *-il* is used regardless of the animacy of the noun. Examples (43)–(45) illustrate this use of *-il* for animates (human and animal referents) and inanimates:[7]

[6]Example (35) is adapted from Asher & Annamalai (2002: 35), and examples (38)–(39) are adapted from Lehmann (1989: 39).

[7]Examples (43) and (45) are from Lehmann (1989: 40).

(43) En̲ maaṇavar-kaḷ-**il** nir̲aiyat tamiẓar iru-kkir̲-aarkaḷ
1SG.OBL student-PL-LOC many Tamilian be-PRES-3PL
'Among my students there are many Tamilians'

(44) Maaṭu-kaḷ-**il** muun̲dru paẓuppaaka irukkinr̲-an̲a
cow-PL-LOC three brown are.PRES-3PL.¬HUM
'Three of the cows are brown.'

(45) Anta maampaẓaṅ-kaḷ-**il** entap paẓam rumaan̲i
DEM.PL mango-PL-LOC which fruit Rumani
'Which fruits among those mangoes are Rumani?'

In summary, locative case is sensitive to a distinction between animates and inanimates. The case marker *-il* occurs only on inanimate nouns in the singular and on both inanimates and animates in the plural when the noun denotes a group from which individuals are selected. The suffix *-iṭam* is used exclusively on nouns that refer to animates (animals and humans), regardless of whether the noun is singular or plural.

3 A formal characterization of Tamil animacy

The Tamil data described in Section 2 can be captured by an analysis that adopts an ANIMACY feature which takes a complex feature structure as its value. Similar structures have been adopted previously in LFG; for example, Dalrymple et al. (2009) use comparable complex feature structures in their account of case marking. We propose that in Tamil, the value of the attribute ANIMACY contains the feature HUMAN and/or the feature ANIMATE, which can each take a positive or negative value. The f-structure for (46) given in Figure 1 contains ANIMACY features and serves as an illustration.

(46) Viman̲i puttakattai paṭittaar.
pilot book.ACC read.PST.3SG.HON
'The pilot read a book.'

Formally, there is no need for a complex feature structure, since the facts can also be captured solely by the HUMAN and ANIMATE features. The complex feature structure is instead theoretically motivated: it serves to express the intuition that grammatical reflexes of animacy form a unified class, regardless of where in the animacy hierarchy the distinction is made. The features HUMAN and ANIMATE are bundled with each other but separate from, for example, PERSON and NUMBER. This intuition seems well motivated cross-linguistically. Consider, for example, differential object marking in Romanian and Spanish (related Romance languages). They both mark some direct objects but not others with a case marker: *pe* in Romanian and *a* in Spanish. In Romanian, objects referring to *humans* are case marked, and objects referring to animals and things are not (Chiriacescu & von Heusinger 2009). In Spanish, objects referring to *humans and animals* are case marked, and objects referring things are not (Fábregas 2013).[8] Even though Spanish and Romanian split the animacy hierarchy differently, the differential object

[8]To the best of our knowledge, these generalizations are broadly correct, but there is much more to say about differential object marking in Romanian and Spanish; see, e.g., Barbu & Toivonen (2018) and Kabatek et al. (2021), and references cited there.

$$
\left[\begin{array}{ll}
\text{PRED} & \text{`read}\langle\text{SUBJ, OBJ}\rangle\text{'} \\
\text{TENSE} & \text{PAST} \\
\text{SUBJECT} & \left[\begin{array}{ll}
\text{PRED} & \text{`pilot'} \\
\text{NUMBER} & \text{SG} \\
\text{CASE} & \text{NOM} \\
\text{HONORIFIC} & + \\
\text{ANIMACY} & \left[\begin{array}{ll} \text{HUMAN} & + \\ \text{ANIMATE} & + \end{array}\right]
\end{array}\right] \\
\text{OBJECT} & \left[\begin{array}{ll}
\text{PRED} & \text{`book'} \\
\text{CASE} & \text{ACC} \\
\text{SPECIFIC} & + \\
\text{ANIMACY} & \left[\begin{array}{ll} \text{HUMAN} & - \\ \text{ANIMATE} & - \end{array}\right]
\end{array}\right]
\end{array}\right]
$$

Figure 1: F-structure for *Vimaṉi puttakattai paṭittaar* ‘The pilot read a book’

marking still reflects animacy in both languages.

Recall from Section 2 that third person pronouns are specified for whether they are human or non-human, and they also signal gender or honorificity in the singular. Sample lexical entries for third person pronouns are provided in (47):

(47) Pronouns

avaḷ:
(↑ PRED) = ‘pro’
(↑ ANIMACY HUM) = +
(↑ GENDER) = FEM
(↑ PERSON) = 3
(↑ NUMBER) = SG

avar:
(↑ PRED) = ‘pro’
(↑ ANIMACY HUM) = +
(↑ HONORIFIC) = +
(↑ PERSON) = 3
(↑ NUMBER) = SG

atu:
(↑ PRED) = ‘pro’
(↑ ANIMACY HUM) = −
(↑ PERSON) = 3
(↑ NUMBER) = SG

avargaḷ:
(↑ PRED) = ‘pro’
(↑ ANIMACY HUM) = +
(↑ PERSON) = 3
(↑ NUMBER) = PL

avai:
(↑ PRED) = ‘pro’
(↑ ANIMACY HUM) = −
(↑ PERSON) = 3
(↑ NUMBER) = PL

The verbal agreement morphology mirrors the pronominal system: third person verbal agreement markers are specified for whether the subject is human or non-human, and third person singular verbs also indicate either gender or honorificity. The agreement morphemes in (48) serve as an illustration:

(48) Agreement markers/incorporated pronouns

-aaḷ:
((↑ SUBJ PRED) = ‘pro’)
(↑ SUBJ ANIMACY HUMAN) = +
(↑ SUBJ GENDER) = FEM
(↑ SUBJ PERSON) = 3
(↑ SUBJ NUMBER) = SG

-atu:
((↑ SUBJ PRED) = ‘pro’)
(↑ SUBJ ANIMACY HUMAN) = −
(↑ SUBJ PERSON) = 3
(↑ SUBJ NUMBER) = SG

-aargaḷ:
((↑ SUBJ PRED) = ‘pro’)
(↑ SUBJ ANIMACY HUMAN) = +
(↑ SUBJ PERSON) = 3
(↑ SUBJ NUMBER) = PL

-aṉa:
((↑ SUBJ PRED) = ‘pro’)
(↑ SUBJ ANIMACY HUMAN) = −
(↑ SUBJ PERSON) = 3
(↑ SUBJ NUMBER) = PL

Tamil is a pro-drop language. The agreement markers therefore have an optional PRED feature. This PRED feature is present when the clause does not contain an overt independent subject and absent when an independent subject noun or pronoun provides a PRED feature (Bresnan & Mchombo 1987; Toivonen 2023).

The two case markers that were considered in Section 2 are sensitive to different splits in the animacy hierarchy. Accusative case is obligatory on nouns with human referents, but it only occurs on indefinite non-human nouns if their interpretation is specific (Section 2.1.3). Locative case differs in form depending on whether it attaches to an animate or inanimate noun (Section 2.2). The lexical entry for the accusative case marker is provided in (49):

(49) Accusative case
-ai:
(↑ CASE) = ACCUSATIVE
{(↑ ANIMACY HUMAN) = + ∨ (↑ SPECIFIC) = + }

The lexical entry for accusative case includes a specification that ensures that the noun is human or specific (or both): it cannot be non-specific and non-human.

The lexical entries for the locative case markers are provided in (50):

(50) Locative case

-iṭam:
(↑ CASE) = LOCATIVE
(↑ ANIMACY ANIMATE) = +

-il:
(↑ CASE) = LOCATIVE
{(↑ ANIMACY ANIMATE) = −
∨ (↑ GROUP) = +}

The examples in Section 2.2 showed that the locative case marker *-iṭam* appears on animate nouns only, but the distribution of *-il* is more complex. The locative marker *-il* appears freely on inanimates, but it can also appear on animates if the interpretation is one where the locative case-marked noun denotes a group from which an individual is extracted. We formalize this with a [GROUP +] feature, borrowed from Jones’s (2015) work on Meryam Mir. This GROUP feature “foregrounds the membership of a collection of individuals" (Jones 2015: 115).

Recall that the entries for pronouns proposed in (47) include HUMAN features, but not ANIMATE features. Locative case-marked pronouns will, however, be specified for both ANIMACY features, because the case marker provides an ANIMATE feature (unless the GROUP feature is used). As a result, the non-human pronoun *atu* has two locative forms (as noted by, e.g., Asher & Annamalai 2002: 230–231): an *-iṭam* form for animals and an *-il* form for inanimates. An example of a locative pronoun referring to an animal is provided in (51):

(51)	Oru	puli	vant-atu.	Kumaar	appaav-ai	atan-**iṭam**-iruntu	kaappaar̲r̲in-aan̲.
	A	tiger	approach.PST-3SG¬HUM.	Kumar	father-ACC	it-LOC-ABL	protect.PST-3SG.M

'A tiger approached. Kumar protected father from it.'

The entries in (47)–(50) are functional categories, and they each contain exactly one feature from the ANIMACY feature complex. The entries in (47)–(49) include the HUMAN feature, and the entries in (50) include the ANIMATE feature.[9] These functional categories can be contrasted with nouns, which are lexical categories. The lexical entries for nouns include both features of the ANIMACY feature complex. This is because all nouns can, for example, trigger agreement, which reflects a HUMAN specification, and they can also take locative case, which reflects an ANIMATE specification. Example lexical entries of nouns are are given in (52):

[9] A reviewer points out that the lack of ANIMATE features in pronouns means that the locative case marker *-il* with a [ANIMATE −] specification should in principle be able to combine with a [HUMAN +] pronoun, creating an absurd complex ANIMACY feature. While this is technically true, it is also independently the case that pronouns need to find a compatible nominal antecedent for their reference, and no nouns are specified as [HUMAN +, ANIMATE −]. Constraints governing pronominal reference and pronoun resolution would therefore presumably independently rule out a pronoun with those ANIMACY features. Linguistically, there does not seem to be a reason to add ANIMATE features to the pronouns. However, it might seem more tidy formally to add an [ANIMATE +] feature to all human pronouns. As far as we can tell, this would not have any consequences for our analysis.

(52) Nouns:

maaṇavi:
$(\uparrow \text{PRED}) = \text{'student'}$
$(\uparrow \text{ANIMACY HUMAN}) = +$
$(\uparrow \text{ANIMACY ANIMATE}) = +$
$(\uparrow \text{GENDER}) = \text{FEM}$
$(\uparrow \text{PERSON}) = 3$
$(\uparrow \text{NUMBER}) = \text{SG}$

maaṇavargal:
$(\uparrow \text{PRED}) = \text{'student'}$
$(\uparrow \text{ANIMACY HUMAN}) = +$
$(\uparrow \text{ANIMACY ANIMATE}) = +$
$(\uparrow \text{PERSON}) = 3$
$(\uparrow \text{NUMBER}) = \text{PL}$

naay:
$(\uparrow \text{PRED}) = \text{'dog'}$
$(\uparrow \text{ANIMACY HUMAN}) = -$
$(\uparrow \text{ANIMACY ANIMATE}) = +$
$(\uparrow \text{PERSON}) = 3$

katavu:
$(\uparrow \text{PRED}) = \text{'door'}$
$(\uparrow \text{ANIMACY HUMAN}) = -$
$(\uparrow \text{ANIMACY ANIMATE}) = -$
$(\uparrow \text{PERSON}) = 3$

The lexical entry for *naay* 'dog' and *katavu* 'door' are not specified for number. This is because the morphologically unmarked versions of non-human nouns are compatible with singular or plural interpretations (Section 2.1.2). If the plural morpheme *-kal* is added, the noun is interpreted as plural.

We assume that in language *production*, nouns get assigned animacy features online based on whether they are conceptualized as belonging to the category of humans (and gods), animals, or things (including plants). This approach naturally accounts for mismatches between biological categories and grammatical animacy categories in cases of personification and 'de-personification' (insults). If an animal or thing is conceptualized as a human (that is, personified), then it will be flagged as a human grammatically.

In language *comprehension*, the agreement morphology, case marking, and pronouns often indicate the animacy of nouns. In some cases, the morphology does not indicate the animacy. For example, when a direct object bears accusative case, the morphology does not directly determine its animacy. In such cases, we assume that the animacy may remain underspecified, or else filled in according to the listener's extralinguistic knowledge or assumptions.

A more conventional analysis would posit default animacy specifications on all nouns. We believe that such an analysis would yield the same results, and it would also be more standard. The defaults would then be overridden for personification, etc. Regardless of whether the analysis adopts online or default specifications, inherent animacy features must be specified for some lexical entries; for example, *kuẓantai* 'baby'.

The compatibility of the word *kuẓantai* with non-human morphology is due to lexical specifications, but only when the gender is not known. We propose the lexical entry in (53). The last two lines in the lexical entry ensure that *kuẓantai* is grammatically [HUMAN $+$] when the entry has a gender feature and otherwise [HUMAN $-$]. When *kuzantai* is [HUMAN $+$], it is compatible with MASCULINE or FEMININE gender; the specific gender is left unspecified in (53), but could be specified with a further disjunctive equation.

(53) *kuẓantai:*
($\uparrow$ PRED) = ‘baby’
($\uparrow$ PERSON) = 3
($\uparrow$ ANIMACY ANIMATE) = $+$
($\uparrow$ NUMBER) = SG
$\{$ [($\uparrow$ GENDER) $\wedge$ ($\uparrow$ ANIMACY HUMAN) = $+$] $\vee$
($\uparrow$ ANIMACY HUMAN) = $-$ $\}$

The grammatical facts follow as expected: Since *kuzantai* can be [HUMAN $-$], the accusative case marker is optional when *kuzantai* is an object. Regardless of its HUMAN specification, *kuzantai* is [ANIMATE $+$], and thus compatible with the locative *-itam* affix.

4 The animacy hierarchy

Animacy effects are very common in the grammars of the world’s languages. As noted in the introduction, the cross-linguistic animacy distinctions are not uniform: they reflect different cut-off points in the animacy hierarchy. Two common splits are (1) human vs. non-humans and (2) animates (humans and animals) vs. inanimates, but the distinctions can also be more nuanced. For example, “lower” animals (e.g., worms) may be grouped with inanimates (Kittilä et al. 2011: 5).

Why should grammars be sensitive to different cut-off points in the hierarchy? Once a distinction is grammaticalized, there might not be any *why*. A child exposed to a language learns the grammar of that language. But why are there differences in which animacy distinctions are grammaticalized?

One possibility is that *culture* determines how to organize nominals according to animacy. For example, if animals are highly valued in a culture, perhaps they are grouped with humans in the language spoken by the practitioners of the culture. The idea that grammatical animacy is tightly connected to culture has been argued for in the interesting and influential work of Robin Wall Kimmerer on Potawatomi. In Potawatomi and other Algonquian languages, gods, humans, animals and some inanimates form one group (“animates”), and the other group (“inanimates”) includes only inanimates. Kimmerer (2013: 64) describes the division as follows:

> “To whom does our language extend the grammar of animacy? Naturally, plants and animals are animate, but as I learn, I am discovering that the Potawatomi understanding of what it means to be animate diverges from the list of attributes of living beings we all learned in Biology 101. In Potawatomi 101, rocks are animate, as are mountains and water and fire and places. Beings that are imbued with spirit, our sacred medicines, our songs, drums, and even stories, are all animate. The list of the inanimate seems to be smaller, filled with objects that are made by people.”

Kimmerer (2013, 2017) argues that the animacy marking reveals something deep about Potawatomi culture, and indeed indigenous cultures more generally. She offers the following interpretation (Kimmerer 2013: 63):[10]

> "So it is that in Potawatomi and most other indigenous languages, we use the same words to address the living world as we use for our family. Because they are our family."

It is possible (perhaps likely) that there are some connections between culture and grammatical animacy marking, and these connections can be interesting in individual cases. However, the exact nature of the connections between culture and grammatical animacy are is unclear, and it seems that they are indirect and imprecise.

Work by Dahlstrom (1995), Goddard (2002), Lockwood (2017: ch. 3.2), and others, shows convincingly that there is no *direct* link between culture and grammatical animacy in Algonquian. In Potawatomi and other Algonquian languages, some inanimates pattern with animates and others do not. The pattern is not predictable based on cultural significance. For example, the fact that *mkedémen* 'blackberry' is animate and *min* 'blueberry' is inanimate in Potawatomi is not culturally determined. Lockwood (2017: p. 47) further notes: "I have seen no compelling evidence to suggest that power or cultural significance explains why 'blood' (*[mskwe]*) is inanimate but 'snot' (*[skigem]*) is animate."[11]

Furthermore, the Algonquian languages are not uniform in how they divide their inanimate vocabulary. For example, the word for tobacco is animate in some Algonquian languages but inanimate in others (Goddard 2002). These differences between languages are not obviously predictable based on cultural differences.

The evidence from Algonquian thus does not indicate that animacy marking is directly predictable from the culture within which the language is spoken. However, it is possible to interpret Kimmerer's claims more generally: perhaps the crucial point is that some languages have inclusive animacy marking and others do not, and this reflects whether the culture is inclusive more generally. Kimmerer continues her line of argumentation by noting the following (Kimmerer 2013: 64):

> "English does not give us many tools for incorporating respect for animacy. In English, you are either a human or a thing. Our grammar boxes us in by the choice of reducing a nonhuman being to an *it*, or it must be gendered, inappropriately, as a *he* or a *she*."

Kimmerer further ponders whether perhaps the world might be a better place if more languages adopted a grammatical system such as that of Potawatami (Kimmerer 2013: 65):

> "Maybe a grammar of animacy could lead us to whole new ways of living in the world, other species a sovereign people, a world with a democracy of species, not a tyranny of one – with moral responsibility to water and wolves, and with a legal system that recognizes the standing of other species. It's all in the pronouns."

[10]We have chosen to include multiple direct quotes by Kimmerer because we find them thought-provoking, and also because we do not want to risk accidentally mischaracterizing her position.

[11]In the Lockwood quote, we replace example numbers by the Potawatomi words in those examples.

This quote further illustrates Kimmerer's position that linguistic animacy can have a direct influence on culture.

Kimmerer is right that English does not make use of grammatical animacy as much as some other languages, and the distinction in third person singular pronouns (*she/he* vs. *it*) roughly separates humans from animals and things. However, the English third person plural pronoun *they* does not differentiate between people, animals and things. Furthermore, many other big European languages (e.g., the Romance languages) use the same third person singular pronouns to refer to people, animals and things (e.g., *elle/il* in French).

It is not difficult to find further facts about grammatical animacy that do not seem to be directly governed by cultural factors. Recall, for instance, the generalizations about differential object marking in Romanian and Spanish, briefly described in Section 3 above. In Romanian, only objects referring to *humans* are case marked, whereas in Spanish, objects referring to *humans and animals* are case marked. We have not come across any suggestion in the literature that the different cut-off points in the animacy hierarchy for case-marking in the two languages would be culturally motivated.

Let us now return to the topic of this paper: animacy in Tamil. Since Tamil exhibits two different splits in the animacy hierarchy, a direct appeal to a cultural explanation is not likely. On the contrary, the fact that the Tamil grammar reflects both a human vs. non-human distinction and an animate vs. inanimate distinction can be taken as an argument *against* a hypothesis holding that grammatical animacy is directly connected to culture.

We conclude that cultural considerations are not likely to offer a satisfactory explanation (or at least not a complete explanation) for why we find different cut-off points in the animacy hierarchy across languages and phenomena. Instead we suggest that this diversity reflects the multifaceted nature of animacy: What we call *animacy* is not a uniform property, but rather it is a conglomerate of properties.

What exactly is animacy? In biology, the basic meaning of animate is 'alive'. However, it turns out not to be all that easy to determine exactly what it means to be alive, even for biologists. The definition of 'life' is a point of debate within and across the fields of biology, chemistry and philosophy (e.g., Nurse 2020; Gómez Marqéz 2021; Fantini et al. 2024). Moreover, 'being alive' does not suffice for explaining linguistic animacy, as pointed out by Kittilä et al. (2011: §4), Yamamoto (1999: ch 1); and others. Plants, for example, are living organisms, but plants are nevertheless typically grouped with inanimate objects rather than with animals in grammars.

Studies in neuroscience and psychology show that humans are sensitive to multiple factors that (imperfectly) correlate with animacy: the capacity for sentience, reason, emotion, language, and self-propelled motion; having a face; the ability to deliberately perform actions, and so on (Carey 2009; Hofrichter et al. 2021; Jozwik et al. 2022; a.o.). Even young children are sensitive to animacy properties such as self-propelled motion and having a face (Opfer & Gelman 2010, a.o.). Agency, or the ability to perform actions, seems to be especially significant for grammatical animacy (see, e.g., Silverstein 1976), although other aspects of animacy, such as the capacity for emotions, are recognized to play a role as well (Yamamoto 1999; Becker 2014).[12]

[12]Matters are complicated by the fact that humans do not (psychologically or linguistically) classify entities according to whether they actually have agency or a face or the capacity for reason, emotion,

We hypothesize that differing cut-off points in the animacy hierarchy can at least in part be explained by the fact that different aspects of animacy have been grammaticalized. For example, if ‘having language’ is the crucial factor, then the distinguishing line is drawn between humans and non-humans. If ‘being sentient’ is relevant, then perhaps humans and animals are grouped together, distinct from inanimates. Once the feature is grammaticalized, new learners will not know what factor was originally decisive, and the distinction may be reinterpreted as a difference between, for example, humans and others.

Our explanation for why the Tamil grammar shows evidence of two different cut-off points would then be that the phenomena originally reflected different aspects of animacy. An investigation of the history of the relevant morphology in Tamil is beyond the scope of this paper, but we offer some speculative remarks that are intended to serve as an illustration of how the multifaceted nature of animacy might lead to different animacy cut-off points.

Recall that a distinction between human and non-human is evident in Tamil pronouns, agreement, plurals, and accusative case. This reflection of animacy may have originally been tied to ‘the capacity to reason’, as indicated by the reference to *rationality* in the Tamil grammatical tradition. An anonymous reviewer expresses the intuition that the human vs. non-human distinction in Tamil is influenced by “social deixis, honorificity, and contextual conceptualization”.

The locative system in Tamil includes two forms: *-il* for inanimates and *-iṭam* for animates. One possible explanation for this animacy distinction is that the two forms were originally tied to different meanings: *-il* for physical location and *-iṭam* for some other relation, perhaps one having to do close vicinity or connection. Objects can certainly be placed on humans and animals, so it is possible for animates to be locations. However, inanimates make for more natural locations, and inanimates would be more commonly referred to as locations. The *-il* ending could therefore be grammaticalized as restricted to inanimates. This leaves animates with no locative case. The original meaning of *-itam* is extended as a generic locative, but restricted to animates only, as *-il* is availble for inanimates.

The particular scenarios we outline for the emergence of the two animacy splits in Tamil are nothing but speculative suggestions. These speculations are intended to illustrate our more general point, which is that a focus on different animacy-related properties may explain differences in cut-off points along the animacy hierarchy.

5 Concluding remarks

Animacy is reflected in multiple grammatical phenomena in Tamil. This paper has aimed to describe those grammatical animacy effects and to capture the effects formally in LFG. The analysis involved spelling out the relevant syntactic features of nouns and also the features of the functional morphemes that reflect animacy in Tamil: pronouns, verbal agreement morphemes, accusative and locative case. The lexical features adopted

sentience, etc. What is instead relevant is whether humans conceptualize entities as having these capacities or perceive them as having a face, instigating movement and actions, etc. See Toivonen (Forthcoming) for references and discussion.

in the analysis are almost exclusively drawn from an inventory of features that are standardly used in LFG for analyzing the syntax of a wide range of languages. However, the adoption of a complex feature structure as the value of the feature ANIMACY is an unusual choice, although not without precedent (Dalrymple et al. 2009).

The Tamil data show that two different animacy splits can occur within the same language: several phenomena are sensitive to the human vs. non-human distinction, and locative case marking is sensitive to the animate vs. inanimate distinction. Although we have not come across previous literature that directly addresses this point, we find it unlikely that multiple animacy splits in the same language is unique to Tamil. Cross-linguistically, it is clear that different cut-off points in the animacy hierarchy occur, even when comparing the same phenomenon in closely related languages. This is illustrated by the differential object marking systems in Spanish and Romanian. Section 4 discussed possible explanations for *why* there are differences in animacy splits. We suggested that the multifaceted nature of animacy is relevant: differences in animacy splits might originally reflect distinct aspects of animacy.

References

Asher, Ronald E. & E. Annamalai. 2002. *Colloquial Tamil: the complete course for beginners*. Routledge. https://doi.org/10.4324/9781315649696.

Barbu, Roxana-Maria & Ida Toivonen. 2018. Romanian object clitics: grammaticalization, agreement and lexical splits. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'18 Conference*, 67–87. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2018/lfg2018-barbu-toivonen.pdf.

Bayanati, Shiva & Ida Toivonen. 2019. Humans, animals, things and animacy. *Open Linguistics* 5. 156–170. https://doi.org/10.1515/opli-2019-0010.

Becker, Misha. 2014. *The acquisition of syntactic structure: animacy and thematic alignment*. Oxford: Clarendon Press. https://doi.org/10.1017/CBO9781139022033.

Bresnan, Joan & Sam Mchombo. 1987. Topic, pronoun, and agreement in Chicheŵa. *Language* 63(4). 741–782. https://doi.org/10.2307/415717.

Butt, Miriam. 2025. Lexical semantics vs. Dependent Case: Urdu/Hindi datives. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'25 Conference*, University of Konstanz: PubliKon.

Camilleri, Maris & Louisa Sadler. 2012. On the analysis of non-selected datives in Maltese. In Butt & King (eds.), *Proceedings of the LFG'12 Conference*, 118–138. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2012/papers/lfg12camillerisadler.pdf.

Carey, Susan. 2009. *The origin of concepts*. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195367638.001.0001.

Chiriacescu, Sofiana & Klaus von Heusinger. 2009. Pe-marking and referential persistence in Romanian. In Arndt Riester & Edgar Onea (eds.), *Focus at the syntax-semantics interface. Working Papers of the SFB 732*, vol. 3, 1–17. University of Stuttgart. http://dx.doi.org/10.18419/opus-5710.

Dahlstrom, Amy. 1995. Motivation vs. predictability in Algonquian gender. In David H. Pentland (ed.), *Papers of the 26th Algonquian Conference*, 195–231. University of Manitoba.

Dalrymple, Mary, Tracy Holloway King & Louisa Sadler. 2009. Indeterminacy by underspecification. *Journal of Linguistics* 45. 31–68. https://www.jstor.org/stable/40343771.

Driemel, Imke. 2023. *Pseudo-noun incorporation and differential object marking*. Oxford University Press. https://doi.org/10.1093/oso/9780192866400.001.0001.

Fábregas, Antonio. 2013. Differential object marking in Spanish: state of the art. *Borealis: An International Journal of Hispanic Linguistics* 2(2). 1–80. http://dx.doi.org/10.7557/1.2.2.2603.

Fantini, Jacques, Mélanie Matveeva, Marine Lefebvre & Henri Chahinian. 2024. What is life? Rethinking biology in light of fundamental parameters. *Life* 14(3). https://doi.org/10.3390/life14030280.

Goddard, Ives. 2002. Grammatical gender in Algonquian. In H. C. Wolfart (ed.), *Papers of the 33rd Algonquian Conference*, 195–231. Ottawa: University of Manitoba.

Gómez Marqéz, Jaime. 2021. What is life? *Molecular Biology Reports* 48(8). 6223–6230. https://doi.org/10.1007/s11033-021-06594-5.

Hofrichter, Ruth, Hasan Siddiqui, Marcus N. Morrisey & M. D. Rutherford. 2021. Early attention to animacy: change-detection in 11-month-olds. *Evolutionary Psychology* 19(2). https://doi.org/10.1177/14747049211028220.

Jones, Stephen. 2015. Number in Meryam Mir. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'15 Conference*, 103–123. Stanford: CSLI. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2015/papers/lfg15jones.pdf.

Jozwik, Kamila M., Elias Najarro, Jasper J. F. van den Bosch, Ian Charest, Radoslaw M. Cichy & Nikolaus Kriegeskorte. 2022. Disentangling five dimensions of animacy in human brain and behaviour. *Communications Biology* 5. 1247. https://doi.org/10.1038/s42003-022-04194-y.

Kabatek, Johannes, Philipp Obrist & Albert Wall (eds.). 2021. *Differential object marking in Romance: the third wave*. Berlin: De Gruyter. https://doi.org/10.1515/9783110716207.

Kifle, Nazareth Amlesom. 2007. Differential object marking and topicality in Tigrinya. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'07*

Conference, 5–25. Stanford: CSLI. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2007/papers/lfg07amlesom.pdf.

Kimmerer, Robin. 2013. *Braiding sweetgrass: indigenous wisdom, scientific knowledge and the teachings of plants*. Milkweed Editions. https://milkweed.org/book/braiding-sweetgrass.

Kimmerer, Robin Wall. 2017. Learning the grammar of animacy. *Anthropology of Consciousness* 28(2). 128–134. https://doi.org/10.1111/anoc.12081.

Kittilä, Seppo, Katja Västi & Jussi Ylikoski. 2011. Introduction to case animacy and semantic roles. In Seppo Kittilä, Katja Västi & Jussi Ylikoski (eds.), *Case, animacy and semantic roles*, 1–26. Amsterdam: John Benjamins. https://doi.org/10.1075/tsl.99.01kit.

Krause, Elif & Klaus von Heusinger. 2019. Gradient effects of animacy on differential object marking in Turkish. *Open Linguistics* 5(1). 171–190. https://doi.org/10.1515/opli-2019-0011.

Lam, Chit Fung. 2021. A constraint-based approach to anaphoric and logophoric binding in Mandarin Chinese and Cantonese. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'21 Conference*, 202–222. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2021/lfg2021-lam.pdf.

Lehmann, Thomas. 1989. *A grammar of modern Tamil*. Pondicherry Institute of Linguistics and Culture.

Lockwood, Hunter Thompson. 2017. *How the Potawatomi language lives: a grammar of Potawatomi*. Ph.D. thesis, University of Wisconsin, Madison. https://digital.library.wisc.edu/1711.dl/A5BAB4H4GQCAD8F.

Lockwood, Michael. 2007. *Basic Tamil verb tables*. Madras: Tambaram Research Associates.

Lødrup, Helge. 2022. The grammatical realization of the long passive in Norwegian. In Miriam Butt, Jamie Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 Conference*, 222–244. https://lfg-proceedings.org/lfg/index.php/main/article/view/2/9.

Morimoto, Yukiko. 2002. Prominence mismatches and differential object marking in Bantu. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'02 Conference*, 292–314. Stanford: CSLI. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2002/pdfs/lfg02morimoto-num.pdf.

Nurse, Paul. 2020. *What is life? Understanding biology in five steps*. Penguin and David Fickling Books.

Opfer, John E. & Susan A. Gelman. 2010. Development of the animate–inanimate distinction. In Usha Goswami (ed.), *The Wiley-Blackwell handbook of childhood cognitive development* (2nd edn.), Wiley-Blackwell. https://doi.org/10.1002/9781444325485.ch8.

Ramasubramoney, Anusha. 2019. Number and honorificity in spoken Tamil. Unpublished manuscript, Mumbai University.

Santazilia, Ekaitz. 2023. *Animacy and inflectional morphology across languages*. Brill.

Sarveswaran, Kengatharaiyer. 2024. Morphology and syntax of the Tamil language https://doi.org/10.48550/arXiv.2401.08367. Preprint arXiv:2401.08367.

Schiffman, Harold F. 1999. *A reference grammar of spoken Tamil*. Cambridge University Press.

Schiffman, Harold F. 2004. The Tamil case system. In Jean-Luc Chevillard & Eva Wilden (eds.), *South-Indian horizons*, 295–305. Institut Français de Pondichéry. https://doi.org/10.4000/books.ifp.7736.

Silverstein, Michael. 1976. Hierarchy of features and ergativity. In Richard Dixon (ed.), *Grammatical categories in Australian languages*, 112–172. Canberra: Australian Institute of Aboriginal Studies.

Toivonen, Ida. 2023. Pronoun incorporation. In Mary Dalrymple (ed.), *The handbook of Lexical Functional Grammar*, 563–601. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185960.

Toivonen, Ida. Forthcoming. The tripartite distinction between grammar, cognition and the world. Draft.

Trompenaars, Thijs, Teresa Angelina Kaluge, Rezvan Sarabi & Peter de Swart. 2021. Cognitive animacy and its relation to linguistic animacy: evidence from Japanese and Persian. *Language Sciences* 86. 1–17. https://doi.org/10.1016/j.langsci.2021.101399.

Yamamoto, Mutsumi. 1999. *Animacy and reference: a cognitive approach to corpus linguistics*. Amsterdam/Philadelphia: John Benjamins. https://doi.org/10.1075/slcs.46.

The Bartangi clause: Configurationality, affixes and clitics

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Abstract

In this paper, I provide an analysis of the clause structure of Bartangi, an Eastern Iranian language spoken in the Pamirs, which has a configurational clause structure and varying positions of agreement markers (second-position clitics and affixes) depending on tense. I show how an LrFG account can generalize the apparent variability from a regular, largely invariable c-structure. I also propose a modification to the mechanism of spanning in LrFG to account for irregular forms instantiating nonadjacent nodes.

1 Introduction

The typology of clause structure and configurationality is one of the central topics discussed in the LFG literature (see Snijders 2015) due to the framework's analytic versatility in the choice of clausal projections and structural positions for grammatical and discourse functions.[†] In this paper, I provide a detailed analysis of the simple clause structure of Bartangi, an Iranian Pamir language. The paper aims to be both an empirical contribution to the typology of configurationality in LFG and an attempt at providing a novel, non-lexicalist take on the traditional LFG notion of morphology competing with syntax (see i.a. Austin & Bresnan 1996, Bresnan 1998), by using LrFG (Asudeh & Siddiqi 2022) as a model of the morphology-syntax interface. Instead of a strict separation between morphology and syntax as distinct levels of representation, LrFG allows defining the same c-structure node as having either "syntactic" (clitics or independent words) or "morphological" (affixal) exponents depending on its environment. I argue that Bartangi combines a configurational core with a clause-initial topic position. A crucial feature of Bartangi is tense-dependent expression of agreement: by verbal affixes in the present and by second-position clitics in the past and perfect. In this analysis, I propose that both types of markers are associated with an Agr node that immediately follows the clause-initial topic; the difference between two modes of expression is reduced to the distinction between the vocabulary items (VIs) instantiating this node. This directly captures the complementary distribution between two marker types. I also discuss the syntax of suppletive and "zero-stem" forms and how it can be captured in LrFG in nonlocal structural configurations.

The paper has the following structure. In section 2, I provide general information on the Bartangi language. In section 3, I describe the clause syntax of Bartangi from a descriptive perspective. Finally, in section 4, I propose an LrFG analyis of Bartangi clause structure and agreement.

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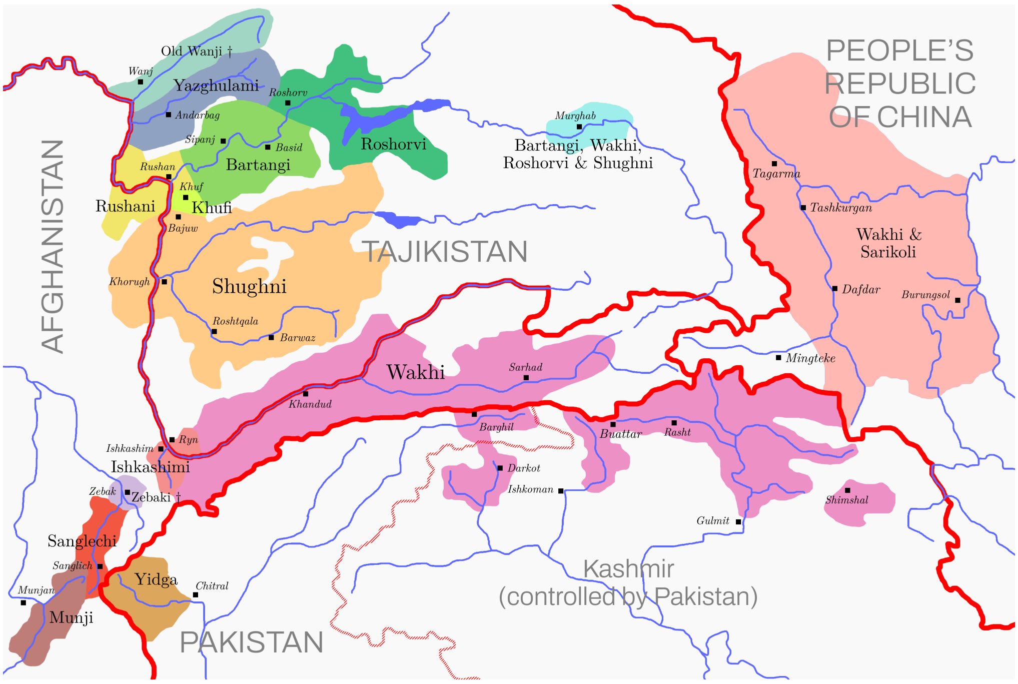

Figure 1: The Pamir languages, map © Yuri Koryakov and Maksim Melenchenko

2 General information on Bartangi

Bartangi is an Eastern Iranian language belonging to the Shughni-Rushani group, spoken in the valley of the river Bartang in the Gorno-Badakhshan Autonomous Oblast (GBAO) of Tajikistan by a few thousand speakers. Bartangi belongs to the so-called Pamir languages, an areal (Wendtland 2009) group of Iranian varieties spoken in the GBAO and in the neighbouring Afghan province of Badakhshan, and as such is characterized by many features common to this linguistic area, including SOV word order, three degrees of deixis, a two-case system on pronouns, a binary semantic gender distinction, optionality of number marking on nouns, a complex system of verbal stems, and preverbal subordinators. The area where Bartangi is spoken can be seen in the map in Figure 1.

There has been little work on Bartangi since the 1970s; two major sources on the languages are the text collection and dictionary by Sokolova (1960) and the grammar by Karamxudoev (1973). In this paper, I mostly rely on data collected during my own fieldwork in 2023–2025 in Basid, GBAO. I am grateful to all native speakers I have worked with during these field trips, in particular, to Fayzmamad Nazariyev, Anoyatsho Soibnazarov, Jonali Pirmamadov, Pulod Kuchakshoev, Kuchaksho Soibnazarov, Asad Niyozov, Khushqadam Bogbonov and Sabzpari Makhramova. Needless to say, all errors are mine.

3 Clause syntax

3.1 Basic word order

Like other Iranian languages, Bartangi has basic SOV word order, as illustrated by the following examples:

(1) *pulod rūpc wīnt*
P. fox see.PST
'Pulod saw a fox.'

(2) *āz =um az wī ɣāc wīnt*
I.NOM=1SG OBJ D3.M.OBL boy see.PST
'I saw the boy.'

However, the order is not strictly SOV and is in fact freer than described for closely related languages such as Shughni and Roshani. Sokolova (1960: 7) connected this relative freedom with the fact that Bartangi extensively uses differential object marking by means of the preposition *az*; and indeed, *az*-marked arguments seem more likely to be located in a noncanonical position (3). However, unmarked objects can also be displaced, especially postverbally (4).

(3) *az portugāliya grūziya ayod*
OBJ P. G. carry.PST
'Georgia defeated Portugal.'

(4) *pulod wīnt rūpc*
P. see.PST fox
'Pulod saw a fox.'

But Bartangi cannot be characterized as a "free word order" language, because SOV is strongly preferred in all contexts, regardless of information-structure properties and other factors that may influence word order. This sets Bartangi apart from so-called discourse configurational languages, such as Ossetic (Belyaev 2022) or Hungarian (Payne & Chisarik 2000, Laczkó 2014), which have highly grammaticalized topic and focus positions. This is illustrated by (5)–(6), which differ in whether the subject is the topic and the object the focus (5) or vice versa (6), but which maintain the same word order; that is, the order of constituents is based on their grammtical function rather than their discourse function.

(5) *pulod az čī wīnt? — yā az asad wīnt*
P. OBJ who see.PST D3.SG.NOM OBJ A. see.PST
'Who did Pulod see? — He saw Asad.'

(6) *čī az asad wīnt? — pulod az asad wīnt*
who OBJ A. see.PST P. OBJ A. see.PST
'Who saw Asad? — Pulod saw Asad.'

3.2 NP structure

3.2.1 Case marking

Like many Iranian languages, Bartangi has a two-case system that contrasts nominative (used for subjects)[1] with oblique (used in all other positions). Overt case marking only appears on personal and demonstrative pronouns, as seen in the following examples:

(7) ***āz*** *=um* *az* ***tā*** *wīn-t*
I.NOM=1SG OBJ thou.OBL see-PST
'I saw you.'

(8) ***yā*** *ɣaδā* *az* ***um*** *ɣāc* *wīn-t*
D3.SG.NOM boy OBJ D3.F.OBL girl see-PST
'The boy saw the girl.'

In (8), we can see that case distinctions in demonstratives are also observed when these demonstratives occur as modifiers with nouns (independent and adnominal forms of demonstratives are identical). In Bartangi and other Pamir languages, adnominal demonstratives are used as definite articles (Edelman 1990: 174); more specifically, as anaphoric articles, as described for Shughni in Parker (2023: 142). Hence, while case distinctions are only retained in a limited morphological class of elements, NPs in naturally occurring texts quite often have case distinctions due to the presence of adnominal demonstratives.

3.2.2 Differential object marking

Differential object marking (DOM) in Bartangi seems to be based on NP structure rather than semantics. It is more grammaticalized than in other Pamir languages, except Roshorvi and Sarikoli. The following NP types are obligatorily marked by the object-marking preposition *az*:[2]

- human proper nouns (5), and optionally, nonhuman proper nouns, as in (3);
- pronouns (7);
- DPs with demonstrative determiners (8).

Other NPs are generally left unmarked, regardless of their semantics. This is especially well-illustrated by the behaviour of possessive NPs, which, although clearly semantically definite in the sense of identifying a unique referent, are not marked by *az* if they have no determiner. This can be seen in (9), where the possessor is the unmarked proper noun *ǰonalī* 'Jonali', and in (10), where the adnominal demonstrative *um* is interpreted as the possessor due to mismatching gender; in the general case, demonstrative determiners in oblique case and possessor are homonymous, such that *um mod* (D3.F.OBL mother) can

[1] Historically, Bartangi used to mark past-tense transitive subjects by the oblique case, in a split ergative pattern. This system has all but disappeared in the modern language and is partly preserved only by some of the older speakers (Sergienko 2025).

[2] The object-marking preposition is formally identical to the preposition *az* 'from'; I gloss the former as OBJ and the latter as ABL to avoid confusion.

mead both ‘her mother’ and ‘the/that mother’ (obl.), and *um um mod* (d3.f.obl d3.f.obl mother) means ‘that mother of hers’.

(9) *āz =um* (?**az**) ***ǰonalī pid*** *wīnt*
I.nom=1sg obj J. father see.pst
‘I saw Jonali’s father.’

(10) *daδ* ***um*** ***murδā*** *um-ri divīs-t =at…*
then d3.f.obl dead_body d3.f.obl-dat show.prs-3sg =conj
‘Then he shows her its dead body and…’ (Sokolova 1960: 15)

The same applies to other unique but non-anaphoric definites: these trigger neither *az* nor the demonstrative, as seen in (11) for a superlative description.

(11) *anoyatx̌o ar māš maktab* (?***az***) *sarbašānd talabā x̌oyond*
A. loc.down we school obj best student teach.pst
‘Anoyatsho taught the best student at our school.’

3.2.3 NP structure

Based on the facts described above, I propose the structure in Figure 2 for the Bartangi noun phrase and the object marker *az*. Since the latter predominantly occurs on NPs with determiners, or on elements from specific lexical classes which can be viewed as inherently involving a determiner (pronouns, proper nouns), I assume that Bartangi has a DP and *az* is licensed by the object being a DP. The possessor is located within NP because of both its position closer to the head than the determiner and the fact that the presence of a possessor does not by itself license *az*.

The structure in Figure 2 has some properties that are unfamiliar from the perspective of traditional LFG. In LrFG, the terminal nodes of the c-structure tree itself are not morphological words or morphemes but the category nodes (P, D, $\sqrt{\ }$ and n) supplied with their f-descriptions just as words are in standard LFG.[3] These terminal nodes are mapped via the projection function ν to exponents – formalized in LrFG as v-structures (Asudeh, Bögel & Siddiqi 2023) – that are defined by vocabulary items (VIs) such as one in (22) below that couple a v-structure with a pair consisting of a list of c-structure categories and an f-description. As per the Elsewhere Principle, the realization for a given terminal node is the most specific match for this node’s category and f-description. A VI can define a list of c-structure categories; in this case, it instantiates all these categories at once if they are adjacent, similarly to lexical sharing (Wescoat 2002); the resulting

[3] Work in LrFG has been somewhat ambiguous on the status of these terminal nodes and their associated f-descriptions, and on whether these f-descriptions have to be reified in any sense. The current line of thinking (Ash Asudeh, p.c.) is that the category nodes together with their f-descriptions are stored in a “syntactic lexicon” – the so-called syntacticon – that acts as a language-specific repository of *exponenda*, things that can be realized by the morphology. Note that any realizational theory needs such an enumeration of exponenda – for example, a similar role is played by the content paradigm in PFM2 (Stewart & Stump 2007). The nodes stored in the syntacticon are inserted into the c-structure as per standard LFG mechanisms, but the f-description for each syntacticon entry is also interpreted by the function Φ that takes an f-structure and returns the (possibly empty) set of f-structures that it describes. It is against these sets of f-structures that f-descriptions in VIs are compared. A more explicit formalization of this mechanism is to be published in future work.

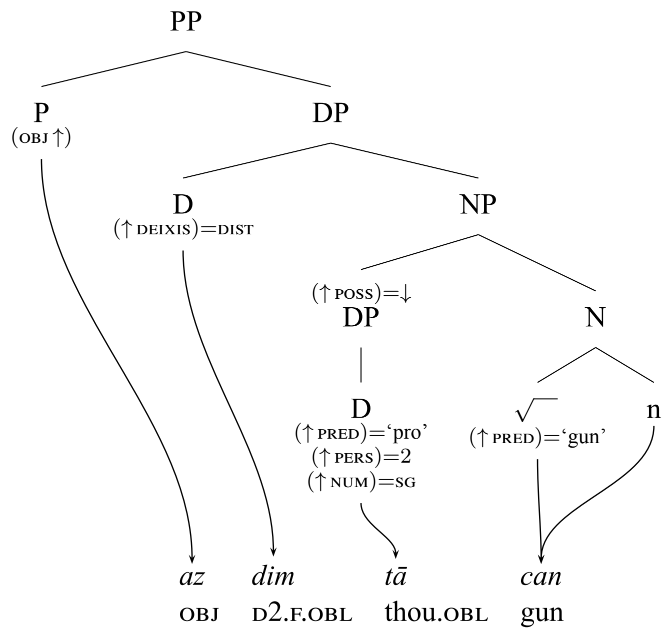

Figure 2: The general structure of Bartangi DPs

realization is called a *lexical span*. Lexical spanning models cumulation and suppletion and, if available, is always preferred to separate realization; an example of a lexical span in Figure 2 is the realization of $\sqrt{}$ and n by *can*.[4] If a node has no suitable realization, so-called *Pac-Man spanning* can link it to an adjacent node that maps to the same c-structure. For a more detailed and explicit discussion of LrFG's formal mechanisms, see Asudeh & Siddiqi (2022).

Bartangi (and Pamir languages in general) is one of the few Iranian languages that has retained a gender system, albeit in a highly modified form. The gender distinction itself is binary (masculine vs. feminine), but only based on sex for higher animals; lower animals and inanimates are assigned to various genders based on complex, poorly understood semantic factors; see Karamšoev (1978). In terms of marking, nouns do not have productive formal gender marking while agreement targets distinguish gender by means of vowel and stem change. Gender is marked on demonstratives, some verb forms and a few adjectives (cf. m. *ʒul* vs. f. *ʒil* ‘small’, although not all speakers use this distinction in the modern language).

Since demonstratives figure prominently in the examples in this paper, I provide the demonstrative paradigm in Table 1. Demonstratives distinguish between three degrees of deixis (proximal, medial and distal), number, case, and gender (in the oblique singular only). I do not use a CASE feature, because for modern Bartangi, a simple inside-out subject/nonsubject distinction is sufficient.

There are other complications in the NP/DP structure and object marking that I will not go into here, as the purpose of this paper is to describe the clause structure of Bar-

[4]Nodes like n are called *categorizers* and are a convention that LrFG inherits from DM that models cross-categorial roots. For the purposes of describing Bartangi, all stems (except perhaps non-verbal components of complex verbs) can be viewed as root + categorizer lexical spans.

Table 1: Demonstrative forms

<table>
<tr><th></th><th colspan="3">D1</th><th colspan="3">D2</th><th colspan="3">D3</th></tr>
<tr><th>CASE</th><th>M</th><th>F</th><th>PL</th><th>M</th><th>F</th><th>PL</th><th>M</th><th>F</th><th>PL</th></tr>
<tr><td>NOM</td><td colspan="2">yim</td><td>māδ</td><td colspan="2">yid</td><td>dāδ</td><td colspan="2">yā</td><td>wāδ</td></tr>
<tr><td>OBL</td><td>mī</td><td>mim</td><td>mif</td><td>dī</td><td>dim</td><td>dif</td><td>wī</td><td>um</td><td>uf</td></tr>
</table>

Table 2: Diagnostic forms of the verbs *sifedow* 'go up', *čegow* 'do' and *wāɣdow* 'shout'

<table>
<tr><th>PRS</th><th>PRS.3SG</th><th>PST.M</th><th>PST.F/PL</th><th>PF.M</th><th>PF.PL</th><th>PF.F</th><th>INF</th></tr>
<tr><td>sifān-</td><td>sifen-t</td><td>sifö-d</td><td>sifā-d</td><td>sifö-ǰ</td><td>sifā-ǰ</td><td>sife-c</td><td>sife-d(-ow)</td></tr>
<tr><td>kin-</td><td>kiх̌t</td><td colspan="2">čū-g</td><td colspan="3">čūǰ</td><td>če-g(-ow)</td></tr>
<tr><td>wāɣ-</td><td colspan="3">wāɣ-d</td><td colspan="3">wāɣ-ǰ</td><td>wāɣ-d(-ow)</td></tr>
</table>

tangi.

3.3 Verb morphology

3.3.1 Stems

Like in all other modern Iranian languages, Bartangi verb inflection is based on a system of stems whose formation involves a number of irregularities. In Bartangi, verbs maximally distinguish between eight different basic forms: the present stem;[5] a special irregular form for 3rd person singular present; the masculine and feminine/plural past-tense forms; the masculine, plural, and feminine perfect forms; and the infinitive. In practice, most verbs do not have all eight forms; in particular, gender distinctions are only found in a subset of intransitive verbs. Minimally, verbs have to distinguish between the present (unmarked), the past+infinitive and the perfect, the latter two of which use distinct suffixes. In Table 2, I show the simplest case (*wāɣdow* 'to shout' with just one stem), the most complex case (*sifedow* 'to go up' with all eight distinct forms) and a more typical "middle ground", *čegow* 'to do'.

This system of gender marking via ablaut is quite unusual and has been the object of several explanation attempts, both synchronic (Muravyeva 1975, Makarov & Plungian 2023, Makarov 2024, Stump & Hippisley 2011) and diachronic (Edelman & Jusufbekov 1999). A concise overview of the historical development of verb stems in Shughni is found in Parker (2023).

While it may be possible to provide a synchronic account of gender agreement by treating vowels as some kind of autosegmental morphemes, the value of such an approach is doubtful, considering that the total number of verbs that have gender agreement of any kind in the dictionary of Sokolova (1960) is only 29 (out of a total of 131). Therefore, I consider treating all stems as listed items to be justified.

[5] I use the term "stem" to designate the part of the verb form which precedes the tense or infinitive suffix: e.g., for the past-tense form *aх̌ovd* 'slept', the stem is *aх̌ov-* while *-d* is the tense suffix. This is different from common usage in the Iranological tradition, where the whole form *aх̌ovd* is commonly treated as a past stem.

However, this does not mean that one cannot capture any regularities involved in Bartangi verb inflection. The past-tense and infinitive always use the same suffix, which is *-d/t* for all verbs, with the exception of five verbs – *če-**g**-ow* 'do', *me-**g**-ow* 'die', *ve-**g**-ow* 'bring', *xe-**g**-ow*, *zide-**g**-ow* 'sweep' – which use *-g*.[6] The perfect suffix is *-č/ǰ*; *-c* is used in the feminine with those verbs that display a gender distinction in the perfect. Further, stems can be organized into two hiearchies: PRS > PST > PRF and PRS > PST > INF, on which each distinct stem must occupy a continuous area. There are other, more complex interactions involving gender (e.g. if there is a distinct feminine perfect form, then there is also a distinct infinitive stem, and these two forms share a vowel), but gender agreement is a separate issue that is beyond the scope of this paper.

3.3.2 Person-number marking

Finite verbs in Bartangi always agree in person and number with the subject. The expression of this agreement differs in the present tense on the one hand, and in the past and perfect, on the other. In the present tense, person and number are expressed by affixes that attach to the verb, regardless of its linear position (12). In the past and perfect forms, second-position clitics are used instead; the clitic typically stands after the first NP or adverb in the clause (13), but, if the verb is clause-initial, it follows the verb (14).

(12) *āz* *az* *pulod* *wīn-**um***
I.NOM OBJ P. see.PRS-1SG
'I see Pulod.'

(13) *āz=**um*** *az* *pulod* *wīnt*
I.NOM=1SG OBJ P. see.PST
'I saw Pulod.'

(14) *wīnt=**um*** *az-ī*
see.PST=1SG OBJ-D3.M.OBL
'See him, I did.'

The affixes and clitics are mutually exclusive within a single clause. Their paradigms have many things in common but are generally distinct, as seen in Tables 3 and 4. In the affix paradigm, the 2nd person singular is unmarked, and the two allomorphs in 3rd person singular are phonologically distributed. In the clitic paradigm, it is the 3rd person singular that is unmarked, while the 3rd person plural has two variants: the general *=an* and the specialized *=af*, which only occurs with transitive verbs (and some unergatives; see Chistyakova 2025) and has an additional restriction: it is only used when the subject is pro-dropped (15). The only exception from this generalization is the combination *uf=af* (16), which combines the oblique form of the 3rd person plural distal demonstrative (a relic of the earlier split ergativity) with *=af*. In all other forms, pro-drop is optional, as seen from the use of *=an* in both sentences in (15).

[6] This historically goes back to the stem-final change **rd → g*; cf. Persian *ka**rd**-an* 'do', *mo**rd**-an* 'die', *bo**rd**-an* 'bring', *xo**rd**-an* 'eat'. However, in Bartangi this is not a synchronic process anymore as it does not occur, for example, in the present tense: *xer-d* 'eats', but not **xeg*.

Table 3: Person-number affixes

	SG	PL
1	*-um*	*-an*
2	∅	*-af*/*-at*
3	*-d*/*-t*	*-an*

Table 4: Person-number clitics

	SG	PL
1	*=um*	*=an*
2	*=at*	*=af*/*=at*
3	∅	*=an*, *=af* (tr.)

(15) a. *wāδ =an / *=af az-ī kud wīnt*
D3.PL.NOM=3PL =3PL.TR OBJ-D3.M.OBL dog(M) see.PST
'They saw the dog.'

b. *az-ī kud =af/ =an wīnt*
OBJ-D3.M.OBL dog(M)=3PL.TR =3PL see.PST
id.

(16) *uf =af az-ī kud wīnt*
D3.PL.OBL=3PL.TR OBJ-D3.M.OBL dog(M) see.PST
'They saw the dog.'

There are no idiosyncrasies or phonological constraints involved in the attachment of clitics to their hosts, with the exception of the optional elision of the initial vowel after the final vowel of the host (*tū=at* ~ *tū=t*) and equally optional *y*-epenthesis (*zarifā=(y)um*). But in the affix paradigm, there are three types of irregularities. First, many verbs have irregular 3rd person singular present forms, such as the verb 'do' shown in Table 2, which has the present stem *kin-* but the 3rd person *kixt*. Second, a few frequently used forms have contracted present forms, e.g. *sām* 'I go', *sām* 'we go' for *sāw-um*, *sāw-an*. Third, while the imperative and the 2nd person present are generally not distinguished in Bartangi, some verbs drop the final consonant in the imperative (with compensatory lengthening) but not in the present: *sāw* 'thou goest', *să̄* 'go'; *pataw* 'thou throwest', *patā* 'throw' (Karamxudoev 1973: 175).

3.4 The second-position constraint

Cross-linguistically, second-position clitics can be licensed prosodically, syntactically, or via a mixed approach. In Bartangi, purely syntactic licensing seems to be sufficient. The pre-clitic material always forms a single constituent; in particular, NPs cannot be split by clitics, as seen in (17), where angle brackets indicate two potential positions for the clitics, only one of which is grammatical.[7]

(17) *pulod <* =um> čöd < =um> wīnt*
P. =1SG house =1SG see.PST
'I saw Pulod's house.'

[7] An exception is when the possessor is marked by the special case/adposition *-ā* and – in most instances – doubled by a possessive pronoun, such as *pulod-ā* ***=yum*** *wī čöd wīnt* (P.-POSS =1SG D3.M.OBL house see.PST) 'I saw Pulod's house', lit. 'to Pulod his house I saw'. But the possessor in such constructions seems to be external, attaching at clause level; cf. Serdobolskaya & Belyaev (2022) for the analysis of a similar construction in Ossetic.

Furthermore, the pre-clitic constituent has a special information-structure status. As seen in (5)–(6) above, the subject can occupy the initial position regardless of its information-structure status.[8] But when another argument occupies this position, it must be topical: in (18), the answer is illicit because Asad is treated as topical, but would have been felicitous if the question was ‘Who saw Asad?’.

(18) *tū=t az čī wīnt? — #az asad=um āz wīnt*
thou.NOM=2SG OBJ who see.PST OBJ A.=1SG I.NOM see.PST
‘Whom did you see? — # I saw Asad.’

The initial position is especially common for topical, stage-setting adverbs. As seen in (19), in this case the rest of the arguments follow in their standard configurational order. In terms of clause structure, this seems to suggest an initial topical position marked by the clitic followed by the configurational core of the clause.

(19) *biyor =um āz x̌ac birozd*
yesterday=1SG I.NOM water drink.PST
‘Yesterday I drank water.’

4 Analysis

The overall structure I propose for the Bartangi clause is displayed in Figure 3, which illustrates (19). I postulate that the Bartangi clause has three layers: AgrP, TP and VP. I will now provide a motivation and description for each of these levels in turn.

4.1 AgrP: The finite clause

AgrP is the layer where the person-number markers are introduced. As we saw above, the pre-clitic position must be occupied either by the subject or by a topic constituent.[9] This is reflected in the phrase structure rule in (20). I assume a flat structure for AgrP because I see no good evidence for treating the clitic as forming a constituent with the following TP.

(20)
$$\text{AgrP} \rightarrow \underset{\left\{ \begin{array}{c} (\uparrow \text{GF}) = \downarrow \\ (\uparrow_\sigma \text{DF}) = \text{TOPIC} \end{array} \middle| \; (\uparrow \text{SUBJ}) = \downarrow \right\}}{\text{XP}} \quad \text{Agr} \quad \underset{\uparrow=\downarrow}{\text{TP}}$$

Both the initial XP and Agr are obligatory. The Agr is a terminal, and is thus provided with no f-description in the rule; the f-description is inserted from the syntacticon, which provides all combinations of person-number features of the subject, plus an optional PRED. Agr is realized by a clitic or an affix depending on the conditions for the corresponding vocabulary items (VIs). For this reason, the affix/clitic properties of the marker can be associated with its VI directly, as described in detail in section 4.4 below.

[8] An anonymous reviewer suggests that subjects appear in this position more often than other constituents because they are default topics. However, this is contradicted by examples like (6), where the subject is clearly in focus.

[9] This analysis does not currently handle verb fronting: if V is allowed to appear in the initial position, the tense affix will be unable to find a valid host. It is possible that verb-initial clauses should be given a prosodic treatment; more research on this topic is needed.

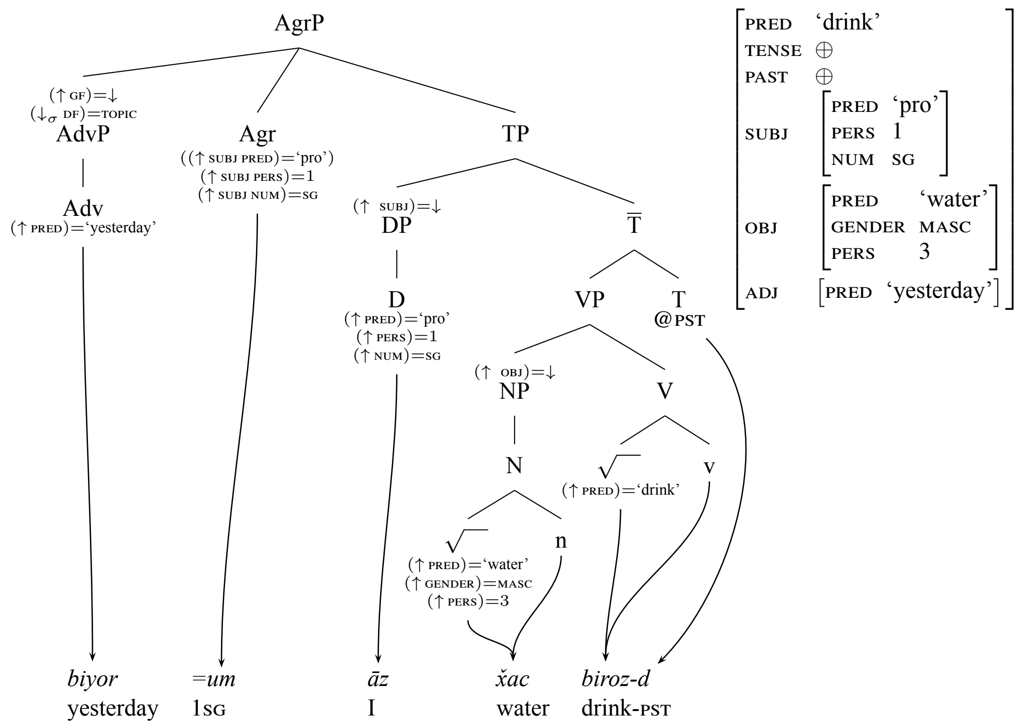

Figure 3: Clause structure with clitic person-number marker

4.2 TP: The clausal core

TP is headed by the T that is instantiated by the tense suffixes on the verb and includes the subject. The reason for positioning T relatively high in the tree and placing the subject in SpecTP rather than VP is the behaviour of infinitival clauses. So-called "infinitives" in Bartangi are rather nominalizations, mixed categories that combine internal verbal and external nominal syntax. The direct object in Bartangi infinitives can be expressed in the same way as in independent sentences (21) or by a possessive phrase, while the subject can only be expressed by a possessor, which is seen from the ungrammaticality of using the nominative pronoun. From this, I conclude that Bartangi infinitives construct NP on top of VP, and the infinitive marker realizes the N head.[10] A sample structure for an infinitival clause is shown in Figure 4.[11]

[10]This analysis implies that the identity of the infinival marker *-d/t* and the past stem marker *-d/t* is due to homonymy. But note that *-d/t* is also used as the 3rd person singular present ending, which is certainly not to be considered the same morpheme. As for the affinity between the infinitival and past stems, of the 131 simplex verbs in Sokolova (1960), only 15 have the same vowel in the infinitive and past stems that is different from the vowel in the present stem, and the majority of these verbs use the vowel *e*, the same vowel that is always used in infinitives having their own distinct stem. Overall, it is unclear how a nominalization and a past tense could be connected in the syntax from the synchronic point of view.

[11]The complex category N_V is used following Asudeh & Siddiqi (2022) to capture the selectivity of this N with respect to verbal complements. A possible alternative is to handle such constraints at v-structure, i.e. in the morphological projection.

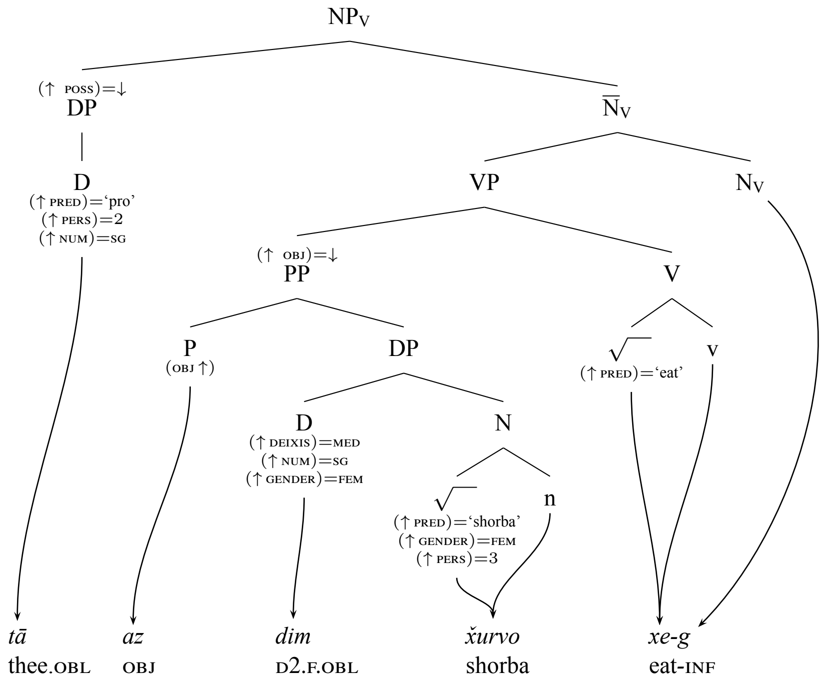

Figure 4: Structure of an infinitival clause (up to NP)

(21) *tā* / **tū* ***az*** *dim* *x̌urvo* *xe-g-qatī* *māš* *sān*
thou.OBL thou.NOM OBJ D2.F.OBL shorba eat-PST-INS we go.PRS:1PL
‘We will go after you eat this shorba.’ (lit. “with your eating this shorba”)

The VIs for the tense markers that realize T are provided in (22); curly braces around f-descriptions are included for clarity. The present-tense feature has no associated VI, while the past and perfect have their own consistent exponents, with the exception of the *-g* past stem,[12] feminine perfect *-c*, which has to be morphologically conditioned to attach only to stems that are defined as having a feminine distinction in the perfect. The templates for the tense features themselves will be explained in the next section.

(22) a. past
$\langle\,[\mathrm{T}],\ \{@\textsc{pst}\}\rangle \xrightarrow{\nu}$ *-t*

b. past in *-g*
$$\langle\,[\mathrm{T}],\ \{@\textsc{pst}\}\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\mathrm{g}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{host} & \begin{bmatrix}\textsc{class} & \textsc{g-pst}\end{bmatrix} \end{bmatrix}$$

c. perfect
$\langle\,[\mathrm{T}],\ \{@\textsc{prf}\}\rangle \xrightarrow{\nu}$ *-č*

[12] Alternatively, since there are only five verbs with this stem ending, the whole words *čūg*, *vūg* etc. can be treated as vocabulary spans.

d. feminine perfect

$$\langle\, [\mathrm{T}],\ \left\{\begin{matrix} @\textsc{prf} \\ (\uparrow \textsc{subj gender}) = \textsc{fem} \end{matrix}\right\} \rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\text{ts}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{host} & \begin{bmatrix}\textsc{class} & \textsc{prf-f}\end{bmatrix} \end{bmatrix}$$

4.3 VP: The verbal stem and direct object

Above I motivated the positioning of the direct object inside VP, as opposed to the higher subject in TP. Whether other verbal complements, such as recipients, or obliques, are also positioned as VP complements, or lack their own positions and are adjoined at different levels in the clause, is a question for further research.

Turning now to the verbal stems, under this analysis they are stored as vocabulary spans specified for tense features. According to the description in section 3.3.1, I use a template inheritance hierarchy for tenses shown in (23), in the spirit of Asudeh et al.'s (2024) analysis of Latin case. I will also define templates to be used in defining the recurrent irregular forms of verbal stems in (24). Double angle brackets are an LrFG convention for indicating constraining equations; VIs only instantiate defining equations, and constraining equations within VIs provide additional context that must be satisfied for the VI to be a valid realization.

(23) a. $@\textsc{prs} := \ (\uparrow \textsc{tense}) = \oplus$

b. $@\textsc{pst} := \ @\textsc{prs}$
$(\uparrow \textsc{past}) = \oplus$

c. $@\textsc{prf} := \ @\textsc{pst}$
$(\uparrow \textsc{perf}) = \oplus$

(24) a. template for past/perfect masculine stem
$@\textsc{pst-m} := \ @\textsc{pst}$
$\langle\!\langle (\uparrow \textsc{subj gender}) = \textsc{masc} \rangle\!\rangle$

b. template for perfect feminine stem
$@\textsc{prf-f} := \ @\textsc{prf}$
$\langle\!\langle (\uparrow \textsc{subj gender}) = \textsc{fem} \rangle\!\rangle$

This hierarchy[13] ensures that the absence of a VI for a stem lower in the hierarchy will lead to the realization for the less-marked stem being used in its stead. Thus, for instance, the verb *wāɣdow* 'shout' from Figure 2 will have a single stem which is not marked for tense at all, as it is also used in the infinitive. The VI in (25) will thus be compatible with features from all three templates in (23). The verb *birexˇtow* 'to drink' (26) will have a

[13] The original version of this paper defined @PRS as having the feature PRS = +, which meant that the past tense was defined as having the features PRS and PST simultaneously. An anonymous reviewer observed that this looks self-contradictory, thus I changed the PRS feature to TENSE: this captures the intuition that the present is the least marked "tensed" form, from which all other tenses inherit. I retained the label PERF for the perfect because, while today it is more of a past evidential than a perfect (Melenchenko 2023), its full range of uses is too complex for any simple label to be an exact fit. The $\oplus$ sign is a notational convention to indicate that these are privative features.

present stem, a past stem (that is used as both past and perfect) and an infinitive stem,[14] which I treat as unspecified for tense. Thus among the forms in (26), the unmarked form will only surface if the TENSE feature is not present, because there are more marked forms available; similarly, the present stem will only be used in the present tense, because there is a specialized past stem. Finally, the maximally distinctive verb *sifedow* 'to go up' (27) has an infinitive stem, a present stem, specialized stems for masculine past/perfect and feminine perfect,[15] and a general past stem which emerges as the unmarked in all other combinations of gender and number.

(25) $\langle [\sqrt{\ },\mathrm{v}], \{(\uparrow \textsc{pred}) = \text{‘shout’}\}\rangle \xrightarrow{\nu} \textit{wāɣd}$

(26) a. infinitive stem (inf. *birex̌-t(-ow)*)
$\langle [\sqrt{\ },\mathrm{v}], \{(\uparrow \textsc{pred}) = \text{‘drink’}\}\rangle \xrightarrow{\nu} \textit{birex̌}$

b. present stem (prs. *biroz-*)
$\langle [\sqrt{\ },\mathrm{v}], \left\{\begin{matrix}(\uparrow \textsc{pred}) = \text{‘drink’} \\ \langle\!\langle @\textsc{prs}\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} \textit{biroz}$

c. past + perfect stem (pst. *birox̌-t*, prf. *birox̌-č*)
$\langle [\sqrt{\ },\mathrm{v}], \left\{\begin{matrix}(\uparrow \textsc{pred}) = \text{‘drink’} \\ \langle\!\langle @\textsc{pst}\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} \textit{birox̌}$

(27) a. infinitive stem (inf. *sife-d-ow*)
$\langle [\sqrt{\ },\mathrm{v}], \{(\uparrow \textsc{pred}) = \text{‘go up’}\}\rangle \xrightarrow{\nu} \textit{sife}$

b. present stem (prs. *sifān-*)
$\langle [\sqrt{\ },\mathrm{v}], \left\{\begin{matrix}(\uparrow \textsc{pred}) = \text{‘go up’} \\ \langle\!\langle @\textsc{prs}\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} \textit{sifān}$

c. past/perfect masculine stem (pst. m. *sifö-d*, prf. m. *sifö-ǰ*)
$\langle [\sqrt{\ },\mathrm{v}], \left\{\begin{matrix}(\uparrow \textsc{pred}) = \text{‘go up’} \\ \langle\!\langle @\textsc{pst-m}\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} \textit{sifö}$

d. perfect feminine (prf. f. *sife-c*)
$\langle [\sqrt{\ },\mathrm{v}], \left\{\begin{matrix}(\uparrow \textsc{pred}) = \text{‘go up’} \\ \langle\!\langle @\textsc{prf-f}\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} \begin{bmatrix}\textsc{phonrep} & /\text{sɪfe:}/ \\ \textsc{class} & \textsc{prf-f}\end{bmatrix}$

e. past feminine / plural and perfect plural
(unmarked past stem: pst. f./pl. *sifā-d*, pst. pl. *sifā-ǰ*)
$\langle [\sqrt{\ },\mathrm{v}], \left\{\begin{matrix}(\uparrow \textsc{pred}) = \text{‘go up’} \\ \langle\!\langle @\textsc{pst}\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} \textit{sifā}$

4.4 Person-number markers

The distribution of the affix and clitic markers is captured in LrFG by defining them as such: the former, as an affix, through the feature [HOST IDENT +], while the latter, through

[14] It might be that the consonantal alternation in the past and infinitive (z+$t \rightarrow \check{x}t$) is morphophonological. If so, this verb can be described as having just two stems: present and infinitive.

[15] The equivalence of the vowel in the infinitive and perfect feminine is a recurring feature in all Bartangi verbs. However, I have to view these forms as homonymous because there is no natural class where these two forms would fit; neither can they be viewed as the unmarked case. In the feminine perfect, I also make use of the CLASS feature to ensure that such forms always use the special feminine perfect affix *-c*.

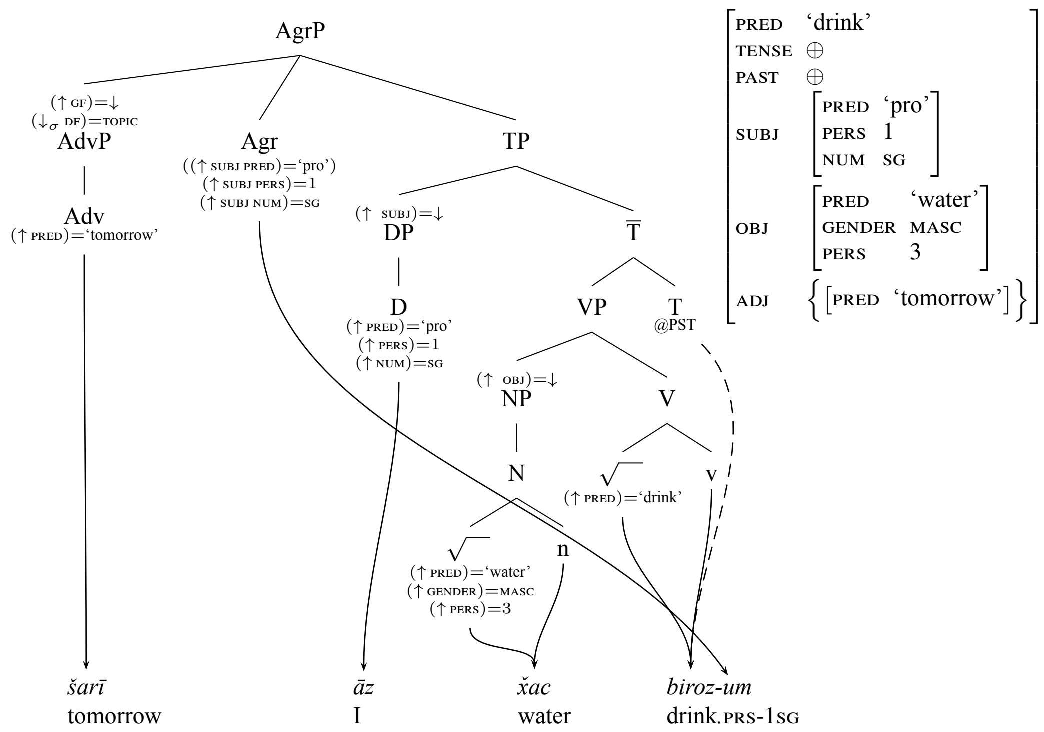

Figure 5: Clause structure with affixal person-number marker

left-dependence and prosodic constraints. The clitic will be linearized in its c-structure position, while the affix will attach to the closest c-structure node it c-commands that maps to the same f-structure (Asudeh, Bögel & Siddiqi 2023). The VIs for a sample affix and clitic are given in (28); the feature hierarchy in (23) ensures that the clitics defined as @PST will also be used in the perfect. The PFRAMES given in the v-structures are not meant as fully formalized representations; they merely serve to indicate that the exponent must stand at the end of a phonological word. A sample affixal realization, for the sentence in (29), is shown in Figure 5. Dashed lines indicate so-called Pac-Man spanning, where a VI co-instantiates an adjacent node if the latter has no licit realization.

(28) a. $$\left\langle [\text{Agr}], \left\{\begin{matrix} (\uparrow \text{ SUBJ PERS}) = 1 \\ (\uparrow \text{ SUBJ NUM}) = \text{SG} \\ \langle\!\langle @\text{PRS} \rangle\!\rangle \end{matrix}\right\} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHON.REP} & /\text{ʊm}/ \\ \text{PFRAME} & (\ldots(\,\cdot\,)_\sigma)_\omega \\ \text{DEP} & \text{LEFT} \\ \text{HOST} & [\text{IDENT } +] \end{bmatrix}$$

b. $$\left\langle [\text{Agr}], \left\{\begin{matrix} (\uparrow \text{ SUBJ PERS}) = 1 \\ (\uparrow \text{ SUBJ NUM}) = \text{SG} \\ \langle\!\langle @\text{PST} \rangle\!\rangle \end{matrix}\right\} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHON.REP} & /\text{ʊm}/ \\ \text{PFRAME} & (\ldots(\,\cdot\,)_\sigma)_\omega \\ \text{DEP} & \text{LEFT} \end{bmatrix}$$

(29) *šarī* *āz* *x̌ac* *biroz-um*
tomorrow I.NOM water drink.PRS-1SG
‘Tomorrow I will drink water.’

Neither of these VIs realizes the PRED feature because they are compatible with both overt and pro drop subjects. However, there is one clitic marker, *=af*, which is incompatible with overt subjects (see example 15 above); I model this by having its VI also instantiate the PRED feature (30). The analysis of the fossilized combination *uf=af*, which seems to allow an overt pronoun to co-occur with *=af*, is unclear at the moment; further information is needed on the morphosyntactic status of this combination.

(30) $$\langle\,[\text{Agr}], \left\{\begin{array}{c} (\uparrow \textsc{subj pers}) = 3 \\ (\uparrow \textsc{subj num}) = \textsc{pl} \\ (\uparrow \textsc{subj pred}) = \text{‘pro’} \\ \langle\!\langle @\textsc{pst} \rangle\!\rangle \\ \langle\!\langle (\uparrow \textsc{obj}) \rangle\!\rangle \end{array}\right\}\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phon.rep} & /\text{af}/ \\ \textsc{pframe} & ((\ )(\ \cdot\ )_{\sigma})_{\omega} \\ \textsc{dep} & \textsc{left} \end{bmatrix}$$

4.5 Zero forms, irregular forms and spanning

There are two phenomena in the behaviour of Bartangi person-number markers that do not have a simple solution in the current version of LrFG: zero realizations of certain person-number combinations and the existence of irregular 3rd person singular present forms.

Recall that there are certain slots in the paradigms of the person-number markers (Tables 3 and 4) that have zero realizations: 3rd person singular in the past/perfect and 2nd person singular in the present. Normally, zero realization is modeled in LrFG through a mechanism called Pac-Man spanning: a VI can co-instantiate an adjacent c-structure node if the latter cannot be realized by any VI in the vocabulary. Pac-Man spanning has not been extensively discussed in the literature, but it seems to be implicitly assumed that it can only occur with nodes that map to the same f-structure; otherwise it would be possible for arbitrary nodes to Pac-Man span their neighbours, making the mechanism too powerful. Thus, in this case, we expect Agr to be Pac-Man spanned with one of the verbal projections; but this is not possible, because none of the verbal projections are adjacent to Agr. Hence, to model zero marking, we will have to resort to rules such as (31), which is an awkward way to model something that should follow from the structure of the paradigm.

(31) $$\text{AgrP} \rightarrow \underset{(\uparrow \textsc{subj})=\downarrow}{\text{XP}} \ \Big\{ \underset{\uparrow=\downarrow}{\text{Agr}} \ \Big| \ \underset{\left\{\begin{array}{c|c} (\uparrow \textsc{pers}) = 3 & (\uparrow \textsc{pers}) = 2 \\ (\uparrow \textsc{num}) = \textsc{sg} & (\uparrow \textsc{num}) = \textsc{sg} \\ @\textsc{pst} & @\textsc{prs} \end{array}\right\}}{\varepsilon} \Big\} \ \underset{\uparrow=\downarrow}{\text{TP}}$$

Irregular person-number forms in Bartangi are only attested in the present tense (which is fitting, considering that agreement markers are affixal in the present) and, as discussed above, belong to three types: irregular 3rd person singular (such as *kix̌t* ‘does’ from *kin-* ‘do’), contracted forms (*sām* ‘I go’ for *sāw-um*, *sān* ‘we/they go’ for *sāw-an*) and final consonant dropping in the imperative (*sā* ‘go!’ but *sāw* ‘thou goest’). The standard way of modelling such inflectional irregularities in LrFG would be through vocabulary spans, but, again, this mechanism is not available because the verbal root, v and Agr are not adjacent.

I suggest that the impossiblity of modelling these forms as irregular is due to a contradiction in the architecture of LrFG. In modelling affixes through host identification by c-command, it abandons the idea that c-structure adjacency is equivalent to linear adjacency of morphemes. Yet the notion of spans remains dependent on linear adjacency, observing the same restrictions as lexical sharing (Wescoat 2002, Lowe 2016). My proposal is to disconnect spanning from c-structure adjacency and model it on the same principles as host identification, namely, c-command and f-structure mapping. This can be done by adopting the following two principles:

(32) **Spanning**
C-structure nodes that map to the same v-structure (= are spanned) must be in a successive c-command relation and map to the same f-structure. The linear position of the phonological form of a span corresponds to the node that does not asymmetrically c-command any other node in the span (i.e. its **lowest** node).

(33) **Pac-Man spanning**
If a c-structure node n_1 has no suitable realization, then, if there is a node n_2 such that $\phi(n_1) = \phi(n_2)$ and **closest**(n_1,n_2), $\nu(n_1) = \nu(n_2)$.

In other words, spans can be non-adjacent as long as the nodes involved map to the same f-structure and are in a c-command relationship; Pac-Man spanning proceeds downwards, to the closest (Asudeh, Bögel & Siddiqi 2023) node it c-commands that maps to the same f-structure.

These are not meant to be fully formalized definitions; the notion of "linear position of a span" is especially unclear. I propose the following informal generalization to capture the ordering of VIs (which applies to the mapping of v-structures to p-structure):

(34) a. Phonological forms of v-structures lacking the feature DEP (independent VIs) are ordered according to the c-structure order of the lowest nodes instantiated by each v-structure.

b. Phonological forms of v-structures having the feature DEP (affixes and clitics) are ordered relative to the v-structure occupying their HOST feature according to the value of DEP (LEFT, RIGHT).

The intuition behind these preliminary definitions seems clear enough to capture the cases at hand. Zero realization of 2nd person singular present and 3rd person singular past is now possible: since there is no VI in the vocabulary that is compatible with these features, Pac-Man spanning ensures that Agr is mapped to the same v-structure as the T node, as in Figure 6.

Irregular forms can now be defined as vocabulary spans, as in the following VI for the short 1st person singular present form of the verb 'go' (35), which corresponds to the tree in Figure 7. The form is spanned across several nodes, but positioned according to the linear location of the verbal root and v.

(35) $$\langle\, [\text{Agr},\sqrt{},\text{v,T}], \left\{\begin{matrix} (\uparrow \textsc{pred}) = \text{‘go’} \\ (\uparrow \textsc{subj pers}) = 1 \\ (\uparrow \textsc{subj num}) = \textsc{sg} \\ @\textsc{prs} \end{matrix}\right\} \rangle \xrightarrow{\nu} \textit{sām}$$

The extended approach to spanning also allows us to capture the existence of a "zero" realization of the verb 'do'[16] in the present tense, as seen in the following examples:

[16]For Shughni, it has been observed in Parker (2023) with complex predicates only, but Maksim Melenchenko (p. c.) has demonstrated that it is also possible with the lexical verb 'do'.

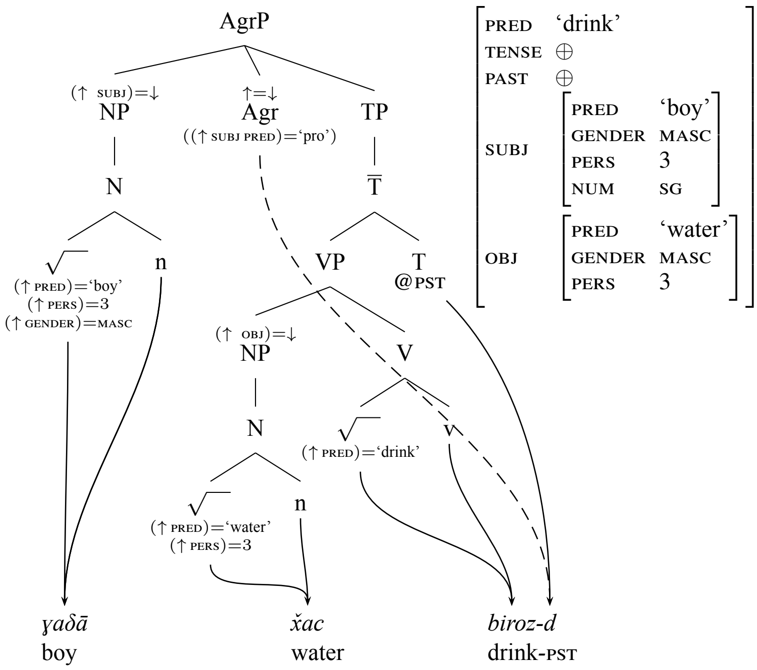

Figure 6: Long-distance Pac-Man spanning of zero Agr

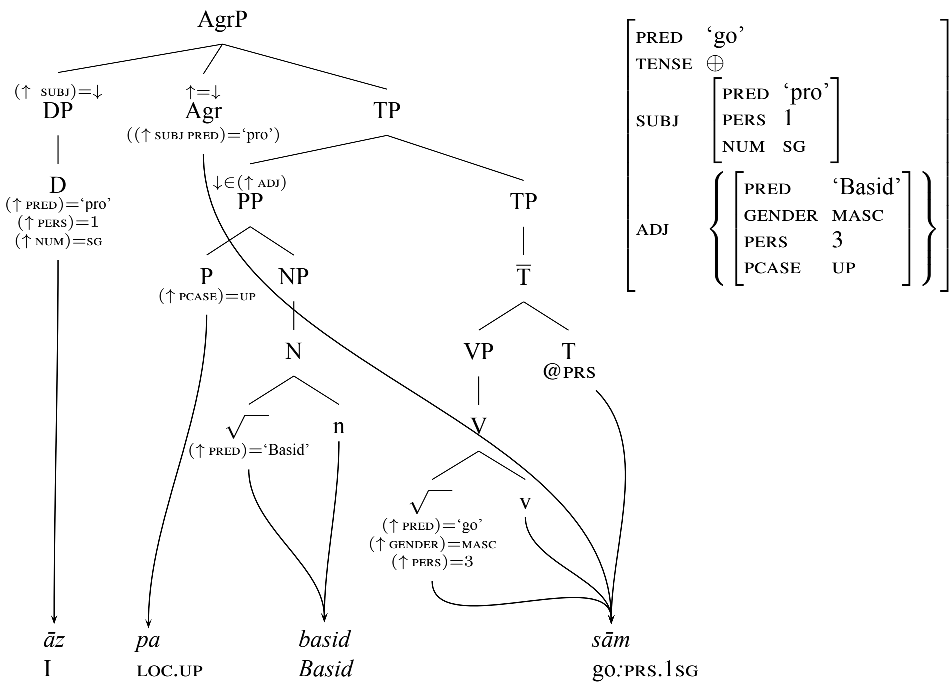

Figure 7: Long-distance vocabulary spanning (‘I go to Basid’)

(36) *āz* *kor-um* / *kor* *kin-um*
I.NOM work-1SG work do.PRS-1SG
'I am working.'

(37) *āz* *salāt-um*
I.NOM salad-1SG
'I am making a salad.'

(38) *āz* *tar* *xāmb-um* *az* *xu*
I.NOM LOC.EQ shelter-1SG OBJ REFL
'I am hiding myself.'

This construction most commonly occurs with complex predicates where 'do' is a light verb, as in (36), but it can equally well be used when 'do' is used in the lexical sense, as in (37), where 'make a salad' can hardly be considered a complex predicate. Example (38) shows that this "zero" verb is not sensitive to the category of the preceding constituent, here attaching to a noun that forms part of a PP.

Under the approach I propose, this exceptional verb can be accounted for by treating these forms as spans of Agr, $\sqrt{\ }$, v and T that have clitic status, as in (39).

(39) $$\left\langle [\mathrm{Agr},\sqrt{\ },\mathrm{v},\mathrm{T}], \left\{\begin{array}{c} (\uparrow \textsc{pred}) = \text{`do'} \\ (\uparrow \textsc{subj pers}) = 1 \\ (\uparrow \textsc{subj num}) = \textsc{sg} \\ @\textsc{pst} \end{array}\right\}\right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phon.rep} & /\text{ʊm}/ \\ \textsc{pframe} & (\ldots(\,\cdot\,)_\sigma)_\omega \\ \textsc{dep} & \textsc{left} \end{bmatrix}$$

This correctly predicts that this "zero" version of the verb cannot be used when the corresponding full verb has a zero ending, as in the 2nd person singular (40). If we were to analyze (36)–(38) as a genuine zero realization of the present stem, we would have been able to Pac-Man span this "zero VI" with the Agr lacking an exponent.

(40) *tū* *kor* *(*kin*)*?*
thou.NOM work do.PRS[2SG]
'Are you working?'

The fact that these forms are unavailable for the 3rd person singular (41) also suggests an analysis in terms of spans stored directly in the vocabulary, where a 3rd person clitic form of the verb 'do' is simply unavailable (presumably due to the complex morphophonological combinations of *-t* with its host, which would require storing individual host + affix combinations in the vocabulary, as done for irregular 3rd person singular present forms).

(41) *asad* **kor-t* / $^{\mathrm{OK}}$*kor* *kiǯt*
A. work-3SG work do.PRS:3SG
'Asad is working'

5 Conclusions

In this paper, I have provided an LrFG analysis of clause structure in Bartangi. Under this analysis, the language has a three-layer clause structure consisting of a VP that includes the direct object, TP that includes the subject, and AgrP that includes the clause-initial topic. In the area of clausal agreement, Bartangi demonstrates a mismatch between distribution and linear exponence: the clitic and affix person-number markers are in complementary distribution depending on tense, but have distinct linear positions. In LrFG, their distributional equivalence can be captured by consistently introducing the person-number features in the same c-structure node Agr; the difference in linear order is captured by competition between a clitic that leans to the topical constituent to its left in the past and perfect tenses, and an affix that attaches to the verb stem in the present tense, through LrFG's mechanism of host identification (Asudeh, Bögel & Siddiqi 2023). I have further proposed a modification to LrFG's notion of spanning to account for spans that seemingly instantiate non-adjacent nodes, allowing the modelling of irregular present-tense forms, including apparent "zero" realizations of the present stem of the verb 'do'. Whether this modification proves to be too powerful is to be decided in future work.

There are further features of Bartangi clause structure that require an explanation in future work. Bartangi allows scrambling to non-topical positions and postverbal arguments, as seen in (4), but the status of such elements is not accounted for under the current analysis. Whether arguments beyond subjects and direct objects have default structural positions for realization is also an open question. Bartangi also has a system of subordinating and coordinating conjunctions with a large number of distinct linear positions (preverbal, clause-initial, clause-final, second; see Belyaev 2025); these have to be integrated into the clause structure proposed in this paper.

List of glossing abbreviations

CONJ: conjunction; D3: distal; F: feminine; INS: instrumental; LOC.DOWN: preposition denoting location below speaker; LOC.EQ: preposition denoting location at equal level with speaker; LOC.UP: preposition denoting location above speaker; M: masculine; NOM: nominative; OBJ: object marker; OBL: oblique; PST: past; REFL: reflexive; SG: singular; TR: transitive.

References

Asudeh, Ash, Bronwyn Bjorkman, Frances Dowle, Neil Myler, Daniel Siddiqi & Lisa Sullivan. 2024. Fusional morphology, metasyncretism, and secondary exponence: A morphemic, realizational approach to Latin declension. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 conference*, 45–68. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/49 (24 December, 2025).

Asudeh, Ash, Tina Bögel & Daniel Siddiqi. 2023. Modelling exponents. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 conference*, 23–44. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/38 (2 October, 2025).

Asudeh, Ash & Daniel Siddiqi. 2022. Realizational morphosemantics in LrFG. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 conference*, 21–40. Konstanz: University of Konstanz. https://lfg-proceedings.org/lfg/index.php/main/article/view/20 (2 October, 2025).

Austin, Peter & Joan Bresnan. 1996. Non-configurationality in Australian Aboriginal languages. *Natural Language and Linguistic Theory* 14(2). 215–268. https://doi.org/10.1007/BF00133684.

Belyaev, Oleg. 2022. Phrase structure and configurationality in Ossetic. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 conference*. Konstanz: University of Konstanz. https://lfg-proceedings.org/lfg/index.php/main/article/view/26 (2 October, 2025).

Belyaev, Oleg I. 2025. Pozicionnye klassy sojuzov v bartangskom jazyke [Position classes of conjunctions in Bartangi]. *Lomonosov Philology Journal* 2. 70–87. https://doi.org/10.55959/MSU0130-0075-9-2025-48-02-6.

Bresnan, Joan. 1998. Morphology competes with syntax: Explaining typological variation in weak crossover effects. In Pilar Barbosa, Danny Fox, Paul Hagstrom, Martha McGinnis & David Pesetsky (eds.), *Is the best good enough? Optimality and competition in syntax*, 59–92. Cambridge, MA: MIT Press & MIT Working Papers in Linguistics.

Chistyakova, Daria. 2025. Split intransitivity in Shughni and Bartangi: A study in lexical microvariation. Talk at the Tenth International Conference on Iranian Linguistics (ICIL10), Viterbo.

Edelman, Joy I. 1990. *Sravnitel'naja grammatika vostočnoiranskix jazykov. morfologija. èlementy sintaksisa* [Comparative grammar of Eastern Iranian languages: Morphology, elements of syntax]. Moscow: Nauka.

Edelman, Joy I. & Šodixon P. Jusufbekov. 1999. Šugnanskij jazyk [Shughni]. In Vera S. Rastorgueva, Joy I. Edelman & Vjačeslav V. Moškalo (eds.), *Jazyki mira: Iranskie jazyki* [Languages of the World: Iranian languages]. Vol. III: *Vostočnoiranskie jazyki* [Eastern Iranian languages], 225–242. Moscow: Indrik.

Karamšoev, Dodxudo. 1978. *Kategorija roda v pamirskix jazykax (šugnano-rušanskaja gruppa)* [The category of gender in the Pamir languages (Shughni-Roshani branch)]. Dushanbe: Doniš.

Karamxudoev, Nodir. 1973. *Bartangskij jazyk (fonetika i morfologija)* [Bartangi language (phonetics and morphology)]. Dushanbe: Doniš.

Laczkó, Tibor. 2014. Essentials of an LFG analysis of Hungarian finite sentences. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'14 conference*. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2014/papers/lfg14laczko2.pdf (13 September, 2020).

Lowe, John J. 2016. English possessive 's: clitic *and* affix. *Natural Language & Linguistic Theory* 34. 157–195. https://doi.org/10.1007/s11049-015-9300-1.

Makarov, Yury. 2024. Shughni morphophonology from a synchronic perspective. Talk at the Research Seminar on Iranian languages, Moscow, 22 May. https://pamiri.online/static/uploads/makarov2024.pdf (2 October, 2025).

Makarov, Yury Yu. & Vladimir A. Plungian. 2023. K opisaniju šugnanskoj morfonologii: predvaritel'nye zamečanija [Towards a description of Shughni morphophonology: Preliminary remarks]. In Irina M. Kobozeva, Xenia P. Semyonova, Natal'ja D. Svetozarova, Leonid M. Zaxarov & Alexander E. Kostyuk (eds.), *«…Vperëd i vverx po lestnice zvučaščej». Sbornik statej k 80-letiju Ol'gi Fëdorovny Krivnovoj* [A collection of papers for Olga Krivnova's 80th anniversary], 178–193. Moscow: Buki-Vedi. https://doi.org/10.5281/zenodo.16364199.

Melenchenko, Maxim G. 2023. Èvidencial'nyj perfekt v šugnanskom jazyke. [The evidential perfect in Shughni]. *Voprosy jazykoznanija* 6. 120–137. https://doi.org/10.31857/0373-658X.2023.6.120-137.

Muravyeva, Irina A. 1975. Nepozicionnye čeredovanija fonem v šugnanskom jazyke [Non-positional alternations of phonemes in Shughni]. In Vladimir A. Zvegincev (ed.), *Issledovanija po strukturnoj i prikladnoj lingvistike* [Studies in structural and applied linguistics], 124–135. Moscow: Izdatel'stvo MGU.

Parker, Clinton. *A grammar of the Shughni language*. Ph.D. dissertation, McGill University. https://escholarship.mcgill.ca/concern/theses/0v8385834 (22 December, 2025).

Payne, John & Erika Chisarik. 2000. Negation and focus in Hungarian: An Optimality Theory account. *Transactions of the Philological Society* 98. 185–230. https://doi.org/10.1111/1467-968X.00062.

Serdobolskaya, Natalia & Oleg Belyaev. 2022. Dative external possessors in Ossetic. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 conference*, 325–344. Konstanz: University of Konstanz. https://lfg-proceedings.org/lfg/index.php/main/article/view/25 (2 October, 2025).

Sergienko, Alexander. 2025. Alignment shift in Bartangi. Talk at the Tenth International Conference on Iranian Linguistics (ICIL10), Viterbo.

Snijders, Liselotte. *The nature of configurationality in LFG*. Ph.D. dissertation, University of Oxford. https://ora.ox.ac.uk/objects/uuid:1310f160-283e-411e-a8d7-20ab4b3380c2 (2 October, 2025).

Sokolova, Valentina S. 1960. *Bartangskie teksty i slovar'* [Bartangi texts and dictionary]. Moscow: Izdatel'stvo Akademii nauk SSSR.

Stewart, Tom & Gregory Stump. 2007. Paradigm Function Morphology and the morphology/syntax interface. In Gillian Ramchand & Charles Reiss (eds.), *The Oxford handbook of linguistic interfaces*, 383–421. Oxford: Oxford University Press.

Stump, Gregory & Andrew Hippisley. 2011. Valence sensitivity in Pamirian past-tense inflection: A realizational analysis. In Agnes Korn, Geoffrey Haig, Simin Karimi & Pollet Samvelian (eds.), *Topics in Iranian linguistics*, 103–115. Wiesbaden: Dr. Ludwig Reichert Verlag. http://titus.uni-frankfurt.de/personal/agnes/paris09/stump_hippisley2011.pdf (2 October, 2025).

Wendtland, Antje. 2009. The position of the Pamir languages within East Iranian. *Orientalia Suecana* LVIII. 172–188. http://uu.diva-portal.org/smash/get/diva2:305500/FULLTEXT02.pdf (2 October, 2025).

Wescoat, Michael T. *On lexical sharing*. Ph.D. dissertation, Stanford University. https://searchworks.stanford.edu/view/4814040 (22 December, 2025).

Ossetic nominal inflection: Between morphology and syntax

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Abstract

Ossetic, an Iranian language spoken in the Caucasus, has a system of eight cases that are mostly formed in an agglutinating fashion, with the possibility of suspended affixation. This system has a number of additional unconventional features, including inflectional irregularities in pronouns, complex stem allomorphy and syncretism patterns and the use of oblique forms as nonfinal conjuncts. In this paper, we review prior accounts of Ossetic case inflection and propose a novel LrFG analysis that we claim allows capturing the relevant facts in a more regular and straighforward manner.

1 Introduction

The system of nominal inflection of Ossetic[1] (Iranian > Indo-European) has several challenging features. While being predominantly agglutinating and allowing suspended affixation, it has numerous irregularities and complex stem allomorphy patterns in a number of pronominal paradigms. It also features suspended affixation in which the case form of non-final conjuncts depends on the structure of the paradigm of the lexeme in question, with nominative forms surfacing for nouns and "genitive" (or oblique-stem) forms for pronouns.

There have been several analyses of Ossetic nominal inflection to date, but they have mostly concentrated on the formal means of modelling suspended affixation. Erschler (2012b) proposed a morphological ellipsis account, while Belyaev (2014, 2021) proposed a feature-based account in LFG with lexical sharing (Wescoat 2002, Broadwell 2008, Lowe 2016). The latter account also included a Paradigm Function Morphology, Version 2 (PFM2, Stewart & Stump 2007, G. Stump 2016) model of nominal and pronominal inflection, as well as of the syntax-semantics interface, based on Dalrymple (2015) and Dalrymple et al. (2019) and integrating an additional mechanism for handling lexical sharing.

While the analysis proposed in Belyaev (2021) adequately handles the suspended affixation facts and basic paradigm structure, it did not aim to capture all properties of Ossetic nominal inflection. Furthermore, in spite of using lexical sharing, the analysis is still fully lexicalist in that all information associated with morphological words – including their lexical sharing patterns – is contributed by a separate morphological module. This means that the patterns of syncretism and stem allomorphy found in nominal inflection cannot be connected with the patterns found elsewhere – specifically, in the system of second-position clitics, whose forms are irregular and thus fully stored in the lexicon rather than handled in the morphology. Finally, to integrate lexical sharing into the morphology-syntax interface, this analysis also implements a mechanism for splitting the f-descriptions between the two shared heads, further complicating the translation between m-features and f-descriptions according to the model in Dalrymple (2015).

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In this paper, we propose a new analysis of Ossetic nominal inflection that uses the LrFG framework (Asudeh & Siddiqi 2023). The main feature of LrFG is that it preserves the syntactic component of LFG, while implementing a non-lexicalist, realizational model of morphology. This offers several advantages that mitigate the shortcomings of the prior analysis. For the first time, the Ossetic system of case and number inflection can be given a uniform account that transcends its "morphological" and "syntactic" dimensions. Furthermore, using a hierarchical model of case inspired by Caha (2009) allows for a compact description of stem and affix allomorphy. Lack of a strict boundary between morphology and syntax allows for a simpler model that is based on a single set of case features. Finally, looking at Ossetic case from a non-lexicalist point of view allows one to see new descriptive problems and ask new questions that have remained unnoticed in prior accounts.

The paper is structured as follows. In section 2, we provide general information on Ossetic and its main varieties. In section 3, we provide a descriptive overview of Ossetic nominal paradigms, including pronominal clitics. In section 4, we discuss prior analyses of Ossetic case inflection, specifically concentrating on the lexical sharing analysis in Belyaev (2021) and its criticism. The new LrFG analysis is described in section 5, where we also show how it overcomes some of the problems faced by the earlier analysis and provides some motivation for a non-lexicalist variant of LFG.

2 General information on Ossetic

Ossetic is an Iranian language spoken by around 450 000 people, most of whom live in the Republic of North Ossetia – Alania (Russia) and in South Ossetia — with sizeable diasporae in Georgia and Turkey. Ossetic is divided into two varieties, Iron and Digor, which are traditionally treated as dialects, although both have distinct literary standards and are treated by some authors as separate languages (cf. Erschler 2020). Of these two, Iron has by far the highest number of speakers and is spoken in most of North Ossetia and in all of South Ossetia; Digor, in contrast, is mostly concentrated in two westernmost districts of North Ossetia (Digoræ and Iræf) and is generally considered the more archaic variety. In this paper, we will only discuss Iron data for reasons of both space and simplicity, but the analysis can potentially be extended to cover Digor as well.

Two kinds of data are used to motivate the analysis: inflection paradigms, which mostly repeat material already known from descriptive grammars such as Gagkaev (1952), Abaev (1958), Axvlediani (1963), and Bagaev (1965), and facts on nominal coordination, which have already been discussed in Erschler (2012a), Belyaev (2014, 2021), and Erschler (2022). Thus we present no new data, but propose a new analysis that, in our view, provides a better generalization of the facts than prior approaches.

3 Ossetic nominal morphology

3.1 Nouns

Nouns in Ossetic inflect in a fully agglutinating fashion, as shown in the paradigm in Table 1. Case is always expressed separately from number, and the form of affixes is gen-

Table 1: Inflection of nouns

	læg 'man'		*k'aba* 'dress'	
	sg.	pl.	sg.	pl.
NOM	læg	læg-tæ	k'aba	k'aba-tæ
GEN	læǯ-ə	læg-t-ə	k'aba-jə	k'aba-t-ə
DAT	læg-æn	læg-t-æn	k'aba-jæn	k'aba-t-æn
ALL	læg-mæ	læg-t-æm	k'aba-mæ	k'aba-t-æm
ABL	læg-æj	læg-t-æj	k'aba-jæ	k'aba-t-æj
INESS	læǯ-ə	læg-t-ə	k'aba-jə	k'aba-t-ə
SUPER	læg-əl	læg-t-əl	k'aba-jəl	k'aba-t-əl
EQU	læg-aw	læg-t-aw	k'aba-jaw	k'aba-t-aw

erally stable across singular and plural, with minor morphophonological differences.[2] The plural marker is always *-t(æ)* or *-tː(æ)* (gemination is phonologically conditioned; see Alekseev & Tyutyunnikova 2023). There are no inflection classes, and the only difference in the form of case affixes in the singular is dependent on whether the stem is consonant-final or vowel-final. Genitive and inessive are always syncretic, as highlighted in red in Table 1. Nouns ending in velar stops can display morphologically conditioned palatalization (/g/ → /ǯ/, /k/ → /č/, /k'/ → /č'/) before the genitive / inessive affix *-ə*, although this is always optional (*læg-ə* is available in addition to *læǯ-ə*).

3.2 Personal pronouns

Ossetic uses dedicated personal pronouns only in the 1st and 2nd persons; see Table 2. These inflect differently from nouns: the genitive / inessive affix *-ə* is not available. In the singular, the nominative and genitive are suppletive and lack segmental case affixes (highlighted in red), while the rest of the cases are based on the genitive form as the stem and attach the same affixes as in the nominal system. The 1st and 2nd person plural pronouns do not distinguish between nominative and genitive forms, utilizing the bare stem for both (higlighted in green).

Most grammars (Abaev 1958, Axvlediani 1963, Bagaev 1965) describe the personal pronoun paradigms as defective, lacking an inessive form.[3]

3.3 Demonstratives

The inflection of demonstrative pronouns, shown in Table 3, shows differences from the inflection of both nouns and personal pronouns. The basic stems of demonstratives are *a-* (proximal) and *wə-* (distal) and they appear not only in the independent pronouns discussed herein, but also in adnominal forms *a-sə* 'this' and *wə-sə* 'that' (e. g. *wəsə læg* 'that man'). The nominative and genitive singular have an identical form, which

[2]We do not include the comitative in the case paradigm because its status as a case (rather than a fused postposition) is unclear; see Erschler (2020).

[3]Gagkaev (1952: 63) provides inessive forms that are the same as the genitive: *mæn*, *dæw*, *max*, *səmax*. However, we have been unable to find contexts where these forms could be used in the locative sense.

Table 2: Inflection of personal pronouns

	æž 'I'	*də* 'thou'	*maχ* 'we'	*šəmaχ* 'you'
NOM	æž	də	max	šəmax
GEN	mæn	dæw	max	šəmax
DAT	mæn-æn	dæw-æn	maχ-æn	šəmaχ-æn
ALL	mæn-mæ	dæw-mæ	maχ-mæ	šəmaχ-mæ
ABL	mæn-æj	dæw-æj	maχ-æj	šəmaχ-æj
INESS	—	—	—	—
SUPER	mæn-əl	dæw-əl	maχ-əl	šəmaχ-əl
EQU	mæn-aw	dæw-aw	maχ-aw	šəmaχ-aw

consists of the stem with the addition of *-j* (highlighted in red). Other forms, except the inessive, use the regular nominal case suffixes, with the exception of the superessive, which uses the historically archaic form *-wəl*[4] instead of the modern *-əl*. The allative, superessive and equative are based on the bare stem. The dative and ablative insert *-m-* between the stem and the case affix (highlighted in green). The inessive forms have just *-m* as the exponent of the inessive case.[5]

In the plural, demonstratives attach the irregular suffix *-don* (found only with demonstratives and *kæsə* 'which') to the bare stem. The rest of the cases attach regularly, with the exception of the genitive, which is optional (i.e. both *wədon* and *wədon-ə* can be used in the sense 'of them'). It is notable that while the regular plural cannot be attached to the demonstrative stems directly (**a-tæ*, **wə-tæ*), it can attach to the *-don* forms, yielding double plurals with associative plural meaning: *a-dæ-ttæ* 'these and others', *wə-dæ-ttæ* 'those and others' (the change *-don* + *tæ* → *-dættæ* is regular; see Alekseev & Tyutyunnikova 2023).

Note that the form of the distal superessive singular in the Cyrillic orthography is ‹уубыл›, i.e. *uwəl* in our transcription. However, in our view, this orthographic convention is due to the phonetic realization of /wə/ as [u] before another consonant, and the phonological form is /wəwəl/.

3.4 Interrogatives

The inflection of interrogatives, shown in Table 4, has much in common with that of demonstratives. The base stems are *kæ-* for the pronoun 'who' and *sæ-* for the pronoun 'what'. Genitive forms (highlighted in red) have a final *-j*: *kæ-j* 'of whom', *sæj* 'of what'.

[4]Here we follow the analysis of Abaev (1958: 28). Alternatively, *-w-* could be treated as part of the stem or as an epenthetic consonant, as in Bagaev (1965: 251). However, there is evidence that the form of this case marker used to be *-wəl* throughout the nominal system: the Digor counterpart is *-bæl*, continuing Proto-Iranian **upari* (Miller 1903: 46–47), and the *-wəl* form of the affix is attested in nonstandard Iron varieties, especially after velars (Bekoev 1985: 159).

[5]It is unclear whether the forms *am* and *wəm* belong to the case system, or are rather demonstrative adverbs 'here' and 'there'. The same applies to the interrogative *kæm*, whose normal function is to mean 'where' rather than the morphologically predicted 'in whom'. But the existence of the form *sæm* 'in what', shown below, indicates that we do have to recognize *-m* as a marker of inessive case.

Table 3: Inflection of demonstrative pronouns

	proximal		distal	
	sg.	pl.	sg.	pl.
NOM	a-j	a-don	wə-j	wə-don
GEN	a-j	a-don(-ə)	wə-j	wə-don(-ə)
DAT	a-m-æn	a-don-æn	wə-m-æn	wə-don-æn
ALL	a-mæ	a-don-mæ	wə-mæ	wə-don-mæ
ABL	a-m-æj	a-don-æj	wə-m-æj	wə-don-æj
INESS	a-m	a-don-ə	wə-m	wə-don-ə
SUPER	a-wəl	a-don-əl	wə-wəl	wə-don-əl
EQU	a-jaw	a-don-aw	wə-jaw	wə-don-aw

Table 4: Inflection of interrogative and reflexive pronouns

	či ‘who’		*sə* ‘what’		*xi* ‘self’
	sg.	pl.	sg.	pl.	
NOM	či	či-tæ	sə	sə-tæ	—
GEN	kæ-j	kæj-t-ə	sæ-j	sæ-j-t-ə	xi
DAT	kæ-m-æn	kæ-m-æn-t-ə	sæ-m-æn	sæ-m-æn-t-ə	xi-s-æn
ALL	kæ-mæ	kæ-mæ-t-ə	sæ-mæ	sæ-mæ-t-ə	xi-mæ
ABL	kæ-m-æj	kæ-m-æj-t-ə	sæ-m-æj	sæ-m-æj-t-ə	xi-s-æj
IN	kæ-m	kæ-m-ə-t-ə	sæ-m	sæ-m-ə-t-ə	xi
SUPER	kæ-wəl	kæ-wəl-t-ə	sæ-wəl	sæ-wəl-t-ə	xi-wəl
EQU	kæ-jaw	kæ-jaw-t-ə	sæ-jaw	sæ-jaw-t-ə	xi-jaw

Nominative is suppletive: *či* ‘who’, *sə* ‘what’. In the dative and ablative, *-m-* is inserted between the stem and the affix, while the inessive has a final *-m* (highlighted in green).

Interrogatives also have plural forms, which are formed in an unusual way: the nominative attaches the regular plural affix *-tæ*, while oblique cases consist of the corresponding singular form and the genitive plural *-t-ə*. The Digor variant of this system, which has optional doubling of the case marker, has been analyzed in Erschler (2022) from the DM perspective. While it would be potentially interesting to implement an LrFG analysis of this system, it is beyond the scope of this paper.

3.5 The reflexive

The reflexive paradigm is shown in Table 4 next to the interrogatives. Reflexives are almost never used without a possessive proclitic that copies the features of the antecedent, thus *mæ=xi* ‘myself’, *dæ=xi* ‘thyself’, etc. In some sources, *xædæg* is given as the “nominative” form of the reflexive; however, it does not function as a reflexive, but rather, as an emphatic marker or intensifier. We thus treat the reflexive paradigm as lacking a nominative form.

The reflexive paradigm shares with the personal pronouns the lack of an overt affix in the genitive. Like the demonstratives and the interrogatives, a consonant is inserted

Table 5: Clitic pronouns in Ossetic

	1sg.	1pl.	2sg.	2pl.	3sg.	3pl.
NOM	—	—	—	—	—	—
GEN	=mæ	=næ	=dæ	=wæ	=æj / =jæ	=sæ
DAT	=mən	=nən	=dən	=wən	=(j)ən	=sən
ALL	=mæm	=næm	=dæm	=wæm	=(j)æm	=sæm
ABL	=mæ	=næ	=dæ	=wæ	=zə	=sæ =zə
INESS	=mæ	=næ	=dæ	=wæ	=zə	=sæ =zə
SUPER	=məl	=nəl	=dəl	=wəl	=(j)əl	=səl
EQU	—	—	—	—	—	—
POSS	mæ= me=	næ= ne=	dæ= de=	wæ= we=	jæ= je=	šæ= še=

in the ablative and inessive (highlighted in green); but, unlike the former two classes, the consonant is *-s* and it is not present in the inessive, whose form is equivalent to the genitive (bare stem). The superessive affix has the form *-wəl*, like in the demonstrative and interrogative paradigms.

3.6 Pronominal clitics

Ossetic has an extensive system of second-position enclitics for all person-number combination and all case forms, with the exception of nominative and equative (see Table 5). The forms of these enclitics are irregular, although in the dative, allative and superessive one can see some similarities with the corresponding case affixes.

The syncretism patterns of the clitics, however, are noteworthy. In the 1st and 2nd persons, genitive, ablative and inessive are expressed by the same forms (in red). In the 3rd person singular, the genitive has a special form (*=æj* after consonants, *=jæ* after vowels, in blue) while the ablative and inessive are both expressed by the clitic *=zə*. In the 3rd person plural, like in the 1st / 2nd persons, the clitic *=sæ* (in red) can be used for genitive, ablative and inessive, but for the ablative-inessive, it competes with *=zə* (in green).

Ossetic also has possessive proclitics, which appear at the left edge of the NP and are mostly homonymous with the correponding genitive enclitics; their last vowel turns to *e* when merged with an initial front or central vowel of the following word. Their distribution overlaps with that of the full genitive pronouns, but not entirely (see Erschler 2009); we view them as situated outside of the case system proper and do not include them in our analysis.

3.7 Phrasal affixation

Like other languages with agglutinating nominal inflection, Ossetic allows using the case affix only on the last conjunct. When non-final conjuncts are nouns, they stand in the nominative (unmarked) form (1). But when the non-final conjuncts are pronouns which use two-stem inflection (i.e. the 1st and 2nd person singular pronouns), they appear in the genitive (oblique stem) rather than the nominative form (2).

(1) *žawər æmæ alan-æn*
Z. and A.-DAT
'to Zaur and Alan'

(2) *mæn* / **æž æmæ alan-æn*
I.GEN I.NOM and A.-DAT
'to me and Alan'

Unlike case, the plural affix cannot be suspended in Ossetic and has to be repeated under coordination (3). Also note that in (3b) the phonological form of the first conjunct is not the base to which the case suffix would be attached (final *-æ* is removed in the oblique cases in the plural).

(3) a. *me=fšəmær æmæ xo-t-æn*
my=brother and sister-PL-DAT
'to my brother and sisters', *'to my brothers and sisters'

b. *me=fšəmær-ttæ æmæ xo-t-æn*
my=brother-PL and sister-PL-DAT
'to my brothers and sisters'

These facts are problematic for lexicalist accounts, because the pattern of suspended affixation is not connected to fixed forms of non-final conjuncts or their morphosyntactic features, but depends on the internal makeup and paradigmatic properties of the conjuncts in question. In a way, the syntax has to "see" the internal structure of words, which can only be implemented in a purely lexicalist approach by including such information in the c- or f-structure, blurring the distinction between morphology and syntax.

4 Prior approaches

4.1 Ellipsis account

The first paper to describe the data above from a theoretical perspective was Erschler (2012b), which postulates morpheme ellipsis along the lines of (4).

(4) *mæn-~~æn~~ æmæ alan-æn*
I.GEN-DAT and A.-DAT
'to me and Alan'

A critique of the ellipsis account was presented in Belyaev (2014), which relied on facts such as (3b), where the "remnant" in the non-final conjuncts is not the base stem for the affix that appears on the final conjunct. A further argument is the fact that the same pattern as in suspended affixation appears with the postposition *ænæ* 'without', which clearly does not involve any ellipsis (5). Thus an analysis that can explain both phenomena is to be preferred to an analysis that treats their similarity as a coincidence.

(5) a. *ænæ žawər* / **žawər-ə*
without Z. Z.-GEN

b. *ænæ mæn* / **æž*
without I.GEN I.NOM

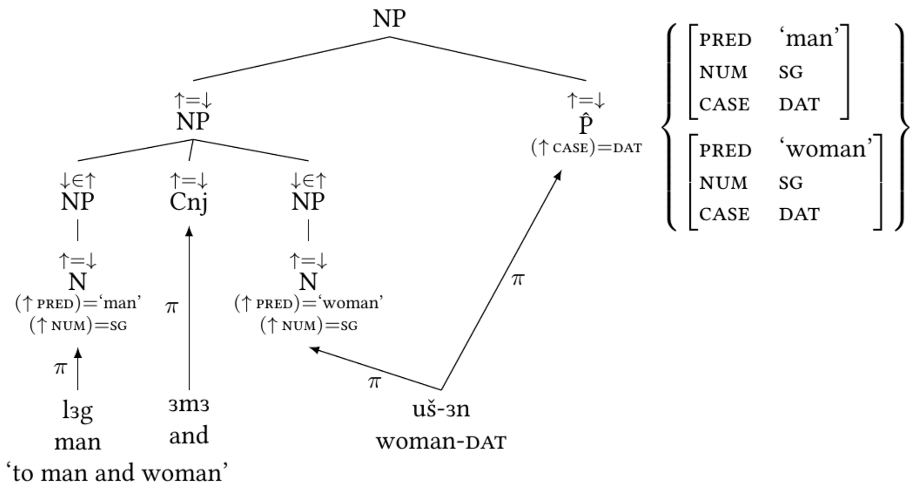

Figure 1: Coordination of nouns (Belyaev 2021)

It should be noted that Erschler (2018) presented another argument in favour of an ellipsis account: the fact that suspended affixation in Ossetic can also be used in alternative questions (6), which, according to Erschler, can be independently shown to involve ellipsis, both in Ossetic and cross-linguistically.

(6) *adæjmag* *k*ʷ*əd* *fæ-žənd?* *arv-ə* *c'æx(-æj)* *ævi* *šəǯət-æj*
person how PV-appear[PST.3SG] sky-GEN blue-ABL or earth-ABL
*ra-jg*ʷ*ərd?*
PV-be_born[PST.3SG]
‘How did the humans appear? Were they born from the sky blue or from clay?’
(Erschler 2018)

However, this argument is not theory-neutral, as it relies on a very specific understanding of ellipsis. While it is true that a full LFG account of alternative questions is (to the best of our knowledge) currently absent, it would be a *non sequitur* to adopt an ellipsis account for suspended affixation based on examples such as (6). Since LFG has no mechanism of postsyntactic deletion, in this paper we will assume that, all things being equal, a non-ellipsis account is preferable to an account that postulates the removal of morphological material.

4.2 LFG analysis with lexical sharing

The most recent version of the lexical sharing account of Ossetic case morphology and suspended affixation was presented in Belyaev (2021). The account is essentially lexicalist, but assumes that case features are introduced in a $\widehat{\mathrm{P}}$ node that is adjoined to NP and is always coinstantiated with the adjacent N node. For nouns, the “nominative” form actually doubles as the nominative proper and as a “caseless” word that only instantiates N. This allows one to use bare nouns as non-final conjuncts in suspended affixation, in a structure like shown in Figure 1.

Personal pronouns require a different mapping between morphology and syntax. This time, the nominative (*æž*, *də*) is a fully marked case form (thus unavailable for

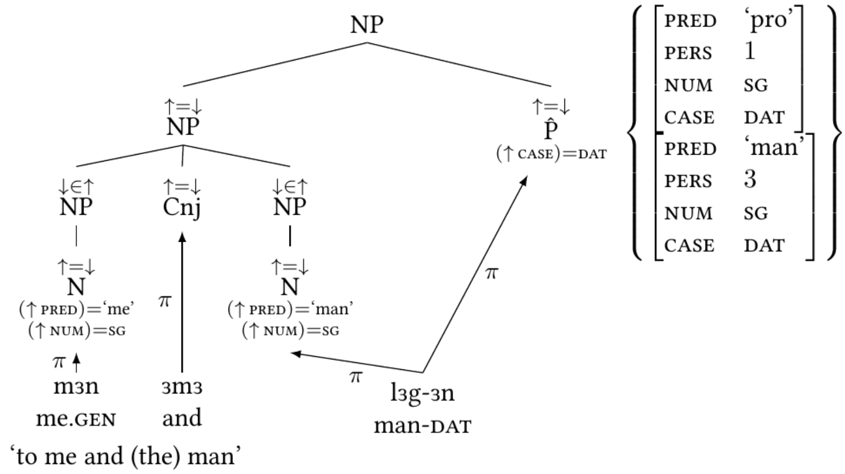

Figure 2: Coordination of a pronoun and noun (Belyaev 2021)

a. ⟨L, {NUM:sg}⟩	d. ⟨L, {NUM:pl}⟩
b. ⟨L, {NUM:sg, CASE:nom}⟩	e. ⟨L, {NUM:pl, CASE:nom}⟩
c. ⟨L, {NUM:sg, CASE:gen}⟩	f. ⟨L, {NUM:pl, CASE:gen}⟩

Figure 3: Content paradigm for Ossetic nominal inflection, fragment (Belyaev 2021)

suspended affixation), while the “genitive” (*mæn*, *dæw*) is either unmarked for case or marked as genitive. This accounts for the “genitive” appearing in nonfinal conjuncts; see Figure 2.

This analysis works on a technical level, but it is purely stipulative unless it is combined with a morphological module that can produce the needed lexical entries. Specifically, the morphology must generate lexical entries not only for all the cases-number combinations found in Ossetic, but also for the caseless forms, with the right homonymy patterns. In the standard model (Dalrymple 2015, Dalrymple et al. 2019), morphological features are formally independent from f-descriptions: hence, morphology itself must provide the needed information on the makeup of its paradigms. In the analysis of Belyaev (2021), this is handled by the PFM2 (G. T. Stump 2001, Stewart & Stump 2007) mechanism of “content paradigms”: abstract sets of features that are to be expressed through the realizational rules. A fragment of the content paradigm for Ossetic nominal lexemes is shown in Figure 3. It can be seen that the paradigm includes both a nominative slot and a caseless slot.

The stems and realization rules ensure that correct syncretism patterns are achieved for the nominative, genitive and caseless forms. Nouns have a single stem which is unmarked for case, and thus the bare stem occurs in the caseless slot. Since there is no dedicated realization rule for the nominative, the same form also appears in the nominative slot through the Elsewhere Principle. The rest of the cases have their own separate suffixal exponents. The form paradigm for *læg* ‘man’ is shown in Figure 4.

For personal pronouns, nominative forms (*æž* ‘I’, *də* ‘thou’) are treated as suppletive, i.e. as marked nominatives. The “genitive” has the same status as the “nominative” of nouns, a bare stem (*mæn* ‘me’, *dæw* ‘thee’). This form is not used for the nominative

a.	⟨*lзg*, {sg}⟩	g.	⟨*lзgtз*, {pl}⟩				
b.	⟨*lзg*, {sg, nom}⟩	h.	⟨*lзgtз*, {pl, nom}⟩				
c.	⟨*lзǯə*, {sg, gen}⟩	i.	⟨*lзgtə*, {pl, gen}⟩		a.	⟨*mзn*, {NUM:sg}⟩	
d.	⟨*lзgзn*, {sg, dat}⟩	j.	⟨*lзgtзn*, {pl, dat}⟩		b.	⟨*зž*, {NUM:sg, CASE:nom}⟩	
e.	⟨*lзgmз*, {sg, all}⟩	k.	⟨*lзgtзm*, {pl, all}⟩		c.	⟨*mзn*, {NUM:sg, CASE:gen}⟩	
f.	⟨*lзǯə*, {sg, in}⟩	l.	⟨*lзgtə*, {pl, in}⟩		d.	⟨*mзnзn*, {NUM:sg, CASE:dat}⟩	

Figure 4: Form paradigm for *læg* 'man'

Figure 5: Paradigm for *æž* 'I', fragment

because there is a dedicated suppletive form, but it is used for the genitive because the affix *-ə* is restricted to occur only on nouns. This gives the form paradigm in Figure 5.

In the model of Dalrymple (2015) and Dalrymple et al. (2019), the morphological module provides pairs of forms and their associated m-features, which are then interpreted by the morphology-syntax interface to yield the category and f-description. Since this anlaysis relies on lexical sharing, m-features must also have information on which features are associated with which head. In Belyaev (2021), this is achieved within the PFM model by redefining the paradigm function so that it splits the morphological features into two bundles: one for N and one for $\widehat{\mathrm{P}}$ (7). Coupled with the right mapping of m-features to m-descriptions, this ensures the structures in Figures 1 and 2.

(7) $\mathrm{PF}\,(\langle \textsc{læg}, \{\textsc{num} : \mathrm{sg}, \textsc{case} : \mathrm{dat}\}\rangle\,) = \langle \textit{lægæn}, \langle \{\textsc{num} : \mathrm{sg}\}_{\mathrm{N}}, \{\textsc{case} : \mathrm{dat}\}_{\widehat{\mathrm{P}}}\rangle\rangle$

Although this analysis uses lexical sharing, it conforms to lexicalism in the wide sense: "words are built out of different structural elements and by different principles of composition than syntactic phrases" (Bresnan & Mchombo 1995: 181). Indeed, words are constructed entirely in the syntax-independent morphological module, and even their head sharing patterns are defined by the morphology rather than by the syntax. Lexical sharing itself is a fairly limited mechanism, and thus the analysis in Belyaev (2021) does not deviate much from the standard LFG model.

Yet we believe that there are a number of disadvantages to the analysis in Belyaev (2021). First, it is overly complex and includes a certain amount of redundancy. Not only are the m-features that are supplied by the morphology essentially duplicates of the corresponding f-structure features, but morphology also has to provide c-structure category information to determine which features are instantiated where, as in (7). The analysis also relies on PFM2's notion of content paradigms. As a realizational model, PFM2 needs to have information on what feature values are to be realized for a given lexical class. Yet, due to lexical integrity, this information cannot come from the syntax and has to be stipulated. But it is difficult to provide a purely morphological justification for the presence of caseless forms in the content paradigm, since they are always homonymous with other forms in the paradigm (nominative or genitive) and are only required for purely syntactic purposes (to be used in suspended affixation and with prepositions). Thus, while formally maintaining lexical integrity, the analysis effectively duplicates syntactic information in the morphology in the form of category annotations and content paradigms.

Second, the analysis fails to explain certain basic facts about Ossetic suspended affixation. It can readily be seen that suspended affixation is only possible when there is a case affix to suspend. When a case value does not have an affixal exponent, suspended affixation is not possible, as seen in (8).

(8) *žawər / [OK]žawər-ə æmæ mæn
Z. Z.-GEN and I.GEN
'of Zaur and me'

In a lexicalist model, even with lexical sharing, the syntax does not have access to the internal structure of words. Hence, in the logic of Belyaev (2021), the only way to disallow the nominative in (8) is to stipulate – in the morphology – that for certain forms such as *mæn*, both case and number are associated with N and there is no "splitting" of features as in (7) and no co-instantiation of N and $\widehat{\mathrm{P}}$. In this model, there is no way to state the obvious generalization that the reason why *žawər* is unavailable in (8) is that there is no affix that can scope over the coordinate phrase. This puts the analysis at an explanatory disadvantage vis-à-vis the ellipsis account (Erschler 2012b), which predicts (8) since there is no affix to be elided in this coordinate phrase.

Finally, adhering to lexical integrity means that enclitic pronouns have nothing to do with the morphological analysis: since they are irregular, they are simply provided to the syntax "as is", complete with their f-description. But the genitive–inessive–ablative syncretism found in the enclitic system has clear parallels in the inflection of nouns and pronouns. The strict separation between morphology and syntax obscures this similarity and requires one to use disjunctive f-descriptions for forms such as *=mæ* (1sg. genitive, inessive and ablative) instead of simpler, underspecified lexical entries.

In sum, in our view, all this shows that Ossetic suspended affixation presents a genuine problem for lexical integrity that cannot easily be overcome through partial solutions such as lexical sharing. While a lexicalist account is technically feasible, it suffers from redundancy and the need for *ad hoc* stipulations. Below we will show how most of these problems can be resolved if they key insights of Belyaev (2021) are carried over to LrFG, a framework inspired by both LFG and Distributed Morphology.

5 Analysis

5.1 Phrase structure and basic vocabulary items

The phrase structure that we propose for Ossetic case inflection in terms of LrFG is very similar to the one used in the analysis of Belyaev (2015), and shown in Figure 6.[6] The f-structure will become clear below, after the templates and vocabulary items (VIs) have been introduced.

The lowercase counterparts to category labels ("categorizers") are used following standard DM practice that has been carried over into most LrFG work. They attach to acategorial roots or functional elements to promote them to one of the major categories, acting as nominalizers, verbalizers, etc. Of course, no language treats all VIs for non-functional items as acategorial; if a VI is exclusively associated with some lexical category, it can be represented as a span of the root and the adjacent lowercase category. There is good evidence that many nominal roots in Ossetic are acategorial: most "adjectives" can also act as nouns (e.g. *xorž* can mean both 'good' and 'goodness'), and some nouns can attach adjectival morphology (e.g. *læg* 'man' has the comparative *læg-dær* 'manlier'); nouns can also productively form complex predicates with the verb *kænən*

[6] We analyze Ossetic as having a DP following arguments in Erschler (2019), which we find convincing.

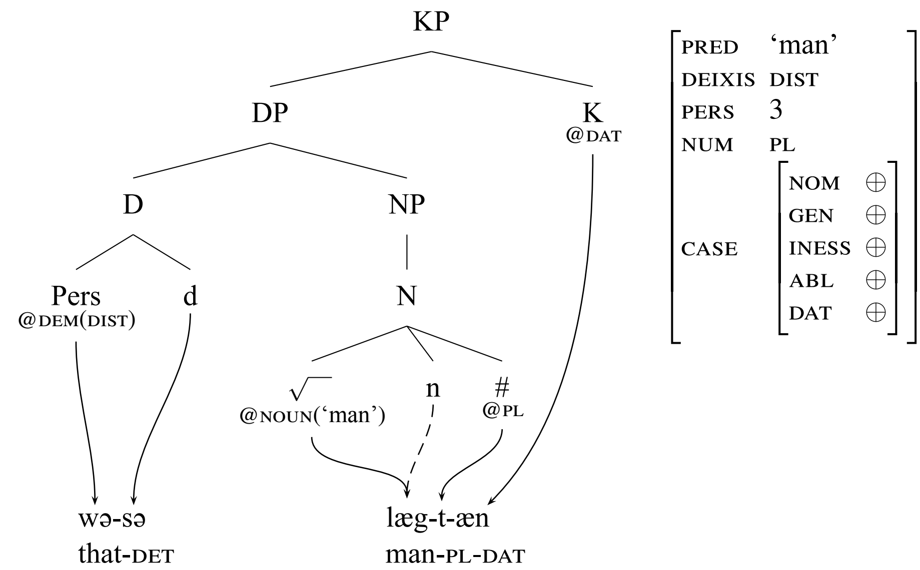

Figure 6: C-, v- and f-structures for Ossetic case-marked DPs

‘do’, which can be treated as a verbalizer, as done in the analysis by Grashchenkov (2018). Thus the decomposition of X^0 heads into roots and categorizers is not just a notational convention, but motivated in the syntax of Ossetic.

Overall, the tree in Figure 6 is an almost exact counterpart to the tree used in the lexical sharing analysis: the K node heads its own projection and is situated above NP/DP, just as $\widehat{\mathrm{P}}$ in Belyaev (2021), while the plural morpheme is located below N, which indicates its syntactic irrelevance. In effect, this tree can be viewed as a “zoomed in” version of the tree in Figure 1, with the status of $\sqrt{}$, n/d and # not much different from “sublexical nodes” used in standard LFG (Bresnan et al. 2016: 368–369,384–385,395–396).

To get the realizations for case- and number-marked nouns, we propose the VI for nominal roots as in (9). Since the VI defines a realization only for the root, and there is no overt nominalizer for roots in Ossetic, the n node is “Pac-Man spanned” [7] with the root, which is indicated by a dashed line in Figure 6 and elsewhere. For the plural, the VIs in (10) can be used; we treat *-tæ* as a special realization that is constrained to occur in the nominative (double angle brackets signify equations that constrain the occurrence of the VI but do not participate in determining the most specific realization) due to examples like (3b), which show that *-æ* is not a nominative affix. Case markers are modeled as in (11), where the genitive is constrained as not occurring on pronouns.[8]

(9) $\langle [\sqrt{}], \{@\text{NOUN}(\text{‘man’})\}\rangle \xrightarrow{\nu} \textit{læg}$

(10) a. $\langle [\#], \{@\text{PL}\}\rangle \xrightarrow{\nu} \textit{-t}$

b. $\langle [\#], \left\{ \begin{array}{c} @\text{PL} \\ \langle\!\langle @\text{NOM} \rangle\!\rangle \end{array} \right\} \rangle \xrightarrow{\nu} \textit{-tæ}$

[7] Pac-Man spanning is a mechanism whereby a node which has no suitable exponent is spanned with an adjacent node if both map to the same f-structure; see, among others, Asudeh et al. (2022).

[8] An anonymous reviewer wonders whether the “suspended affixes” in Ossetic are actually clitics. Indeed, Ossetic case markers do not utilize the host identification mechanism (Asudeh et al. 2023) and are thus clitics or “leaners” rather than affixes in LrFG terms; however, due to their host sensitivity they should still be classified as affixes from the descriptive point of view.

(11) a. $\langle\,[\mathrm{K}], \left\{\begin{matrix} @\textsc{gen} \\ \langle\!\langle \neg(\uparrow\ \textsc{pred fn}) = \\ \text{pro}\rangle\!\rangle \end{matrix}\right\}\rangle \xrightarrow{\nu}$ *-ə*

b. $\langle\,[\mathrm{K}], \{@\textsc{dat}\}\rangle \xrightarrow{\nu}$ *-æn*

c. $\langle\,[\mathrm{K}], \{@\textsc{all}\}\rangle \xrightarrow{\nu}$ *-mæ*

The VI for the demonstrative stem is given in (12a), while the suffix *-sə* that allows it to be used as an adnominal determiner is shown in (12b).

(12) a. $\langle\,[\mathrm{Pers}], \{@\textsc{dem}(\textsc{dist})\}\rangle \xrightarrow{\nu}$ *wə* b. $\langle\,[\mathrm{d}],\ \_\ \rangle \xrightarrow{\nu}$ *-sə*

The templates for nouns (13) and demonstratives (14) are quite straightforward. For demonstratives, the PRED feature is optional because, as we will see below, the same stem occurs in the adnominal position and in independent pronouns. The @SG and @PL templates simply serve as shorthand for $(\uparrow \textsc{num}) = \textsc{sg}$ and $(\uparrow \textsc{num}) = \textsc{pl}$, respectively.

(13) $\textsc{noun}(\_\textsc{p}) :=$ $(\uparrow \textsc{pred}) = \_\textsc{p}$ $(\uparrow \textsc{pers}) = 3$

(14) $\textsc{dem}(\_\textsc{dx}) :=$ $(\uparrow \textsc{pers}) = 3$ $(\uparrow \textsc{deixis}) = \_\textsc{dx}$

5.2 Case hirerachy

We model cases as a hierarchy inspired by the work of Caha (2009); however, instead of functional projections in a phrase structure tree, we use a system of privative features for each of the individual cases, organized into templates where the template for each successive case in the hierarchy inherits from the template for the preceding case (Asudeh et al. 2024); see a fragment in (15).

(15) a. $\textsc{nom} :=$ $(\uparrow \textsc{nom}) = \oplus$ b. $\textsc{gen} :=$ $@\textsc{nom}$ $(\uparrow \textsc{gen}) = \oplus$ c. $\textsc{iness} :=$ $@\textsc{gen}$ $(\uparrow \textsc{iness}) = \oplus$

The complete hierarchy that we assume for Ossetic is displayed in Figure 7. Note that unlike the configurational approach of Caha (2009), feature hierarchies of this type can be branching. In Ossetic, we claim that only the core five cases (nom., gen., iness., abl. and dat.) form a linear hierarchy; the other three (super., equ. and all.) are placed outside the hierarchy in that they do not inherit from any other cases. The motivations for specific inheritance patterns are indicated by the circled areas. We will discuss how exactly this case contingency operates for each individual instance below.

These templates for cases now allow us to construct the f-structure in Figure 6.

5.3 Nouns

In Figure 6, we saw the c- and f-structures for a noun-headed DP marked by an oblique case with a dedicated marker, dative. All the other case forms except the nominative have exactly analogous structures, modulo the case feature and its exponent. The nominative has no VI that can act as its exponent, and thus, per standard LrFG assumptions, the case node in this form forms a span with the closest node belonging to the same f-structure (so-called Pac-Man spanning). This is seen in Figure 8; ditto for the singular feature in the # node, which also has no VI that can instantiate it.

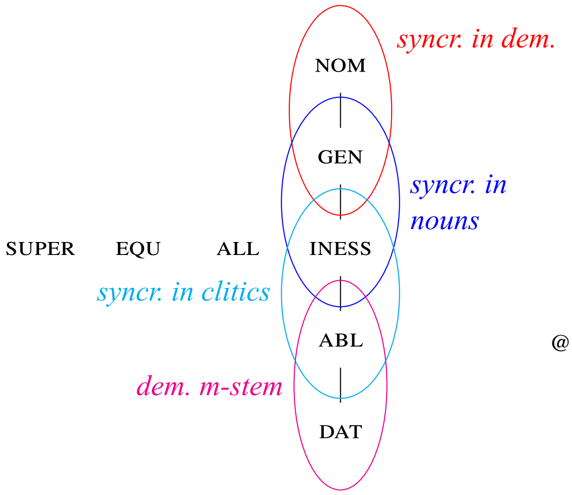

Figure 7: Case hierarchy for Ossetic

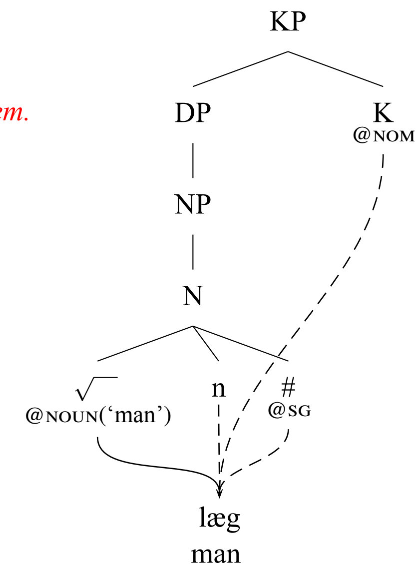

Figure 8: Structure of nominative nouns

Since the "nominative" form of the noun in this analysis is just the bare stem that is not specified as instantiating K in the vocabulary, it can be used as a nonfinal conjunct in the context of "suspended affixation" – which is, in our terms, coordination of two or more DPs under a single KP; see Figure 9. Since proper nouns like *žawər* 'Zaur' and *alan* 'Alan' can never act as adjectives or adverbs, we treat them as lexical spans, hence the solid lines in the mapping from n to the exponent.

Our case hierarchy in Figure 7 ensures the syncretism between genitive and inessive in noun inflection: the inessive directly inherits from the genitive, and thus they both share the feature [GEN ⊕]. There is no specialized VI that can act as an exponent for the inessive, thus the genitive VI, shown in (11a) above, is the most specific VI that is compatible with the features of the inessive.

5.4 Personal pronouns

1st and 2nd person singular pronouns differ from nouns in having dedicated suppletive nominative forms, which we treat as spans that include the sub-N^0 nodes as well as K (16a). The "genitive" is the bare, unmarked stem (16b). The template for personal pronouns is provided in (17).

(16) a. $\langle [\text{Pers,n,\#,K}], \left\{\begin{matrix} @\textsc{pron}(1\ \textsc{sg}) \\ @\textsc{nom} \end{matrix}\right\} \rangle \xrightarrow{\nu}$ *æž*

b. $\langle [\text{Pers,n,\#}], \{@\textsc{pron}(1\ \textsc{sg})\} \rangle \xrightarrow{\nu}$ *mæn*

(17) $\textsc{pron}(\_\textsc{pers}\ \_\textsc{num}) :=$
$(\uparrow \textsc{pred}) = \text{'pro'}$
$(\uparrow \textsc{pers}) = \_\textsc{pers}$
$(\uparrow \textsc{num}) = \_\textsc{num}$

The structure of the suppletive nominative is shown in Figure 10. Unlike the bare stems of nouns, bare stems of pronouns cannot be used for the nominative, because both the c-structure features and the f-structures described by (16a) subsume those described by (16b). But in the genitive, using the bare stem with a Pac-Man spanned K head (mapping shown as dashed line), shown in Figure 11, is the only option because there is

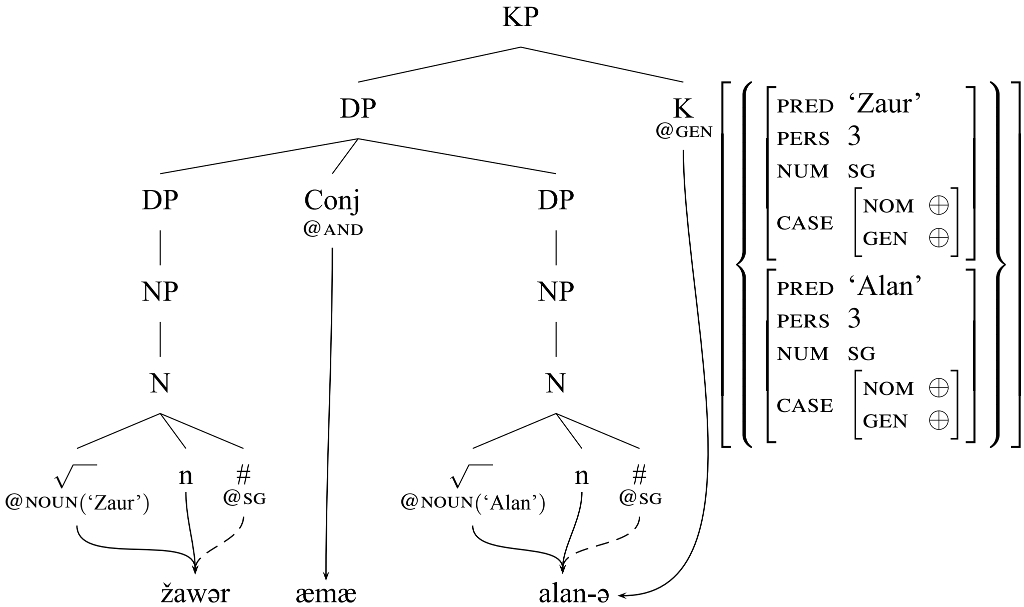

Figure 9: C- and f-structures for suspended affixation with nouns

neither a suppletive genitive nor a genitive affix compatible with pronouns available. At the same time, as shown in Figure 12, since the VI for the bare stem does not expone the K node or constrain the case feature, it can function as a non-final conjunct in suspended affixation and serve as the stem for all non-nominative cases.

Plural 1st and 2nd person pronouns have a single stem that is unmarked for case; see (18). Since the genitive *-ə* is unavailable, the same form also fills in the genitive slot; presumably, the inessive is unavailable for semantic reasons. Note that unlike the singular pronouns, the VIs do not span the # head, because the plural suffix is in fact available for these pronouns: the forms *max-tæ* (we-PL) and *šəmax-tæ* (you-PL) are attested in certain contexts.

(18) $\langle$ [Pers, n], $\{$@PRON(1 PL)$\}\rangle \xrightarrow{\nu}$ *max*

We can now turn to the question of how the ungrammaticality of (8), where the genitive Pac-Man spanned with the final conjunct *mæn* 'me' is shared with the first conjunct, is to be explained under this analysis. As seen in Figure 11, in the genitive forms of the 1st and 2nd person pronouns, the K node is Pac-Man spanned with the stem. It seems reasonable to assume the following general constraint on spanning (or at least on Pac-Man spanning): c-structure nodes that participate in a span must map to the same f-structure, or, in more formal terms: $\forall v.\exists! f.\forall n \in \nu^{-1}(v).\phi(n) = f$. That is, for every v-structure v (that is, a morphological exponent) there is one and only one f-structure f such that any node n that is realized by v maps to f. When two or more DPs are coordinated under one K, the nodes under N^0 map to the f-structure of the final conjunct, while K maps to the whole f-structure set for the coordinate phrase; thus the constraint is violated.[9] It remains to be seen, as an empirical question, whether this

[9]The same constraint explains why nominative coordinate phrases with a non-final pronominal stem like **mæn æmæ alan* 'me and Alan' are ungrammatical. In this example, too, the nominative K head is

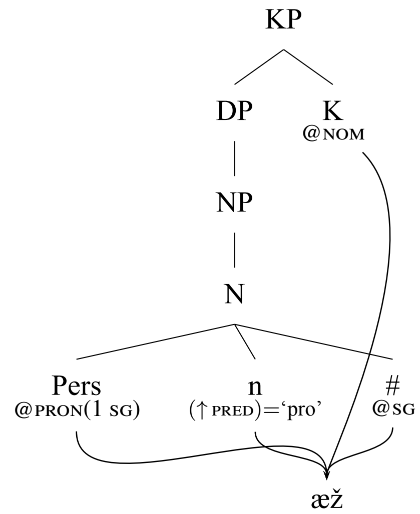

Figure 10: Suppletive nominative

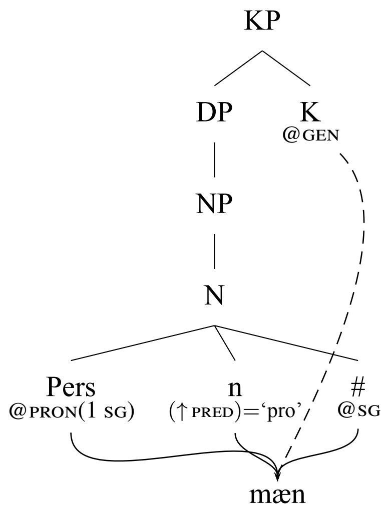

Figure 11: Bare oblique as genitive

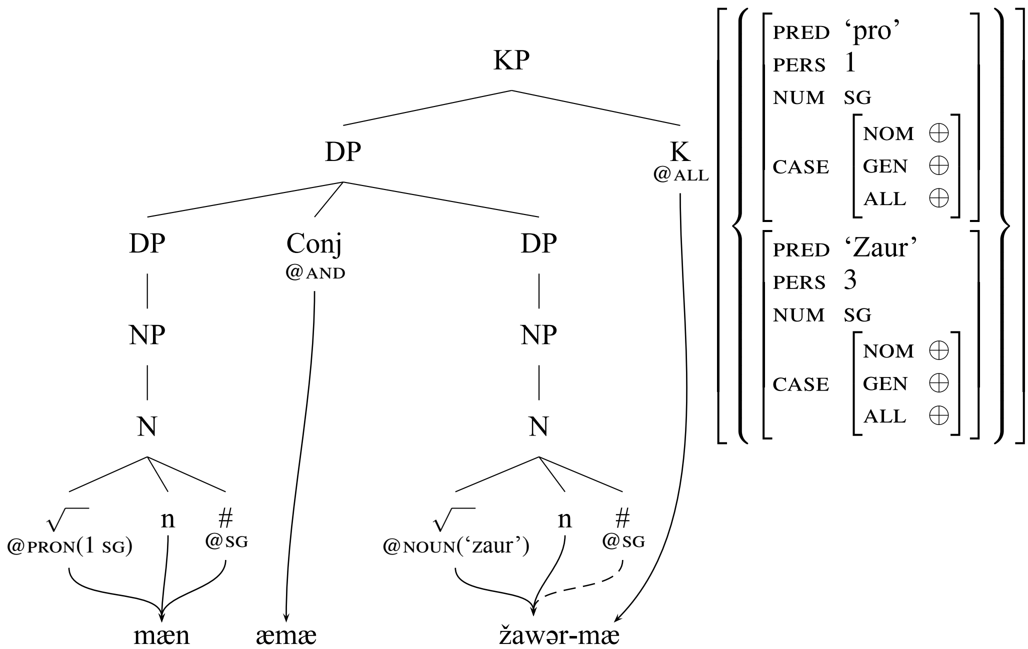

Figure 12: C- and f-structures for suspended affixation with pronoun and noun

constraint is too strong.

5.5 Demonstratives, interrogatives and reflexives

Demonstratives have a more complex paradigm structure. They appear to use three distinct irregular forms: (a) the *j*-form in the nominative and genitive (*wə-j*); (b) the *m*-stem in the dative, inessive and ablative; (c) the bare stem, as expressed by the VI in (12a) above, in the rest of the cases (*wə-*). The marker *-j* can be defined as an exponent of singular number in # and the nominative case in K (19); this predicts its use in the genitive as well (since the genitive *-ə* is constrained not to occur on pronouns).

(19) $$\langle [\#, \mathrm{K}], \left\{\begin{array}{c} @\textsc{nom} \\ \langle\!\langle (\uparrow \textsc{deixis}) \rangle\!\rangle \\ @\textsc{sg} \\ \langle\!\langle (\uparrow \textsc{pred fn}) =_c \text{pro} \rangle\!\rangle \end{array}\right\} \rangle \xrightarrow{\nu} \textit{-j}$$

Since the inessive *wə-m* serves as the stem for abl. *wə-m-æj* and dat. *wə-m-æn*, we could define *-m-* as a stem extender (an exponent for the n head) constrained as $\langle\!\langle @\textsc{iness} \rangle\!\rangle$. This would mean that the inessive has no separate exponent and is Pac-Man spanned with the "inessive stem", which in turn predicts the possibility of using the inessive forms *am*, *wəm* in suspended affixation. This prediction is not borne out; neither the *m*-stem forms nor the bare stems can be used in suspended affixation:

(20) **wə-m æmæ alan-æn*
that-IN and A.-DAT
('to him and Alan')

(21) **wə æmæ alan-mæ*
that and A.-ALL
('towards him and Alan')

It thus appears more correct to consider the inessive *-m* as a case affix that is distinct from the stem-forming *-m*. An additional confirmation for this analysis is the reflexive paradigm (Table 4), in which the stem marker *-s-* surfaces in the ablative and dative, but not the inessive. This gives the following VIs for the two *-m* markers:

(22) a. $$\langle [\#, \mathrm{K}], \left\{\begin{array}{c} @\textsc{iness} \\ \langle\!\langle (\uparrow \textsc{deixis}) \rangle\!\rangle \\ @\textsc{sg} \\ \langle\!\langle (\uparrow \textsc{pred fn}) =_c \text{pro} \rangle\!\rangle \end{array}\right\} \rangle \xrightarrow{\nu} \textit{-m}_1$$ b. $$\langle [\mathrm{n}, \#], \left\{\begin{array}{c} \langle\!\langle @\textsc{abl} \rangle\!\rangle \\ \langle\!\langle (\uparrow \textsc{deixis}) \rangle\!\rangle \\ @\textsc{sg} \\ \langle\!\langle (\uparrow \textsc{pred fn}) =_c \text{pro} \rangle\!\rangle \end{array}\right\} \rangle \xrightarrow{\nu} \textit{-m}_2$$

In effect, we postulate two homonymous *-m* markers: the stem marker and the inessive case marker. This can be indirectly confirmed by data from Digor Ossetic, where the distal demonstrative forms for dative, ablative and inessive are *wo-m-æn*, *wo-m-æj* and *wo-m-i*, respectively. As in Digor, this suggests that in all three forms *-m* is a stem marker. Yet in the plural, where the distal stem is *won-*, the same three cases have the forms *won-æn*, *won-æj* and *won-æ-**mi***. The latter form suggests that the inessive exponent in Digor is *-mi*, and the *-m* in the inessive is not part of the stem.

We further have to explain why $\textit{-m}_1$ (or *-s* in the reflexive) cannot appear without a following overt case affix. One way to explain this is to explicitly assert that *-m* forms a bound stem. In LrFG, this can be done by supplying the VI with the annotation (HOST •), an inside-out statement requiring this VI to be the host for some other VI.

Pac-Man spanned with the noun stem, and thus cannot scope over non-final conjuncts.

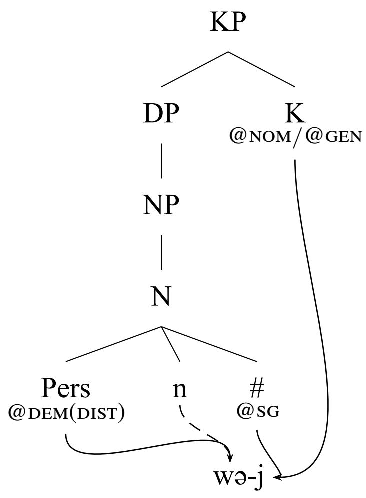

Figure 13: Demonstrative nom. / gen.

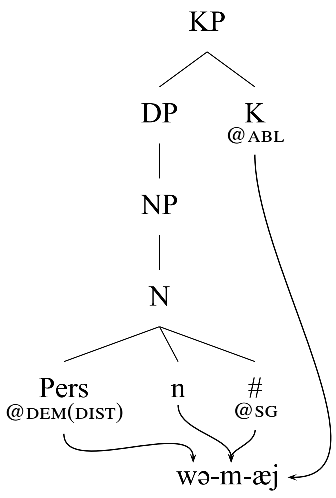

Figure 14: Demonstrative ablative

We can similarly characterize the demonstrative stem in (12) as a bound stem. It remains to be seen whether this stipulation is truly required, or a deeper explanation could be found for the bound status of these forms.[10] The structure for the nominative/genitive form is shown in Figure 13 (@NOM/@GEN abbreviates two different trees); for the *m*-stem ablative, in Figure 14.

The plural marker *-don* can be analyzed as occupying the n node (23), given that it is compatible with the second plural in *-tæ*. Note that in our analysis, the number features of pronouns are introduced by their functional heads, so *-don* does not really function as a plural marker *per se*, but rather, as a nominalizer that is licensed by a plural pronoun.

(23) $\langle\, [\mathrm{n}], \left\{ \begin{matrix} \langle\!\langle (\uparrow \textsc{deixis}) \rangle\!\rangle \\ \langle\!\langle @\textsc{pl} \rangle\!\rangle \end{matrix} \right\} \rangle \xrightarrow{\nu}$ *-don*

The paradigm structure of the interrogatives is essentially the same as that of demonstratives and we can generally use similar VIs, with the exception that the nominative *či* 'who' and *sə* 'what' should be defined as suppletive VIs; see (24).

(24) a. $\langle\, [\mathrm{Pers,n,\#,K}], \left\{ \begin{matrix} (\uparrow \textsc{pred}) = \text{‘pro’} \\ (\uparrow \textsc{pers}) = 3 \\ (\uparrow \textsc{spec}) = \textsc{wh} \\ @\textsc{nom} \end{matrix} \right\} \rangle \xrightarrow{\nu}$ *či* b. $\langle\, [\mathrm{Pers}], \left\{ \begin{matrix} (\uparrow \textsc{pred}) = \text{‘pro’} \\ (\uparrow \textsc{pers}) = 3 \\ (\uparrow \textsc{spec}) = \textsc{wh} \end{matrix} \right\} \rangle \xrightarrow{\nu}$ *kæ*

Note that if the VIs *kæ-* and *sæ-* are defined as bound stems, interrogatives turn out to be the only lexical class that does not have caseless forms available for independent

[10] The ungrammaticality of *wə* as an independent word can be explained by the requirement that a phonological word in Ossetic be at least bimoraic; *wə* has a short vowel and thus only one mora (see Borise & Erschler 2022). As for *wəm*, there is independent evidence that syllable-final *-m* may or may not have a mora (Alekseev & Tyutyunnikova 2023), thus the two *-m* morphemes could have different phonological status. However, this explanation does not apply to *a* 'this', which has a long vowel yet cannot be used independently in modern Ossetic. Neither does it work for the reflexive stem *xi-s-*, which would be an admissible word from the prosodic point of view; however, *-s-* can alternatively be analyzed as an epenthetic, because the same consonant appears with some preverbs attaching to vowel-initial stems, cf.: *agurən* 'to look for' (ipfv.), *ba-s-agurən* 'to look for' (pfv.).

use. This correctly predicts, as in Belyaev (2021), that interrogatives cannot be used with suspended affixation; the only option is to repeat the case marker, which, in our analysis, means to coordinate two complete KPs:

(25) **či* / **kæj* / **kæm* / OK*kæm-æj æmæ sæm-æj*
who.NOM who.GEN who.IN who-ABL and what-ABL
'from whom and what'

For reflexives, *xi* is the exponent conditioned as @GEN, while *-s-* is defined exactly as *-m* in (22). Since there is no inessive exponent compatible with reflexives, *xi* also serves as the inessive, as predicted.

5.6 Clitics

Finally, we turn to the analysis of second-position clitics. As seen in Table 5, the forms of the clitics are not directly derivable from normal case endings, even though there are certain regularities within the clitic system: the single-consonant stems for the person-number features and the endings for some of the cases: *-ən* (dative), *-æm* (allative), *-əl* (superessive). However, irregularities far outweigh the regularities, and since this is a closed class of elements, we can assume that they are not synchronically decomposable and are instead stored in the lexicon as complete VIs. Following standard LFG practice, we also assume that clitics occupy the special syntactic category CL (Bögel et al. 2010, Lowe & Belyaev 2015).

The irregularity of the forms themselves does not mean that the structure of the *paradigm* cannot be generalized, since clitics encode the same case features as nouns do. We will now show that the hierarchy in Figure 7 handles the syncretism patterns here as well. The dative, superessive and allative have dedicated forms and are thus completely marked for their respective cases (note that these are all at the lower end of or outside the hierarchy, and thus these forms cannot be used for anything else). The syncretic genitive-ablative-inessive forms *=mæ* 'me', *=dæ* 'thee', *=næ* 'us', *=wæ* 'you' and *=sæ* 'them' can be viewed as realizing the @GEN template, from which the ablative and inessive inherit. No clitic can be used for the equative, because there is no dedicated form and the equative deos not inherit from any other case in the hierarchy in Figure 7.

(26) $\langle\,[\mathrm{CL}], \left\{\begin{matrix}@\textsc{pron}(3\ \textsc{pl})\\ @\textsc{gen}\end{matrix}\right\}\rangle \xrightarrow{\nu} =\textit{sæ}$

The 3rd person clitics are somewhat special. The 3sg. genitive *=æj* / *=jæ* is not syncretic with any other case. In terms of our analysis, this means that in addition to the realizational specifications in (26), it is also explicitly prevented from expressing the inessive (and consequently, all cases lower in the hierarchy); see (27). The clitic *=zə* is used for the inessive and ablative in the singular and, optionally, in the plural, which means that it can be defined as realizing @INESS but unspecified for number; see (28).

(27) $\langle\,[\mathrm{CL}], \left\{\begin{matrix}@\textsc{pron}(3\ \textsc{sg})\\ @\textsc{gen}\\ \langle\!\langle\neg(\uparrow\ \textsc{in})\rangle\!\rangle\\ \langle\!\langle\neg(\uparrow\ \textsc{equ})\rangle\!\rangle\end{matrix}\right\}\rangle \xrightarrow{\nu} =\textit{æj}$ (28) $\langle\,[\mathrm{CL}], \left\{\begin{matrix}@\textsc{iness}\\ (\uparrow\ \textsc{pers}) = 3\\ (\uparrow\ \textsc{pred}) = \text{`pro'}\end{matrix}\right\}\rangle \xrightarrow{\nu} =\textit{zə}$

This definition of =*zə* leads to a welcome "side effect": since =*zə* is unmarked for number, and =*sæ* is underspecified for case, **MostInformative**$_f$ (see Asudeh & Siddiqi 2023) ranks both as equally appropriate candidates for exponing CL as neither of the f-structures required by the VIs subsumes the other, i.e. exactly the kind of free variation that we see in the paradigm in Table 5.

6 Behaviour of the preposition 'without'

The distribution of nominal and pronominal forms used with *ænæ* 'without', as seen in (5) above, can be accounted for within this analysis if we assume that this preposition attaches to DPs rather than KPs. In this configuration, it is only compatible with those forms that can be used independently without a case exponent – which are exactly the "nominative" of nouns and the "genitive" of personal pronouns.

This analysis also implies that those lexical items that lack free "caseless" forms, viz. interrogatives, are unable to be used with this preposition, just as they cannot be used in suspended affixation (25). This is indeed the case: both **ænæ či* (with the nominative) and **ænæ kæj* (with the genitive) are ungrammatical; to express the meaning 'without whom', one has to use the fallback ablative government option: *ænæ kæmæj*.

7 Conclusions

In this paper, we propose a novel analysis of Ossetic suspended affixation in terms of LrFG. While being conceptually close to the lexical sharing analysis of Belyaev (2021), it has the advantage of abandoning the redundant distinction between morphological and syntactic features and replacing the arbitrary content paradigms of PFM2 with standard LFG phrase structure rules. The lack of "suspended" affixation with portmanteau forms is also accounted for by constraints of the spanning mechanism of LrFG. Furthermore, using a model where morphology directly expones the syntax allows us to use a hierarchy in the spirit of Caha (2009) to model case syncretism and allomorphy in both regular inflection and in the clitic subsystem. This leads to the analysis capturing all the data of prior analyses as well as predicting the free variation between two clitic exponents in the 3rd person plural inessive and ablative. The use of features instead of functional projections used in Nanosyntax analyses also allows for a far more flexible and language-specific modeling of case hierarchies, with the option of branching. A question that is to be resolved in future work is the "syntactically inert" status of bare non-genitive stems, which requires stipulation in the current version of the analysis. It remains to be seen whether this stipulation, which was covertly present in Belyaev (2021) as well, is really needed, or the relevant facts can be explained by a deeper phonological or morphological generalization.

References

Abaev, Vasilij I. 1958. *Istoriko-ètimologičeskij slovar' osetinskogo jazyka*. [Historical etymological dictionary of Ossetic]. Vol. 1: *A-k'*. Moscow & Leningrad: Izdatel'stvo AN SSSR.

Alekseev, Danil A. & Varvara O. Tyutyunnikova. 2023. Est' li v osetinskom jazyke russkie ery? k tipologii «nevidimyx» glasnyx s osetinskoj perspektivy [Are there Russian *yer*s in Ossetic? On the typology of "invisible" vowels from the Ossetic perspective]. In *Dvadcataja konferencija po tipologii i grammatike dlja molodyx issledovatelej. tezisy dokladov*. [20th Conference on Typology and Grammar for Young Researchers. Book of Abstracts], 5–8. Saint Petersburg: ILI RAN.

Asudeh, Ash, Bronwyn Bjorkman, Frances Dowle, Neil Myler, Daniel Siddiqi & Lisa Sullivan. 2024. Fusional morphology, metasyncretism, and secondary exponence: A morphemic, realizational approach to Latin declension. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 conference*, 45–68. Konstanz: PubliKon.

Asudeh, Ash, Tina Bögel & Dan Siddiqi. 2022. Modelling exponents. Talk at Mo-MOT 2022. https://lrfg.online/wp-content/uploads/2022/11/Asudeh-Bogel-Siddiqi-2022-MOMOT22.pdf (24 July, 2023).

Asudeh, Ash, Tina Bögel & Daniel Siddiqi. 2023. Modelling exponents. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 Conference*, 23–44. Konstanz: Publikon. https://lfg-proceedings.org/lfg/index.php/main/article/view/38 (2 October, 2025).

Asudeh, Ash & Daniel Siddiqi. 2023. Morphology in LFG. In Mary Dalrymple (ed.), *The handbook of Lexical Functional Grammar*, 855–901. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185976.

Axvlediani, Georgij S. (ed.). 1963. *Grammatika osetinskogo jazyka* [A Grammar of the Ossetic language]. Vol. 1: *Fonetika i morfologija* [Phonology and morphology]. Ordžonikidze: NII pri Sovete ministrov Severo-Osetinskoj ASSR.

Bagaev, Nikolaj K. 1965. *Sovremennyj osetinskij jazyk* [Modern Ossetic language]. *Fonetika i morfologija* [Phonology and morphology]. Ordžonikidze: Severo-Osetinskoe knižnoe izdatel'stvo.

Bekoev, Dmitrij G. 1985. *Ironskij dialekt osetinskogo jazyka* [Iron dialect of Ossetic]. Ordzhonikidze: Iryston.

Belyaev, Oleg. 2015. Systematic mismatches: Coordination and subordination at three levels of grammar. *Journal of Linguistics* 51(2). 267–326. https://doi.org/10.1017/S0022226714000450.

Belyaev, Oleg. 2021. Paradigm structure influences syntactic behaviour: Ossetic case inflection. In I Wayan Arka, Ash Asudeh & Tracy Holloway King (eds.), *Modular design of grammar*, chap. 16, 251–281. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780192844842.003.0016.

Belyaev, Oleg I. 2014. Osetinskij kak jazyk s dvuxpadežnoj sistemoj: gruppovaja fleksija i drugie paradoksy padežnogo markirovanija [Ossetic as a two-case language: Suspended affixation and other case marking paradoxes]. *Voprosy jazykoznanija* 6. 31–65.

Bögel, Tina, Miriam Butt, Ronald M. Kaplan, Tracy Holloway King & John T. Maxwell III. 2010. Second position clitics and the prosody-syntax interface. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'10 conference*. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/15/lfg10.html (14 October, 2020).

Borise, Lena & David Erschler. 2022. Mora count and the alignment of rising pitch accents in Iron Ossetic. In *Proccedings of Speech Prosody 2022*, 871–875. https://doi.org/10.21437/SpeechProsody.2022-177.

Bresnan, Joan, Ash Asudeh, Ida Toivonen & Stephen Wechsler. 2016. *Lexical-functional syntax*. 2nd edn. Oxford: Wiley Blackwell.

Bresnan, Joan & Samuel A. Mchombo. 1995. The lexical integrity principle: Evidence from Bantu. *Natural Language & Linguistic Theory* 13. 181–254. https://doi.org/10.1007/BF00992782.

Broadwell, George Aaron. 2008. Turkish suspended affixation is lexical sharing. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'08 conference*. Stanford, CA: CSLI Publications. http://web.stanford.edu/group/cslipublications/cslipublications/LFG/13/papers/lfg08broadwell.pdf (23 December, 2025).

Caha, Pavel. 2009. *The nanosyntax of case*. University of Tromsø dissertation.

Dalrymple, Mary. 2015. Morphology in the LFG architecture. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'15 conference*, 64–83. Stanford, CA: CSLI Publications.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press.

Erschler, David. 2009. Possession marking in Ossetic: Arguing for Caucasian influence. *Linguistic Typology* 13. 417–450. https://doi.org/10.1515/LITY.2009.021.

Erschler, David. 2012a. From preverbal focus to preverbal "left periphery": the ossetic clause architecture in areal and diachronic perspective. *Lingua* 122(6). 673–699.

Erschler, David. 2012b. Suspended affixation in Ossetic and the structure of the syntax-morphology interface. *Acta Linguistica Hungarica* 59(1–2). 153–175. https://doi.org/10.1556/ALing.59.2012.1–2.7.

Erschler, David. 2018. Suspended affixation as morpheme ellipsis: Evidence from Ossetic alternative questions. *Glossa* 3(1). 12. https://doi.org/10.5334/gjgl.501.

Erschler, David. 2019. A new argument for existence of the DP in languages without articles. *Journal of Linguistics* 55(4). 879–887. https://doi.org/10.1017/S0022226719000288.

Erschler, David. 2020. Iron Ossetic. In Maria Polinsky (ed.), *The Oxford handbook of languages of the Caucasus*, 641–688. Oxford: Oxford University Press.

Erschler, David. 2022. Iterated D-layers and multiple case exponence: The structure and significance of a morphological *rarissimum*. *Glossa: a journal of general linguistics* 7(1). 1–38. https://doi.org/10.16995/glossa.9528.

Gagkaev, Konstantin E. 1952. *Očerk grammatiki osetinskogo jazyka* [A sketch of Ossetic grammar]. Ordžonikidze: Gos. izd-vo Severo-Osetinskoj ASSR.

Grashchenkov, Pavel V. 2018. Meždu leksikonom i sintaksisom, fonologiej, semantikoj — interfejsnye javlenija v osetinskix složnyx predikatax [Between Lexicon, Syntax, Phonology, Semantics: the Interface Phenomena in the Ossetic Complex Predicates]. *Typology of Morphosyntactic Parameters* 1(1). 73–87.

Lowe, John J. 2016. English possessive 's: clitic *and* affix. *Natural Language & Linguistic Theory* 34. 157–195. https://doi.org/10.1007/s11049-015-9300-1.

Lowe, John J. & Oleg Belyaev. 2015. Clitic positioning in Ossetic. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG15 Conference*, 229–249. Stanford, CA: CSLI Publications.

Miller, Wsewolod. 1903. *Die Sprache der Osseten*. Strassburg: Trübner.

Stewart, Tom & Gregory Stump. 2007. Paradigm Function Morphology and the morphology/syntax interface. In Gillian Ramchand & Charles Reiss (eds.), *The Oxford handbook of linguistic interfaces*, 383–421. Oxford: Oxford University Press.

Stump, Gregory. 2016. Paradigms at the interface of a lexeme's syntax and semantics with its inflectional morphology. In Daniel Siddiqi & Heidi Harley (eds.), *Morphological metatheory*, 27–58. Amsterdam: John Benjamins. https://doi.org/10.1075/la.229.02stu.

Stump, Gregory T. 2001. *Inflectional morphology: A theory of paradigm structure*. Cambridge: Cambridge University Press.

Wescoat, Michael T. 2002. *On lexical sharing*. Stanford University dissertation. https://searchworks.stanford.edu/view/4814040 (22 December, 2025).

Lexical semantics vs. Dependent Case: Urdu/Hindi datives

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Abstract

This paper discusses dative subject experiencer constructions in Urdu/Hindi. These have recently been taken to provide evidence for Dependent Case Theory, which sees the locus of explanation for case marking patterns in the phrase structural configuration two NPs are placed in. This paper reexamines the arguments and adduces more data, concluding that an analysis involving event-based linking within LFG provides a more insightful approach to the data.

1 Introduction

This paper contributes to the on-going debate as to the best approach to understanding case.[†] Legate (2024: 72), for example, provocatively concludes that “Case is out of Universal Grammar” in a recent contribution to a collection entitled *The Place of Case in Grammar* (Sevdali et al. 2024). This is because her analysis of crosslinguistic patterns shows that any understanding of case must involve a confluence of factors, which Legate identifies as encompassing at least “the structural relationships between X^0s and nominals, the structural relationships between nominals, thematic roles, predicate types, the identity of particular lexical items, and so on.” Kagan (2024) in that same volume argues that the correlations between case and meaning are widespread crosslinguistically, encompassing thematic roles, individuation/ prominence (i.e. referentiality and topic/focus) and tense/aspect. This echoes the combination of semantic and structural factors that Butt and King have been advocating since the early 1990s in their formulation of a theory of case within LFG (e.g., Butt & King 1991, 2003, 2004). The data Butt & King have drawn on come primarily from Urdu/Hindi (and some Georgian).

However, it is exactly with respect to data from Urdu/Hindi that Baker (2024) in the same *The Place of Case in Grammar* volume advocates an analysis in terms of Dependent Case Theory. In stark contrast to Kagan and Butt & King, Dependent Case sees the primary locus for an explanation of the distribution of case in terms of phrase structure relationships. This paper takes on Baker’s analysis and focuses on the role of datives. Baker specifically addresses datives as part of his analysis in order to bolster the structurally motivated Dependent Case analysis for Urdu/Hindi.

In Butt & King’s system, on the other hand, datives are semantically motivated in that they mark goals and experiencers (which are seen as an abstract type of goal). This paper reiterates Butt & King’s original position and shows that while structural factors play a role in understanding the distribution of case, they cannot provide a full account. Rather, it is argued that systematic properties governing the relationship between arguments and the event structure of a predicate play the crucial role (Schätzle 2018; Beck & Butt 2024; Kagan 2024).

2 Urdu/Hindi: The problem

Baker (2024) takes on Urdu/Hindi[1] precisely because the case patterns in this language

[†]Many thanks to Saira Bano and Benazir Mumtaz for providing interesting data points and to the two anonymous reviewers for very insightful comments.

[1]Urdu and Hindi are written in different scripts and are national languages of Pakistan and India, respectively. However, they are structurally almost identical in many respects, including case marking.

pose a challenge for Dependent Case. Urdu/Hindi has both an ergative/nominative alternation on subjects and an accusative/nominative alternation on objects, as shown in (1) and (2). These alternations operate independently from one another, contra the expectations of Dependent Case.

(1) a. ram**=ne** kamputar xarid-a
Ram.M.Sg=Erg computer.M.Sg.Nom buy-Perf.M.Sg
'Ram bought a/some computer.'

b. ram**=ne** kamputar**=ko** xarid-a
Ram.M.Sg=Erg computer.M.Sg=Acc buy-Perf.M.Sg
'Ram bought a (certain)/the computer.'

(2) a. ram kamputar xarid-e-g-a
Ram.M.Sg.Nom computer.M.Sg.Nom buy-3.Sg-Fut-M.Sg
'Ram will buy a/some computer.'

b. ram kamputar**=ko** xarid-e-g-a
Ram.M.Sg.Nom computer.M.Sg=Acc buy-3.Sg-Fut-M.Sg
'Ram bought a (certain)/the computer.'

The nominative/accusative alternation on the object in both (1) and (2) is due to Differential Object Marking (DOM), by which the accusative *ko* is obligatory when referring to humans and definite/specific objects. Thus, in (1) and (2), the *ko* conveys that a certain/specific computer rather than some random computer has beeen bought from the shop (see Butt (1993); Bhatt & Anagnostopoulou (1996); de Hoop & Narasimhan (2005) for Urdu/Hindi and Bossong (1985); Aissen (2003); Malchukov & de Swart (2009) on DOM more generally.)

The nominative/ergative alternation on the subject in (1) vs. (2) is known as split-ergativity, whereby an ergative is required on agentive subjects for a subset of situations. In Urdu/Hindi the split is aspect based, with perfective morphology on the verb making an ergative obligatory (see Patel-Grosz 2021 for an overview of ergativity in Indo-Aryan). Both split-ergativity and DOM are well-known phenomena. However, many languages seem to employ one but not the other at the same time, leading to intuitions that overt case marking should ideally only occur on one of the core grammatical relations (subject and object) in sentences as in (1) and (2). This intuition is reflected in various forms in the literature, e.g., Dixon (1994); Plank (1979) on typologically motivated ideas of case alignment, Legendre et al. (1993); Aissen (1999, 2003); de Hoop (2009) from the perspective of Optimality Theory (OT). The work by Marantz (2000); Baker (2014) and Baker & Bobaljik (2017), for example, from a Chomskyan perspective has led to the full-fledged formalization of Dependent Case Theory (Baker 2015).

Dependent Case Theory posits that an ergative is structurally dependent on the presence of a nominative object and that an accusative object is structurally dependent on the presence of a nominative subject. This is codified as in (3) (Baker 2024: 37).

(3) a. If NP1 c-commands NP2 in the same domain, then assign NP2 accusative.
b. If NP1 c-commands NP2 in the same domain, then assign NP1 ergative.

The problematic Urdu/Hindi examples for this approach are (1-b) and (2-a). This is different from languages such as Nez Perce, where one also finds an overtly marked object together with an overtly marked ergative. However, in Nez Perce, the appearance of the ergative is reportedly dependent on the appearance of the accusative. If the object is definite, as in (4-b), then it is marked with the accusative case and the subject then must be ergative. If the object is indefinite, as in (4-a), then both the subject and the object are unmarked (nominative). Patterns as in Nez Perce thus provide evidence for the Dependent Case intuition (Baker 2014: 129).

(4) a. Háama hi-'wí-ye wewúkiye. (Nez Perce)
man.**NOM** 3-shoot-ASP elk.**NOM**
'The man shot an elk.' (Rude 1986: 552)

b. Háama-nm hi-néec-'wi-ye wewúkiye-ne. (Nez Perce)
man-**ERG** 3-PL.OBJ-shoot-ASP elk-**ACC**
'The man shot the elk (pl).' (Rude 1986: 127)

Urdu/Hindi, on the other hand, would seem to go against the Dependent Case intuition. Baker (2024) ends up solving the Urdu/Hindi problem by becoming more specific about the size of the domain the basic rules in (3) can apply in. Overall, three different domains are identified as being relevant for case assignment: vP, AspP and CP. These also correspond to different phases in current Minimalist conceptualizations.

Since the appearance of the ergative crosslinguistically is often tied to aspectual information, for example, as in the perfective morphology in Hindi, Baker sees AspP as the relevant domain for ergative assignment, formulating the rule in (5-a). Conversely, the relevant domain for the assignment of accusative case is taken to be the CP. The relevant rule for Urdu/Hindi is in (5-b).

In order to deal with the constraint that ergatives in Urdu/Hindi (generally) only appear on transitive perfective verbs, he further formulates the constraints in (6).

(5) a. Phase head Asp:
high dependent case: Erg (*ne*),
low dependent case: none,
unmarked case: Nom (∅)

b. Phase head C:
high dependent case: none,
low dependent case: Acc (*ko*),
unmarked case: Nom (∅) (Baker 2024: 40)

(6) a. In Hindi perfective clauses, Asp is a hard phase head (but v is not).
b. In Hindi imperfective clauses, v is a hard phase head (but Asp is not).

Being a hard phase head entails that the relevant case assignments must happen within that phase. Let us see how this works for (7) (repeated from above). As shown in (8-a), 'Ram' is generated in the Spec of vP and 'computer' in the complement position of VP, as per standard Minimalist assumptions. The clause is perfective, so v is not a hard phase head, as per (6-a). The next relevant phase for case assignment is Asp. This is a hard phase head so case must be spelled out here. In Asp the high dependent case is ergative as per (5-a), so Ram is ergative. The low dependent case gets no marking, that is, the object 'computer' is assigned the unmarked nominative case, as shown in (8-b).

(7) a. ram=ne kamputar xarid-a
Ram.M.Sg=Erg computer.M.Sg.Nom buy-Perf.M.Sg
'Ram bought a/some computer.'

b. ram=ne kamputar=ko xarid-a
Ram.M.Sg=Erg computer.M.Sg=Acc buy-Perf.M.Sg
'Ram bought a (certain)/the computer.'

(8) a. [Asp$_{perf}$ [$_{vP}$ Ram v [$_{VP}$ buy computer]]]

b. [Asp$_{perf}$ [$_{vP}$ Ram_**Erg** v [$_{VP}$ buy computer_**Nom**]]]

This configuration accounts for (7-a). Now let's move on to (7-b). Baker (2014) essentially side steps the problem represented by this example in the following way. He adopts the insight that the appearance of the accusative is tied to specificity effects, rather than being due to purely structural constraints. Along with Bhatt & Anagnostopoulou (1996), Baker assumes that objects in Urdu/Hindi move out of the VP if they are specific, thus getting the DOM effect (see also, e.g., Diesing (1992); Ramchand (1997) for crosslinguistic argumentation).

The pattern in (7-b) is thus accounted for by assuming an alternative derivational path for (8-a). This involves the object 'computer' moving out of the VP and into the Spec of AspP, as shown in (9-b). At the same time, 'Ram' also still needs to move higher up in the tree to reach the "final position of the subject" (Baker 2014: 43) in Spec TP, as shown in (9-c). In this configuration the relevant domain for the assignment of case is the CP and as per (5) the low dependent case is accusative, which is assigned to 'computer', as shown in (9-c).

(9) a. [Asp$_{perf}$ [$_{vP}$ Ram_**Erg** v [$_{VP}$ buy computer]]]

b. [$_{AspP}$ computer Asp$_{perf}$ [$_{vP}$ Ram_**Erg** v [$_{VP}$ buy ___]]]

c. [$_{CP}$ [$_{TP}$ Ram_**Erg** [$_{AspP}$ computer_**Acc** Asp$_{perf}$ [$_{vP}$ ___ v [$_{VP}$ buy ___]]]]]

The derivation of the Nom-Nom/Acc patterns in (2), repeated here in (10), can now also follow. As before, 'Ram' is generated in Spec vP and 'computer' as the complement of VP, see (11-a). However, the clause is now not perfective and so now v is a hard phase head. Following Fox & Pesetsky (2004), a consequence of this is taken to be that the contents of the VP are rendered invisible when it is time to assign case to 'Ram' in Spec vP. So this remains unmarked (nominative). Similarly, when Ram moves further up to Spec of TP, it becomes invisible for 'computer' in the complement of VP, so this also remains unmarked (nominative). That gives us (10-a).

(10) a. ram kamputar xarid-e-g-a (Urdu/Hindi)
Ram.M.Sg.Nom computer.M.Sg.Nom buy-3.Sg-Fut-M.Sg
'Ram will buy a/some computer.'

b. ram kamputar**=ko** xarid-e-g-a (Urdu/Hindi)
Ram.M.Sg.Nom computer.M.Sg=Acc buy-3.Sg-Fut-M.Sg
'Ram bought a (certain)/the computer.'

(11) a. [Asp$_{impf}$ [$_{vP}$ Ram v [$_{VP}$ buy computer]]]

b. [$_{CP}$ [$_{TP}$ Ram [$_{AspP}$ computer_**Acc** Asp$_{impf}$ [$_{vP}$ ___ v [$_{VP}$ buy ___]]]]]

The situation changes when the object moves out of the complement of VP for DOM reasons up to within the vP. As shown in (11-b), now the CP domain contains two NPs and by (5) the lower NP in the CP domain is assigned accusative.

Baker is thus able to make the Urdu/Hindi data work while keeping the structural, configurational flavor of Dependent Case alive. He also makes a point of noting that the DOM movement of the object is essentially structural, even though it may result in a different semantics for the object. If one looks at his system, closely, though, what Baker has essentially done is to decouple the two subject and object NPs from a dependent relation exactly when it is needed, but to place them back together in a structurally dependent position when it is convenient, maintaining that structural dependency is at the explanatory core of case subject/object case assignment, even when it is not.

However, even this intricate account is not without problems within Baker's approach. This is because he posited a *Strict Cycle Condition* as in (12) in earlier work to restrict spurious case assignment.

(12) If NP1 c-commands NP2 at the spell out of XP, and NP1 also c-commands NP2 at the later spell out of YP, this c-command relationship is not considered for the purposes of dependent case assignment in YP. (Baker 2024: 46)

This condition is intended to ensure that in the face of movements to different positions in the tree, only the newer configuration counts for the assignment of Dependent Case. Yet in order to account for the Urdu/Hindi Ergative-Accusative pattern, the configurational relationship between the subject and the object is considered twice (cf. (9)), in contravention of the Strict Cycle Condition.

Rather than abandoning the new account in the face of this theory-internal contradiction, Baker points to data from Urdu/Hindi dative subjects and argues that this data speaks in favor of maintaining the Strict Cycle Condition. As such, he proposes to change the condition slightly, as shown in (13). The effect of this change is that configurations are not counted in the domain of the VP, where more than one argument can be generated, but are counted elsewhere.

(13) *If NP1 and NP2 are both spelled out for the first time in domain XP* and NP1 c-commands NP2 in XP; then NP1 c-commanding NP2 in a later spell out YP is not considered for the purposes of case assignment in YP. (Baker 2024: 48)

The next section first discusses the Urdu/Hindi dative subject data adduced by Baker and then discusses further data that goes against the Dependent Case intuition. An alternative LFG account that works with the event based linking developed in Schätzle (2018); Beck & Butt (2024); Butt et al. (2023) and Butt & Bano (2024) is proposed in section 4, followed by a final discussion in section 5.

3 Urdu/Hindi Dative Subjects

3.1 Dative Subjects and Dependent Case

Urdu/Hindi dative subjects generally adhere to the pattern shown schematically in (14), by which an experiencer subject is marked overtly with the dative and the object remains unmarked. This fits in very well with the Dependent Case intuition since only one case is overtly marked and this case marking happens as part of a typical Dependent Case configuration of two NPs being set into a relationship with one another.

(14) Kim_**Dat** appeared moon_**Nom**
Lit.: ‘To Kim appeared the moon.’, meaning ‘Kim saw the moon.’

Typical Urdu/Hindi examples with a dative subject are as in (15).[2] The examples in (16) further show that the accusative/nominative DOM alternation observed in the previous section with ergative subjects does not seem to be allowed with dative subjects. Note that the dative and the accusative are form-identical in Urdu/Hindi (and indeed, in many other Indo-Aryan languages).[3]

(15) a. ṭuʃar=ko tʃand dɪkʰ-a
Tushar.M.Sg=Dat moon.M.Nom appear-Perf.M.Sg
‘Tushar saw the moon.’ (Mohanan 1994a: 141)
b. ram=ko buxar/bimari hɛ
Ram.M.Sg=Dat fever/sickness be.Pres.3.Sg
‘Ram is feverish/sick, Ram has a fever/sickness.’

(16) a. ila=ko anu/*=ko dɪkʰ-i
Ila.F.Sg=Dat Anu.F.Sg.Nom/=Acc appear-Perf.F.Sg
‘Ila saw Anu.’ (lit. Anu appeared to Ila.) (Mohanan 1994a: 96–97)
b. mʊjʰe park-mẽ yeh gʰaṛi/*=ko mɪl-i
I.Obl.Dat park-in this watch.Nom/=Acc met/got-Perf.F.Sg.
‘I found this watch in the park.’ (Baker 2024: 47)

This seemingly strict dative-nominative configuration thus fits well with the Dependent Case intuition. The details of Baker’s analysis are as shown in (17). The two core arguments are assumed to be generated within the VP as shown in (17-a). This initial dependency relationship is governed by the statement in (18-c), which is considered to apply in Urdu/Hindi in addition to the ones already seen in (5).

(17) a. [Asp [$_{\mathrm{vP}}$ v$_{Perf}$ [$_{\mathrm{VP}}$ Tushar appear moon]]]
b. [Asp [$_{\mathrm{vP}}$ v$_{Perf}$ [$_{\mathrm{VP}}$ Tushar_**Dat** appear moon_$\emptyset$]]]

(18) c. Phase head v:
high dependent case: Dat (*ko*), low dependent case: none,
unmarked case: Nom ($\emptyset$) (Baker 2024: 40)

The relevant phase head for the configuration in (17-a) is v, so the high dependent case is dative as per (18) and that is what Tushar is marked with, see (17-b). Given that objects can in principle move up to a higher position in Spec AspP and receive accusative case there, the question is why that cannot happen for the configuration in (17). The answer is given by the revised version of the Strict Cyclicity Condition, which prohibits configurations of two NPs being (re)considered for Dependent Case if they were first spelled out in the same domain. This holds true of (17), as both the core arguments were first spelled out within the VP. It does not hold true of the ergative configuration in

[2] Here and elsewhere ‘Obl’ in the gloss refers to ‘oblique’.
[3] Evidence for the two distinct functions is adduced in Butt & King (2004).

(9) because there the two core arguments are spelled out in two different domains: VP (object) and vP (subject).

3.2 The Semantics of Dative Case

The Dependent Case account for Urdu/Hindi thus works with respect to the data seen so far. It claims to be a purely structural account; however, semantic factors are invoked indirectly in terms of: a) the movement of the object for specificity semantics; b) the different treatment of dative subjects as originating within the VP vs. ergative subjects as originating in Spec of vP.

This treatment obscures the robust generalization that all instances of datives can basically be analyzed as marking goals in Urdu/Hindi. These can be spatial goals or recipients as in (19) or they can be temporal as in (20), see Ahmed (2006) for an overview of all uses of Urdu/Hindi *ko*, and Ahmed Khan (2009) for a model of Indo-Aryan case in terms of the dimensions PATH, PLACE and DYNAMIC.

(19) a. ṭuʃar=ko kɪtab mɪl-i
Tushar.M.Sg=Dat book.F.Nom receive-Perf.F.Sg
'Tushar received a book.'

b. ram=ne kamputar ila=ko di-ya
Ram.M.Sg=Erg computer.M.Sg.Nom ila.F.Sg=Dat give-Perf.M.Sg
'Ram gave Ila the computer.

c. amra lahor=ko gɑ-yi
Amra.F.Sg.Nom Lahore=Dat go-Perf.F.Sg
'Amra went to Lahore.' (Ahmed 2006)

(20) tʃor rat=ko a-ya
thief.M.Sg.Nom night.F.Sg=Dat come.Perf.M.Sg
'The thief came at night.' (Ahmed 2006)

In addition to temporal and spatial, the goals can also be abstract, thus giving rise to experiencer subjects as in (21) and the examples already seen above.

(21) a. ram=ko hɑlva pɑsɑnd hɛ
Ram.M.Sg=Dat halva.M.Sg.Nom liking.M be.Pres.3.Sg
'Ram likes halva.' (lit. Halva liking is at/to Ram.)

b. nadya=ko kahani yad a-yi
Nadya.F.Sg=Dat story.F.Sg.Nom memory come-Perf.F.Sg
'Nadya remembered a/the story.' (lit. Story memory came to Nadya.)

A purely structural account such as that proposed by Dependent Case Theory loses this very robust generalization witih respect to the distribution of dative case in Urdu.

3.3 More on Differential Case Marking

Differential Case Marking (DCM) is pervasive in Indo-Aryan (Butt 2022), this includes DOM of the type seen above with the accusative/nominative alternation for specificity, but also other types of alternations. One of these involves Differential Subject Marking

(DSM) with ergative vs. dative subjects, as shown in (22).[4] Here the ergative signals that the event is desired by the subject, whereas the dative can be used to denote both a desire and an obligation reading, with the obligation reading being the more dominant one, cf. Bashir (1999).

(22) a. ravi=**ne** barselona ja-n-a hɛ
Ravi.M.Sg=Erg Barcelona go-Inf-M.Sg. be.Pres.3.Sg
'Ravi wants to go to Barcelona.'

b. ravi=**ko** barselona ja-n-a hɛ
Ravi.M.Sg=Dat Barcelona go-Inf-M.Sg. be.Pres.3.Sg
'Ravi must/wants to go to Barcelona.'

The ergative-dative alternation in (22) is part of a wider pattern in Urdu/Hindi by which the ergative alternates with the dative in Urdu/Hindi to express agentive vs. experiencer subjects, as illustrated by the N-V complex predicates in (23). Both constructions have been analyzed already (e.g., Mohanan (1994a); Butt & King (2004) and references therein), the dative in (23-b) is an abstract goal of the type typical for experiencer subjects in Urdu/Hindi (cf. Verma & Mohanan 1990). In N-V complex predicates (as in Urdu/Hindi complex predicates more generally), the light verb determines the case marking on the subject: the agentive 'do' requires an ergative subject whereas the motion verb 'come' requires a goal.

(23) a. nadya=**ne** kahani yad k-i
Nadya.F.Sg=Erg story.F.Sg.Nom memory do-Perf.F.Sg
'Nadya remembered a/the story.' (lit. Nadya did memory of story.)

b. nadya=**ko** kahani yad a-yi
Nadya.F.Sg=Dat story.F.Sg.Nom memory come-Perf.F.Sg
'Nadya remembered a/the story.' (lit. Story memory came to Nadya.)

The use of the dative vs. the ergative in (22) is trickier to analyze, but basically seems to be due to an agentive vs. non-agentive contrast whereby the ergative signals the agentive variant and is placed in contrast to the dative, which is associated with reduced agentivity via its core goal semantics (Butt & King 2004).

Examples as in (22) are not taken into account in Baker's treatment of Urdu/Hindi. Examples such as (23) could in principle be made to work along the lines summarized above once an account of complex predication were in place. In (23) the difference in case marking on the subjects can be made to follow from the choice of light verb. However, in (22) it is not clear what structural factor coud be taken to drive the observed DSM: the only overt difference between the two examples is the case marking.

A further case in point is that a number of other alternations can also be found in Urdu/Hindi. One of these involves an alternation between the polysemous *se* 'from, with, by' (see Butt & Ahmed 2011) and the accusative *ko*.[5] This is found for example in (24) with the verb 'meet' that we have already encountered as a experiencer predicate. Example (25) shows its use with agentive psych predicates.

[4]Generally DCM is taken to pertain only to a situation in which a marked case alternates with an unmarked case. However, I see no reason why situations as in (22) should not be classified as DCM.

[5]The *se* is glossed as instrumental ('Inst') in the close gloss for the sake of convenience since this is its most general meaning. In the examples in this paper it is mainly used to denote sources.

(24) a. ravi amra=**ko** bagʰ=mẽ mɪl-i
Ravi.M.SgNom Amra.F.Sg=Acc garden=in met-Perf.F.Sg
'Ravi met Amra in the garden.'

b. ravi amra=**se** bagʰ=mẽ mɪl-i
Ravi.M.Sg.Nom Amra.F.Sg=Inst garden=in met-Perf.F.Sg
'Ravi met (with) Amra in the garden.'

(25) a. ram sigɑrət=**se/ko** nɑfrɑt kɑr-ta
Ram.M.Sg.Nom cigarette.F=Inst/Acc hate.F do-Impf.M.Sg
'Ram hates cigarettes.'

b. ram ʊs lɑṛki=**se/ko** nɑfrɑt kɑr-ta
Ram.M.Sg.Nom that.Obl girl.F.Sg=Inst/Acc hate.F do-Impf.M.Sg
'Ram hates that girl.'

Examples as in (24) and (25) could be accounted for by positing different structural positions that the object argument moves into, but again, the main difference seems to be located in the semantics ascribed to the object argument and it therefore seems that this is where the locus of explanation should also lie.[6]

3.4 DOM and Dative Subjects

This section returns to the observation that dative subjects seem to prohibit an overt marking on the object. This is surprising, given the overall propensity in Urdu/Hindi for DCM, but it is an observation that has so far been robustly attested in the existing lierature. For example, de Hoop & Narasimhan (2005) formulate an Optimality Theory constraint-based account of case marking for argument identification in Hindi and also conclude that dative subjects only allow for dative-nominative configurations. Example (26-a) is particularly remarkable because Urdu/Hindi nominative/accusative DOM generally requires human objects to be marked with *ko*, but this is completely ungrammatical in conjunction with a dative subject.

(26) a. ram=**ko** lɑṛki/*=**ko** pɑsɑnd hɛ
Ram.M.Sg=Dat girl.F.Sg.Nom/=Acc liking.M be.Pres.3.Sg
'Ram likes that girl.'

b. ram=**ko** hɑlva/*=**ko** pɑsɑnd hɛ
Ram.M.Sg=Dat halva.M.Sg.Nom/=Acc liking.M be.Pres.3.Sg
'Ram likes halva.'

One possible explanation for the patterns in (26) could be in terms of the Obligatory

[6]A reviewer points out that the use of *ko* on 'cigarette' in (25) is unexpected since we have so far been told that *ko* is a marker of specificity. There is indeed more to be said about the use of *ko* on objects, with Butt (1993) and Bhatt & Anagnostopoulou (1996) having made a good beginning, but with much more to be done on the connection to the semantics of indefinites and generics. On the one hand, Urdu/Hindi bare nouns can also receive specific readings. On the other hand, *ko*-marked phrases can receive generic interpretations, as in 'I am going to the doctor's.', where a generic doctor's office is being referred to, but *ko* marking on 'doctor' is nevertheless possible. Veneeta Dayal's body of work contains the most advanced insights with respect to Urdu/Hindi, see Dayal & Sağ (2020) for references and an overview of the interconnected topics of kind terms, genericity, (in)definiteness, specificity, bare nouns and pseudoincorporation. As such, section 4 begins a move away from the particular specificity analysis of *ko* towards a more general notion of result/goal and quantizedness.

Contour Principle (OCP) that Mohanan (1994b) posits as a constraint on case realization in Urdu/Hindi. The Case OCP prohibits two (or more) of the same type of an overt case marker to co-occur in a clause. However, Mohanan's Case OCP does not completely rule out two co-occurring *ko*-marked arguments, as these do exist, see (27).

(27) ravi=ne batʃtʃe=**ko** amra=**ko** di-ya
Ravi.M.Sg=Erg child.M.Obl=Acc Amra.F.Sg=Dat give-Perf.M.Sg
'Ravi gave the child to Amra.'

Given that two *ko* can co-occur elsewhere in the language, we cannot use Mohanan's Case OCP to rule out two *ko*-marked arguments for dative subjects.

Furthermore, one does find constellations that go beyond the basic dative-nominative pattern with experiencer predicates that take dative subjects. The examples below are counterparts to the 'liking' predicates used in (26) (the predicate in (26) is actually made up of an N+be combination, as are the predicates in (28)).

(28) a. ram=**ko** ʊs lɑṛki=**se** nɑfrɑt/pyar hɛ
Ram.M.Sg=Dat that.Obl girl.F.Sg=Inst hate.F/love.M be.Pres.3.Sg
'Ram hates/loves that girl.' (lit. Hate/love of that girl is at Ram.)

b. ram=**ko** sigɑrət=**se** nɑfrɑt hɛ
Ram.M.Sg=Dat cigarette.F=Inst hate.F be.Pres.3.Sg
'Ram hates cigarettes.' (lit. Hate of cigarette is at Ram.)

The data adduced in this section taken together points to an alternative analysis than that proposed by the Dependent Case intuition. For one, the dative-nominative pattern is not the only pattern to be accounted for with respect to dative subjects. For another, the Dependent Case approach does not do justice to the semantic import of case marking: 1) goals are robustly marked with dative case in Urdu/Hindi; 2) dative and ergative are used in DCM to mark semantic differences.

The next section therefore develops an account of the case marking patterns that acknowledges the fundamental semantic nature of case (cf. also Kagan 2020, 2024) and couples the established Constructive Case approach within LFG (Butt & King 2003; Nordlinger 1998) with the event-based theory of linking developed in recent years (Schätzle 2018; Butt et al. 2023; Beck & Butt 2024).

4 Analysis

This section first introduces the basics of event-based linking in section 4.1. An account of the case markers in terms of Constructive Case is then developed in section 4.2, finally leading to a full analysis of the patterns observed with respect to dative subjects in Urdu/Hindi in section 4.3, including a treatment of N-V complex predicates to account for the N+be constructions seen above in (28).

4.1 Event-based linking

Unlike many other proposals for relating argument structure to syntactic roles, standard LFG does not assume an event-based representation (Butt 2006). Rather, argument structure is conceived of as a list of argument roles such as *agent, patient, goal*, etc.

One exception is Butt's (1995) proposal for linking based on Jackendoff's ideas on event decomposition (e.g., Jackendoff 1990). Butt derives LFG's argument structure hierarchy from an event-based representation that includes notions such as CAUSE, ACT, BECOME and then proceeds to map from argument roles to grammatical relations via LFG's standard mapping theory (cf. Bresnan & Zaenen 1990; Findlay et al. 2023).

A more recent event-based proposal for linking has been formulated in Schätzle (2018); Butt et al. (2023) and Beck & Butt (2024). This approach works with Ramchand's (2008) tripartite organization of subevental structure, combines this with Proto-Role information as proposed by Zaenen (1993) and is integrated with Kibort's (2014) version of LFG's Mapping Theory. A short sketch and motivation of this approach is provided in what follows.

Ramchand (2008) decomposes an event into three major subevents, each of which causes/initiates the other, as shown in (29). In addition, *rhemes* (*rh*) are taken to be in a static relationship with one of the three subevents of a predicate, like a static spatial Figure/Ground relationship. We here do not go into details of the reasons behind this organization, but adopt the basic intuition into LFG's linking theory.

(29) **Ramchand's tripartite event decomposition**

(i) a causing or initiating subevent (*init*); results in a

(ii) a process subevent (*proc*); results in a

(iii) a result state (*res*)

We associate an argument slot with each of Ramchand's subevents (*init, proc, res*) as well as a further one with the *rh*. Overall this yields four argument participants, which nicely corresponds to the four basic argument participant slots proposed by Kibort (2014). We follow Kibort (and Grimshaw 1990) in eschewing thematic role labels. Instead, we use an 'x' to represent an argument slot, as Kibort does. Each of these argument slots is associated with (that is, licensed by) a subevent plus the rheme. The general schema is shown in (30). The argument slot associated with *init* will generally correspond to an agent, the argument slot associated with a *res* to a patient/undergoer. However, these are just rough correspondences. As we shall see, the General Schema in (30) allows us degrees of flexibility and thus a nuanced approach to argument structure.

(30) **General Linking Schema**

		init	proc	res	rh	
predicate	$<$	x	x	x	x	$>$
		FIGURE	GROUND			
grammatical relations		SUBJ	OBJ	OBJ_{theta}	OBL	

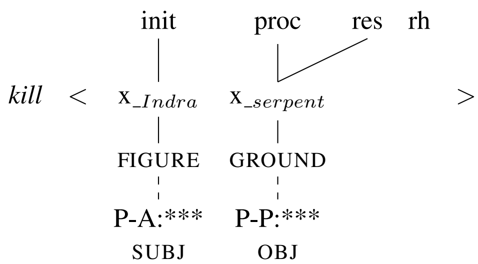
The argument slots are mapped to grammatical functions. In determining the mapping, we make use of Zaenen's (1993) proposal for integrating the notion of Proto-Roles (cf. Dowty 1991; Van Valin & Polla 1997) into LFG's mapping rules so that the argument with the most Proto-Agent properties is linked to the SUBJ and the argument with the most Proto-Patient properties is linked to the OBJ.

We further incorporate figure/ground relations as originally proposed by Talmy (1975) to provide a mechanism by which an argument can be foregrounded (the FIGURE) relatively to a GROUND. The entailments generated by the figure/ground relations as well as the *init, proc, res* and *rh* are all factored into the linking to grammatical relations. For example, a FIGURE will contribute a Proto-Agent property, a GROUND a Proto-Patient property. The *init* contributes a Proto-Agent property, the *proc* and *res* subevents generally each contribute a Proto-Patient property, while the *rh* is inert in the sense that it does not contribute any information as to the Proto-Role properties.

We provide an example for an agentive clause as well as an experiencer predicate to show how the basics of the system work. For more examples and discussion see Schätzle (2018); Butt et al. (2023); Beck & Butt (2024). The examples below are taken from Beck & Butt (2024).[7]

Example: Active Agentive Clause In a typical agentive clause we have two core arguments, classically referred to as an agent and a patient or as an actor and an undergoer. In our schema, this corresponds to two argument slots. One of these is associated with the *init* subevent, the other with both the *proc* and *res* subevents. That is, for the example in (31), 'Indra' is the initiator of the event and the 'serpent' is the undergoer of a process and represents a final result (being dead). The clause is active, so the event initiator 'Indra' is foregrounded, the only other argument is taken to be the GROUND.

(31) Indra killed the serpent.



With this basic configuration in place, we can now add up the Proto-Agent (P-A) vs. Proto-Patient (P-P) properties to determine the linking to grammatical functions. 'Indra' receives two P-A properties because it is the initiator of an event and functions as the FIGURE. Our linking schema further takes the degree of the sentience of an argument into account, since this seems to be a very basic and important organizing principle of argument realization (e.g., see Vihman & Nelson 2019; Gregorio et al. 2025) with a strong tendency for arguments with greater relative sentience (as judged by humans) to be realized as subjects. Greater relative sentience can be operationalized via the animacy hierarchy, for example, by which personal pronouns rank over human referents, which rank over other animates, which in turn rank over inanimates (cf. Croft 2012).

[7]The FIGURE/GROUND dimension has no particular effect on the analyses in this paper. It does play a significant role for passives and for the historical change from spatial predications to experiencer subjects ('Fear is at Ravi.' $\longrightarrow$'Ravi is afraid.'), see Schätzle (2018) and Beck & Butt (2024) for details.

The argument ‘Indra’ thus receives a total of three P-A properties. In contrast, the ‘serpent’ receives a total of three P-P properties from: 1) *proc*; 2) *res*; 3) being the GROUND. In this case, the linking to grammatical functions is clear: ‘Indra’ has the most P-A properties and no P-P properties so it is linked to SUBJ. In contrast, ‘serpent’ has the most P-P properties and no P-A properties, so it is linked to OBJ.

Example: An Experiencer Predicate Experiencer predicates present a less clear cut picture. The example here is taken from Ramchand (2008), who analyzes experiencer predicates as consisting of a ‘holder of a state’, namely, the experiencer and a *rh* that represents properties of that state. The experiencer (‘holder of the state’) is taken to be licensed by the *init* subevent. Given that this is a stative situation, there is no process that is initiated and therefore also no result. Rather, the experiencer is in a configuration with a *rh*, as shown below.

(32) Katherine fears nightmares.

$$\begin{array}{lccccc} & & \text{init (holder)} & \text{rh} & \\ & & | & | & \\ \text{FEAR} & < & x_{\_Katherine} & x_{\_nightmares} & > \\ & & | & | & \\ & & \text{FIGURE} & \text{GROUND} & \\ & & \vdots & \vdots & \\ & & \text{P-A:**, P-P*} & \text{P-P:*} & \\ & & \text{SUBJ} & \text{OBJ} & \end{array}$$

In this example, ‘Katherine’ has two P-A properties (FIGURE and sentience) and one P-P property (holder of state). While the ‘holder of a state’ is licensed by the *init*, in this case it does not contribute a P-A property: since it is an experiencer of a state, this counts as a P-P property. The other argument, ‘nightmares’, has only one P-P property, due to it being a GROUND. The two arguments thus have an equal amount of P-P properties. However, given that ‘Katherine’ has more P-A properties, this argument is linked to the SUBJ and the ‘nightmares’ are linked to the OBJ.

4.2 Constructive Case

Linking theory within LFG does not make direct reference to case, even though many of the original mapping rules were motivated by evidence from case marking patterns across languages. We adopt Butt and King’s (2003) approach by which case markers are provided with (sub)lexical entries that specify their syntactic and semantic contribution to a clause. The case marking must be compatible with the linking of arguments to grammatical functions, providing a system of mutual constraints typical of LFG.

In line with the Constructive Case approach argued for by Nordlinger (1998), Butt and King take a lexical semantic approach to case. In this approach, case markers provide information as to the grammatical functions of the clause (rather than be “assigned” to a given NP on the basis of its position, for example, as per the Minimalist intuition). As shown in the sample entry in (33) for the Urdu/Hindi ergative, this is achieved via the use of *inside-out functional uncertainty*: the entry states that the mother node that the case marker is contained in must be a SUBJ.

(33) ne $(\uparrow \text{CASE}) = \text{erg}$
$(\text{SUBJ} \uparrow)$
$(\text{init} \uparrow_{arg-str})$

The other pieces of information in the lexical entry state that the case is ergative and that the semantic requirement that this be related to an *init* subevent must be satisfied (again via inside-out functional uncertainty). We here assume that information about the semantic subevental properties of a clause are represented at a(rgument)-structure, since this is crucial for licensing the argument slots.

The lexical entry for the accusative/dative can be handled similarly, as shown in (34). However, this entry needs to account for both the dative and the accusative functions of *ko*.[8] The accusative is restricted to direct objects: it states that it has case accusative and requires to be contained within a OBJ. The subevental semantic requirement is that it be connected to both a *proc* and a *res* subevent. Following Ramchand (1997), we assume that the arguments of a *res* subevent are *quantized* so that they either measure out a change of state (apples are eaten, buildings are built, serpents are killed) or a path along which the trajectory moves towards a result state (e.g., push a cart to the store). Although the details remain to be worked out, we assume that the specificity reading associated with *ko* on direct objects will follow from the general semantics that can be attributed to a quantized result. Thus, under the analysis in (34), the specificity requirement associated with the accusative is connected to the *res* subevent.

(34) ko

Possibility 1	$(\uparrow \text{CASE}) = \text{acc}$	
	$(\text{OBJ} \uparrow)$	
	$(\text{proc\&res} \uparrow_{arg-str})$	
Possibility 2	$(\uparrow \text{CASE}) = \text{dat}$	
	Possibility 2a	Possibility 2b
	$(\text{SUBJ} \uparrow)$	$(\text{OBJ}_{goal} \uparrow)$
	$(\text{init}_{\text{-hold}} \uparrow_{arg-str})$	$(\text{res} \uparrow_{arg-str})$

The dative can mark either subjects or indirect (restricted) objects (OBJ_{goal}), giving rise to two subpossibilities in (34). It can either be used to mark an OBJ_{goal}, in which case it must be connected to a *res* subevent at a-structure (with *res* representing the goal semantics in the sense that reaching a goal (end of a path) represents a resultant state, see Ramchand (1997) for an in-depth discussion). The dative can also be used on subjects. In this case it needs to be connected to an *init* subevent. This makes it look very much like the ergative, with the difference being that this *init* needs to be a holder of a state. This further specification could be achieved formally in any number of ways, for the moment, it is stated simply as an annotation on the *init*.

Lastly, an entry for the use of the *se* is provided in (35). The case marker *se* is highly polysemous, marking instruments and sources more generally. We here only provide the entry needed for the examples in the paper: the *se* marks objects with source semantics.

[8]We assume a single lexical entry for *ko* for two reasons. One is that we adhere to the XLE formalization of LFG, in which we have developed a computational grammar for Urdu (Butt & King 2002). This formalization allows for only one lexical entry per head word. The other reason is that there is no evidence for two separate entries. In line with many of the Indo-Aryan case markers, we treat *ko* as polysemous.

(35) se $(\uparrow \text{CASE}) = \text{inst}$
$(\text{OBJ}_{\text{source}} \uparrow)$
$(\text{rh}_{\text{source}} \uparrow_{arg-str})$

With the basics of linking and the entries for the case markers in place, we can now proceed on to an alternative analysis of the case marking patterns found in Urdu/Hindi.

4.3 Alternative Analysis

For the sake of completeness, we begin with the ergative-accusative patterns from the beginning of the paper. We then move on to the dative subjects.

4.3.1 Agentive Clauses

In our analysis, the determination of ergative vs. nominative and accusative vs. nominative operates independently from one another as they are governed by a set of independent constraints. As shown in (36), the linking basically follows that already seen for 'Indra killed the serpent.' We begin with the situation in which the clause has perfective morphology and the computer is non-specific, corresponding to (36-a).

(36) a. ram**=ne** kamputar xarid-a
Ram.M.Sg=Erg computer.M.Sg.Nom buy-Perf.M.Sg
'Ram bought a/some computer.'

b. ram**=ne** kamputar**=ko** xarid-a
Ram.M.Sg=Erg computer.M.Sg=Acc buy-Perf.M.Sg
'Ram bought a (certain)/the computer.'

The major difference to the 'Indra killed the serpent.' example seen before is that the second argument is not also linked to the *res* subevent. The conditions for the accusative case are thus not fulfilled and the object marking will be nominative. The nominative functions as the default case which is assigned in the absence of any more specific constraints as part of the phrase structure rules for the NP, which check that every NP has case. In the situation above the subject could be either ergative or nominative, but the ergative must be chosen because perfective verbal morphology requires an ergative.

(37) Ram bought a/some computer.

		init	proc	res	rh	
BUY	<	$x_{\_Ram}$	$x_{\_computer}$			>
		FIGURE	GROUND			
		P-A:***	P-P:**			
		SUBJ	OBJ			
		Erg/~~Nom~~	Nom			

If the second argument is also connected to the *res* subevent, as in (38), then we get the case pattern in (36-b) because the constraints in the entry for the accusative case are satisfied. The connection to the *res* subevent allows for a specificity reading, thus accounting for the semantics of (36-b).

(38) Ram bought a specific computer.

		init	proc	res rh	
BUY	<	$x_{\_Ram}$	$x_{\_computer}$		>
		FIGURE	GROUND		
		P-A:***	P-P:***		
		SUBJ	OBJ		
		Erg/~~Nom~~	**Acc**		

4.3.2 Simplex Experiencer Predicates

The simple dative experiencer subject examples as in (39) follow straightforwardly from Ramchand's analysis of experiencer predicates. The verb is a stative experiencer predicate, as such it has two arguments: one connected to the *init* that licenses a holder of a state and the other connected to a *rh*. Since this is a stative predication, a consideration of the ergative does not enter the picture.

(39) ṭuʃar=ko tʃand dɪk^{h}-a
Tushar=Dat moon.M.Nom appear-Perf.M.Sg
'Tushar saw the moon.' (Mohanan 1994a: 141)

		init (holder)	rh	
APPEAR	<	$x_{\_Tushar}$	$x_{\_moon}$	>
		FIGURE	GROUND	
		P-A:**, P-P*	P-P:*	
		SUBJ	OBJ	
		Dat	**Nom**	

The lexical entry for the dative is compatible with this configuration, so the dative is chosen. The nominative is considered the elsewhere case when no other specifications apply (Butt & King 2003, 2004). This is true for the situation in (39).

4.3.3 Complex Predicate Experiencer Subjects

Most of the dative experiencer subjects in Urdu/Hindi are actually complex predicates, as in (40), which features an N+V combination ('liking'+'be'). In analyzing these, we follow the theory of complex predication articulated in Butt (2014) (and references therein). For us, the main relevant features of the analysis are: 1) complex predicates contain a *light verb* which has an open argument slot that must be filled by another predicational element; 2) when two (or more) a-structures are combined, the lowest matrix argument is coindexed with the highest embedded argument for purposes of linking. The schema in (41) shows how this plays out for the example in (40).

(40) ram=**ko** hɑlva pɑsɑnd hɛ
Ram.M.Sg=Dat halva.M.Sg.Nom liking.M be.Pres.3.Sg
'Ram likes halva.'

(41) Ram likes halva.
BE < $init_i$ (holder) %rh >
|
LIKING < $init_i$ (holder) rh >
SUBJ OBJ
Dat **Nom**

The main predicational element is the predicate 'liking'. This contains *init* and a *rh*, as per Ramchands' basic analysis. This is combined with the light verb version of 'be' that is based on a copula predication. It is also taken to contain an *init* and a *rh*. The idea behind this analysis is that a property (a *rh*) is being predicated of a holder of state (an *init*). In this case the property predicated of the *init* of 'be' is a variable (indicated by %) and this is filled in with 'liking'. As per Butt's theory of complex predication, the lowest matrix argument is coindexed with the highest embedded argument, yielding just two arguments for the purposes of linking. The resulting configuration is exactly that of a simplex experiencer predicate, with thefore exactly the same linking and case marking results: a dative subject and a nominative object.

4.3.4 Experiencer subjects with source stimulus

Having established how basic experiencer predicates work in simplex and complex constructions, we can now turn to the examples in (42), which feature a dative subject and an instrumental case on the object.

(42) a. ram=**ko** ʊs lɑṛki=**se** nɑfrɑt/pyar hɛ
Ram.M.Sg=Dat that.Obl girl.F.Sg=Inst hate.F/love.M be.Pres.3.Sg
'Ram hates/loves that girl.' (lit. Hate/love of that girl is to Ram.')

b. ram=**ko** sigɑrət=**se** nɑfrɑt/pyar hɛ
Ram.M.Sg=Dat cigarette.F=Inst hate.F/love.M be.Pres.3.Sg
'Ram hates cigarettes.'

The major difference here is taken to stem from the underlying lexical semantics of the main predicates. The second argument is taken to be the *source* of the hating/loving. Otherwise everything proceeds as was already seen above. The complex predicate is formed, yielding an overall *init rh* configuration.

(43) Ram hates that girl.
BE < $init_i$ (holder) %rh >
| |
| HATE < $init_i$ (holder) rh (source) >
SUBJ OBJ_{source}
Dat **Inst**

The *init* holder of a state is realized as a dative subject, as before. Rather than defaulting to a nominative object, however, the further lexical semantic specification on the *rh* puts the lexical entry of *se* into play. Note that the rh for *pasand* 'liking' seen in the previous section is not specified any further and *pasand* is also not compatible with *se* marked arguments.

4.3.5 Agentive Psych Predicates

This final section turns to the pattern exemplified by (44). This pattern features predicates that can also be seen as psych predicates, but agentive ones. They can be modified with adverbials such as 'on purpose' and appear with an ergative when the verbal morphology is perfective, see (45).

(44)	ram	ʊs	lɑṛki=**se/ko**	nɑfrɑt	kɑr-ta
	Ram.M.Sg	that.Obl	girl.F.Sg=Inst/Acc	hate.F	do-Impf.M.Sg
	'Ram hates that girl.'				
(45)	ram=**ne**	ʊs	lɑṛki=**se/ko**	nɑfrɑt	ki-ya
	Ram.M.Sg=Erg	that.Obl	girl.F.Sg=Inst/Acc	hate.F	do-Perf.M.Sg
	'Ram hated that girl.'				

The agentive reading is due to the agentive light verb 'do', which takes two arguments, an *init* and a *proc* (one does something, some process/activity). As seen below, the argument structure of the noun 'hate' is substituted in for the *%proc* variable of 'do'. Predicates like 'hate' and 'love' have two different lexical semantics. There is one version which is essentially an experiencer predicate, where the argument licensed by *init* is a holder of state (loving/hating something). This is the version shown below. The argument licensed by the *init* subevent of 'do' can be realized either as nominative or as an ergative, depending on the verbal morphology. The stative version of 'hate' looks exactly as in the previous section, with the *se* being compatible with the source lexical semantics required by the verb.

(46) Ram hates/hated that girl.

DO	<	init_i	%proc		>		
			|				
			HATE	<	init_i (holder)	rh (source)	>
		SUBJ				$\text{OBJ}_{\text{source}}$	
		Erg/Nom				**Inst**	

The other version of 'hate' is a dynamic version with an undergoer of the hating. Like all dynamic verbs, this version of 'hate' consists of an *init* subevent, along with a *proc* that can lead to a *res* (something undergoes a process of being hated and is hated as a result). For the examples in (45) and (46), we assume the *proc&res* combination, allowing for the licensing of accusative *ko*.

(47) Ram hates/hated that girl.

DO	<	init_i	%proc		>		
			|				
			HATE	<	init_i	proc&res	>
		SUBJ				OBJ	
		Erg/Nom				**Acc**	

4.3.6 Absence of accusative with dative subjects

We have now seen how all of the case patterns attributed to a syntactic Dependency Configuration by Baker can instead be accounted for via a direct recourse to lexical semantic and subevental representations. There is one more fact that needs to be accounted for under this alternative analysis, namely why no accusative objects are allowed in typical dative subject constructions like (48).

(48) *ram=**ko** hɑlva=**ko** pɑsɑnd hɛ
Ram.M.Sg=Dat halva.M.Sg=Acc liking.M be.Pres.3.Sg
'Ram likes halva.'

The explanation for this also most naturally comes from semantic considerations rather than structural configurations. A typical experiencer predicate as in (48) is stative and does not contain a *proc* subevent and therefore also no *res* subevent. As such, the accusative is never licensed for these types of predicates.

5 Conclusion

This paper has looked at case marking patterns in Urdu/Hindi that were taken up by Baker and given an analysis within Dependent Case Theory. Dependent Case Theory crucially makes use of structural configurations between two NPs. This approach foregrounds syntactic factors as the locus of explanation for case marking patterns, integrating semantic considerations only indirectly via movement and the positions NPs are spelled out in (e.g., within VP or vP).

The Dependent Case approach begins with attractively simple assumptions and mechanisms. However, the deeper it ventured into the Urdu/Hindi case patterns, the more complex the overall mechanisms became. This paper instead proposes to take a primarily semantically motivated approach to case, as already proposed in previous work for Urdu (Butt & King 1991, 2003, 2004) and adds to the existing research by extending the account to case marking patterns found witih dative subjects.

The analysis crucially involves event-based linking, a constructive case approach and a consideration of the lexical semantics of the predicates. The dative is taken to be associated with an abstract goal semantics that includes experiencers, the accusative is associated with result subevents. These semantic factors interact with syntactic constraints and this can be modeled naturally within LFG's projection architecture.

Contra Legate (2024: 72), who concludes that "Case is out of Universal Grammar", we propose that Universal Grammar should in fact be covering the intricate interaction between lexical semantics, case and grammatical functions, rather than concentrating on only syntactic tree configurations. That is, if one sees case as providing a systematic interface between argument realization and event semantics, then it is certainly part of Univeral Grammar and the LFG analysis proposed here provides an avenue towards crosslinguistically viable analyses.

References

Ahmed, Tafseer. 2006. Spatial, temporal and structural usages of Urdu *ko*. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG06 Conference*, 1–13. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2006/pdfs/lfg06ahmed.pdf.

Ahmed Khan, Tafseer. 2009. *Spatial expressions and case in South Asian languages*. Ph.D. thesis, University of Konstanz. http://nbn-resolving.de/urn:nbn:de:bsz:352-125089.

Aissen, Judith. 1999. Markedness and subject choice in Optimality Theory. *Natural Language and Linguistic Theory* 17. 673–711.

Aissen, Judith. 2003. Differential object marking: Iconicity vs. economy. *Natural Language and Linguistic Theory* 21. 435–483.

Baker, Mark. 2014. On dependent ergative case (in Shipibo) and its derivation by phase. *Linguisitic Inquiry* 45. 341–380. https://www.jstor.org/stable/43695650.

Baker, Mark. 2015. *Case: Its principles and its parameters*. Cambridge: Cambridge University Press. https://doi.org/10.1093/oso/9780198865926.003.0002.

Baker, Mark. 2024. Dependent case and the sometimes indepedence of ergativity and Differential Object Marking. In Christina Sevdali, Dionysios Mertyris & Elena Anagnostopoulou (eds.), *The place of Case in grammar*, 25–50. Oxford: Oxford University Press.

Baker, Mark & Jonathan Bobaljik. 2017. On inherent and dependent theories of ergative case. In Jessica Coon, Diane Massam & Lisa Travis (eds.), *The Oxford Handbook of Ergativity*, 111–134. Oxford: Oxford University Press.

Bashir, Elena. 1999. The Urdu and Hindi ergative postposition *ne*: Its changing role in the grammar. In Rajendra Singh (ed.), *The Yearbook of South Asian Languages and Linguistics*, 11–36. New Delhi: Sage Publications.

Beck, Christin & Miriam Butt. 2024. The rise of dative subjects: Relative prominence in event structure. In Christina Sevdali, Dionysios Mertyris & Elena Anagnostopoulou (eds.), *The place of Case in grammar*, 239–274. Oxford: Oxford University Press.

Bhatt, Rajesh & Elena Anagnostopoulou. 1996. Object shift and specificity: Evidence from ko-phrases in Hindi. In Lise Dobrin, Kora Singer & Lisa McNair (eds.), *Papers from the main session of the Chicago Linguistics Society (CLS) 32*, 11–22.

Bossong, Georg. 1985. *Differentielle Objektmarkierung in den Neuiranischen Sprachen*. Tübingen: Gunter Narr Verlag.

Bresnan, Joan & Annie Zaenen. 1990. Deep unaccusativity in LFG. In Katazyna Dziwirek, Patrick Farrell & Errapel Mejías-Bikandi (eds.), *Grammatical relations: A cross-theoretical perspective*, 45–57. Stanford: CSLI Publications.

Butt, Miriam. 1993. Object specificity and agreement in Hindi/Urdu. In *Papers from the 29th Regional Meeting of the Chicago Linguistic Society (CLS)*, vol. 1, 80–103.

Butt, Miriam. 1995. *The structure of complex predicates in Urdu*. Stanford: CSLI Publications. https://typo.uni-konstanz.de/csli-konstanz/books/dissertation-butt.pdf.

Butt, Miriam. 2006. *Theories of case*. Cambridge: Cambridge University Press.

Butt, Miriam. 2014. Control vs. complex predication: Identifying non-fnite complements. *Natural Language and Linguistic Theory* 32. 165–190. http://link.springer.com/article/10.1007/s11049-013-9217-5/fulltext.html.

Butt, Miriam. 2022. Case markers in Indo-Aryan. In Mark Aronoff (ed.), *Oxford research encyclopedia of linguistics*, Oxford: Oxford University Press. https://doi.org/10.1093/acrefore/9780199384655.013.292.

Butt, Miriam & Tafseer Ahmed. 2011. The redevelopment of Indo-Aryan case systems from a lexical semantic perspective. *Morphology* 21(3). 545–572. https://doi.org/10.1007/s11525-010-9175-0.

Butt, Miriam & Saira Bano. 2024. Iranian perception predicates revisited: Evidence from Hazaragi. In M. Butt, J. Y. Findlay & I. Toivonen (eds.), *Proceedings of the LFG'24 conference*, 116–140. https://lfg-proceedings.org/lfg/index.php/main/article/view/66.

Butt, Miriam, Lucrezia Carnesale & Tafseer Ahmed. 2023. Experiencers vs. agents in Urdu/Hindi nominalized verbs of perception. In M. Butt, J. Y. Findlay & I. Toivonen (eds.), *Proceedings of the LFG'23 conference*, 90–113. https://lfg-proceedings.org/lfg/index.php/main/article/view/46.

Butt, Miriam & Tracy Holloway King. 1991. Semantic case in Urdu. In L. Dobrin, L. Nichols & R.M. Rodriguez (eds.), *Papers from the 27th regional meeting of the Chicago Linguistic Society*, 31–45.

Butt, Miriam & Tracy Holloway King. 2002. Urdu and the Parallel Grammar project. In N. Calzolari, K.-S. Choi, A. Kawtrakul, A. Lenci & T. Takenobu (eds.), *Proceedings of the 3rd workshop on Asian Language Resources and International Standardization, 19th International Conference on Computational Linguistics (COLING '02)*, 39–45. https://doi.org/10.3115/1118759.1118762.

Butt, Miriam & Tracy Holloway King. 2003. Case systems: Beyond structural distinctions. In Ellen Brandner & Heike Zinsmeister (eds.), *New perspectives on case theory*, 53–87. Stanford: CSLI Publications.

Butt, Miriam & Tracy Holloway King. 2004. The status of case. In Veneeta Dayal & Anoop Mahajan (eds.), *Clause structure in South Asian languages*, 153–198. Berlin: Kluwer Academic Publishers.

Croft, William. 2012. *Typology and universals*. Cambridge: Cambridge University Press. Second edition.

Dayal, Veneeta & Yağmur Sağ. 2020. Determiners and bare nouns. *Annual Review of Linguistics* 6. 173–194. https://doi.org/10.1146/annurev-linguistics-011718-011958.

de Hoop, Helen & Bhuvana Narasimhan. 2005. Differential case-marking in Hindi. In Mengistu Amberber & Helen de Hoop (eds.), *Competition and variation in natural languages: The case for case*, 321–346. Amsterdam: Elsevier. https://doi.org/10.1016/B978-008044651-6/50015-X.

Diesing, Molly. 1992. *Indefinites*. Cambridge: The MIT Press.

Dixon, R. M. W. 1994. *Ergativity*. Cambridge: Cambridge University Press.

Dowty, David. 1991. Thematic proto-roles and argument selection. *Language* 67(3). 547–619.

Findlay, Jamie Y., Roxanne Taylor & Anna Kibort. 2023. Argument structure and mapping theory. In Mary Dalrymple (ed.), *The handbook of Lexical Functional Grammar* (Empirically Oriented Theoretical Morphology and Syntax), Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185966.

Fox, Danny & David Pesetsky. 2004. Cyclic linearization of syntactic structure. *Theoretical Linguistics* 31. 1–46.

Gregorio, Nina, Matteo Gay, Sharon Goldwater & Edoardo Ponti. 2025. The cross-linguistic role of Animacy in grammar structures. In *Proceedings of the 63rd Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, 7349–7363. https://doi.org/10.18653/v1/2025.acl-long.364.

Grimshaw, Jane. 1990. *Argument structure*. Cambridge: The MIT Press.

de Hoop, Helen. 2009. Case in Optimality Theory. In *The Oxford handbook of case*, 88–101. Oxford: Oxford University Press.

Jackendoff, Ray. 1990. *Semantic structures*. Cambridge: The MIT Press.

Kagan, Olga. 2020. *The semantics of case*. Cambridge: Cambridge University Press.

Kagan, Olga. 2024. Can case be semantic? In Christina Sevdali, Dionysios Mertyris & Elena Anagnostopoulou (eds.), *The place of Case in grammar*, 215–238. Oxford: Oxford University Press.

Kibort, Anna. 2014. Mapping out a construction inventory with (lexical) mapping theory. In M. Butt & T. H. King (eds.), *Proceedings of the LFG'14 conference*, 262–282. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2014/papers/lfg14kibort.pdf.

Legate, Julie Anne. 2024. On theories of Case and Universal Grammar. In Christina Sevdali, Dionysios Mertyris & Elena Anagnostopoulou (eds.), *The place of Case in grammar*, 51–72. Oxford: Oxford University Press.

Legendre, Géraldine, William Raymond & Paul Smolensky. 1993. An optimality-theoretic typology of case and grammatical voice systems. In Joshua S. Guenter, Barbara A. Kaiser & Cheryl C. Zoll (eds.), *Proceedings of the Nineteenth Annual Meeting of the Berkeley Linguistics Society*, 464–478.

Malchukov, Andrej & Peter de Swart. 2009. Differential case marking and actancy variations. In *The Oxford Handbook of Case*, 339–355. Oxford: Oxford University Press.

Marantz, Alec. 2000. Case and licensing. In Eric J. Reuland (ed.), *Arguments and case: Explaining Burzio's Generalization*, 11–30. Amsterdam: John Benjamins. https://doi.org/10.1075/la.34.04mar.

Mohanan, Tara. 1994a. *Argument structure in Hindi*. Stanford: CSLI Publications.

Mohanan, Tara. 1994b. Case OCP: A constraint on word order in Hindi. In *Theoretical perspectives on word order in South Asian languages*, 185–216. Stanford: CSLI Publications. https://typo.uni-konstanz.de/csli-konstanz/books/word-order-sals.pdf.

Nordlinger, Rachel. 1998. *Constructive Case: Evidence from Australian languages*. Stanford: CSLI Publications. https://typo.uni-konstanz.de/csli-konstanz/books/nordlinger-case98.pdf.

Patel-Grosz, Pritty. 2021. Ergativity in Indo-Aryan. In *Oxford Research Encyclopedia of Linguistics*, Oxford: Oxford University Press. https://doi.org/10.1093/acrefore/9780199384655.013.282.

Plank, Frans (ed.). 1979. *Ergativity: Towards a theory of grammatical relations*. New York: Academic Press.

Ramchand, Gillian. 1997. *Aspect and predication*. Oxford: Oxford University Press.

Ramchand, Gillian. 2008. *Verb meaning and the lexicon: A first phase syntax*. Cambridge: Cambridge University Press.

Rude, Noel. 1986. Topicality, transitivity, and the direct object in Nez Perce. *International Journal of American Linguistics* 52. 124–153.

Schätzle, Christin. 2018. *Dative subjects: Historical change visualized*. Ph.D. thesis, University of Konstanz. http://nbn-resolving.de/urn:nbn:de:bsz:352-2-1d917i4avuz1a2.

Sevdali, Christina, Dionysios Mertyris & Elena Anagnostopoulou (eds.). 2024. *The place of Case in grammar*. Oxford: Oxford University Press.

Talmy, Leonard. 1975. Figure and ground in complex sentences. In *Proceedings of the First Annual Meeting of the Berkeley Linguistics Society*, 419–430.

Van Valin, Robert D. & Randy J. La Polla. 1997. *Syntax: Structure, meaning and form*. Cambridge: Cambridge University Press.

Verma, M. K. & K.P. Mohanan (eds.). 1990. *Experiencer subjects in South Asian languages*. Stanford: CSLI Publications.

Vihman, Virve-Anneli & Diane Nelson. 2019. Effects of animacy in grammar and cognition: Introduction to special issue. *Open Linguistics* 5(1). 260–267. https://doi.org/10.1515/opli-2019-0015.

Zaenen, Annie. 1993. Unaccusativity in Dutch: Integrating syntax and lexical semantics. In James Pustejovsky (ed.), *Semantics and the lexicon*, 129–161. Dordrecht: Kluwer Academic Publishers. https://doi.org/10.1007/978-94-011-1972-6_9.

Constraining scope in Glue Semantics: the linear logic approach

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Abstract

A hallmark of the Glue approach to the syntax-semantics interface is its clean and simple treatment of quantifiers and quantifier scope ambiguity, without the need to assume different syntactic structures for different scopes. One weakness, which has received renewed attention recently, is Glue's inability to *constrain* such scope ambiguities when they should *not* occur. We propose a new means of encoding constraints on the relative scope of quantifiers, building on Fry's (1997) analysis of negative polarity items. We believe that our proposal also holds promise for the analysis of other constraints on relative scope, including modifier scope and scope islands.

1 Introduction

Glue semantics is the standard theory of the syntax–semantics interface and of semantic composition in LFG (Dalrymple et al. 1993; Dalrymple et al. 2019: ch. 12; Asudeh 2022, 2023; Asudeh & Dalrymple in prep.), though it can be combined with any syntactic theory (Asudeh & Crouch 2001; Frank & van Genabith 2001; Gotham 2018; Haug & Findlay 2023).[†] The basic idea is that words (and phrasal configurations which contribute meaning) encode an association between the meaning which they express and a logical expression which specifies how that meaning can combine with other meanings in the sentence. This logical approach makes Glue very flexible, and enables it to describe syntax–semantics interactions more straightforwardly and/or elegantly than other theories can. In particular, it allows Glue to model quantifier scope ambiguity, as witnessed in sentences like (1), without recourse to an otherwise unmotivated syntactic ambiguity (often brought about via "Quantifier Raising" as in Chomsky 1976, May 1977, 1985, Heim & Kratzer 1998: ch. 7–8, *inter alia*).

(1) *Someone chose everything.*
$\leadsto$ There is a person who chose everything. $[\exists \gg \forall]$
$\leadsto$ Everything was chosen by someone. $[\forall \gg \exists]$

The sentence in (1) has two interpretations in English depending on the order in which the quantifiers are combined, as indicated above. In Glue, these two interpretations correspond to two distinct logical proofs which can be constructed from the same lexically-contributed premises (we will see how this works in more detail in the following section).

However, the Glue approach to quantifier scope is sometimes *too* flexible. Although some sentences with two quantifiers, like (1), are ambiguous, others, like (2), are not:

(2) *The teacher gave one student every problem.*
$\leadsto$ One particular student was given every problem. $[\textit{one} \gg \textit{every}]$
$\not\leadsto$ Each problem was given to a possibly different student. $[\textit{every} \not\gg \textit{one}]$

In the double object construction in English (and in many languages), when both objects denote quantifiers, they can only be interpreted in the order in which they appear.

[†]We would like to thank the audience at the 2025 LFG conference, the members of the Glue mailing list, the two abstract reviewers, and the two manuscript reviewers for their helpful comments and feedback. Any remaining errors herein are of our own doing.

However, the naïve Glue approach will instead predict that both readings are possible, contrary to fact. We therefore need some way to constrain the general permissiveness of Glue in certain contexts.

In this paper, we offer a solution to this problem from a formal perspective, and provide a technique that allows the theorist to enforce a particular scope relation between any two quantifiers using the existing resources of Glue semantics. We begin in Section 2 with a brief introduction to Glue semantics and a more detailed look at how it handles quantifiers. Section 3 further illustrates the problem of quantifier scope rigidity, before Section 4 presents our solution. Section 5 examines some previous attempts to tackle this problem, and compares them to our approach, before Section 6 concludes.

2 Glue semantics and quantifier scope

As mentioned above, in Glue semantics, the meaning contributions of linguistic objects are given as pairs consisting of a meaning expression (on the left-hand side) and a logical expression (on the right-hand side). Such combinations are known as *meaning constructors*. We will often refer to the left-hand side as the *meaning side* and the right-hand side as the *glue side* or *glue type*. Meaning expressions must support function abstraction and application, but are otherwise unconstrained; for simplicity and generality, we use expressions of predicate logic (with generalized quantifiers) in the following, but many recent Glue analyses use some variant of Compositional Discourse Representation Theory (Muskens 1996). The logical expressions of the glue side are formulated in a fragment of linear logic (Girard 1987), a resource logic which ensures that each meaning contribution is used exactly once in semantic composition.

In (3), the meaning constructor contributed by the proper name *Fred* associates the meaning **fred** with the resource f, and the meaning constructor contributed by the intransitive verb *danced* associates the meaning $\lambda x.\mathbf{dance}(x)$ with the implicational resource $f \multimap d$:[1]

(3) a. $\mathbf{fred} : f$ (meaning constructor for *Fred*)
b. $\lambda x.\mathbf{dance}(x) : f \multimap d$ (meaning constructor for *danced*)

In our LFG setting, f is the f-structure (or its semantic projection) for the subject *Fred*, and d is the f-structure for the sentence *Fred danced*, as shown by the italic labels in the f-structure in (4):

(4) $_{d}\begin{bmatrix} \text{PRED} & \text{`DANCE}\langle\text{SUBJ}\rangle\text{'} \\ \text{SUBJ} & _{f}\begin{bmatrix} \text{PRED} & \text{`FRED'} \end{bmatrix} \end{bmatrix}$ (f-structure for *Fred danced*)

Thus, we can think of the glue (right-hand) side of the verb's meaning constructor as requiring a resource for the subject f, and producing a resource for the sentence d. These meaning constructors serve as premises in a linear logic proof, driven by the glue side. This proof is successful if the result is complete (all of the necessary resources are present) and coherent (we can derive a resource for the sentence with no unused

[1]The symbol $\multimap$ represents linear implication, the correspondent in linear logic of classical logic's material conditional, $\rightarrow$.

resources left over). Logical inference steps on the glue side correspond to operations in the lambda calculus on the meaning side, following the Curry-Howard correspondence (Curry & Feys 1958; Howard 1980). For example, *modus ponens*, a.k.a. implication elimination, corresponds to function application. Using this correspondence, we build up the meaning of the sentence compositionally as a side effect of the logical deduction. Let us illustrate this with a simple example.

For the sentence *Fred danced* we have the proof in (5).[2] Given the meaning constructor $\lambda x.\mathbf{dance}(x) : f \multimap d$ contributed by *danced* and the meaning constructor $\mathbf{fred} : f$ contributed by *Fred*, we can derive, via one instance of implication elimination, the expression $\mathbf{dance}(\mathbf{fred}) : d$, which associates the meaning $\mathbf{dance}(\mathbf{fred})$ with the resource d for the sentence *Fred danced*:

(5)
$$\frac{\begin{array}{ll}\textbf{[Fred]} & \textbf{[danced]}\\ \mathbf{fred} : f & \lambda x.\mathbf{dance}(x) : f \multimap d\end{array}}{\mathbf{dance}(\mathbf{fred}) : d}$$

The proof for a transitive sentence proceeds in the same manner, but involves two instances of implication elimination/function application:

(6)
$$\frac{\dfrac{\begin{array}{ll}\textbf{[Fred]} & \textbf{[hit]}\\ \mathbf{fred} : f & \lambda x.\lambda y.\mathbf{hit}(x,y) : f \multimap (g \multimap h)\end{array}}{\lambda y.\mathbf{hit}(\mathbf{fred},y) : g \multimap h} \qquad \begin{array}{l}\textbf{[George]}\\ \mathbf{george} : g\end{array}}{\mathbf{hit}(\mathbf{fred},\mathbf{george}) : h}$$

In Section 1, we noted that sentences like (1), repeated here as (7), are ambiguous, which each reading corresponding to a different order of combination for the quantifiers. We represent this explicitly here, using unanalysed meanings for *someone* and *everything*:

(7) *Someone chose everything.*
$\rightsquigarrow \mathbf{someone}(\lambda x.\mathbf{everything}(\lambda y.\mathbf{choose}(x,y)))$ $[\equiv \exists x.\forall y.\mathbf{choose}(x,y)]$
$\rightsquigarrow \mathbf{everything}(\lambda y.\mathbf{someone}(\lambda x.\mathbf{choose}(x,y)))$ $[\equiv \forall y.\exists x.\mathbf{choose}(x,y)]$

We also noted that the standard Glue approach to quantifiers models this semantic ambiguity successfully, without requiring a corresponding syntactic ambiguity. Each scope interpretation instead corresponds to a different proof derived from the same f-structure and the same meaning constructor premises. Let us illustrate how this works.

Quantifiers in Glue are given meaning constructors like those in (8). In words, these meaning constructors look for some dependency on the argument position the quantifier occupies, consume that dependency, and return a meaning corresponding to its output:[3]

[2]We write proofs in natural deduction style, and leave steps corresponding to implication elimination unannotated, but indicate which introduction or elimination rule is being used in other cases. Linguistically contributed meanings are indicated by writing the word or construction introducing them in square brackets.

[3]The universal quantifier $\forall$ on the glue side of the meaning constructors for *someone* and *everything* in (8) quantifies over possible scope structures S, allowing these quantifiers to choose different scope points in a complex sentence, and to choose different relative scopes when there is more than one quantifier; this is not relevant in the examples we discuss, so we could simply fix S as the resource corresponding to the clause, which in our running example is c.

(8) Standard meaning constructors for *someone* and *everything* (to be revised):

a. $\lambda P.\mathbf{someone}(P) : \forall S.(s \multimap S) \multimap S$

b. $\lambda P.\mathbf{everything}(P) : \forall S.(e \multimap S) \multimap S$

To derive a meaning for *Someone chose everything*, we also need an f-structure for the sentence, shown in (9), and the meaning constructor for *chose*, given in (10):

(9) $$_{c}\left[\begin{array}{ll}\text{PRED} & \text{`CHOOSE}\langle\text{SUBJ, OBJ}\rangle\text{'}\\ \text{SUBJ} & _{s}\left[\text{PRED `SOMEONE'}\right]\\ \text{OBJ} & _{e}\left[\text{PRED `EVERYTHING'}\right]\end{array}\right]$$

(10) Meaning constructor for *chose*:

$\lambda x.\lambda y.\mathbf{choose}(x, y) : s \multimap (e \multimap c)$

We now have three premises (the two in (8) and the one in (10)), corresponding to each of the three words in the sentence. From these premises, we can construct two distinct proofs of the resource c corresponding to the meaning of the clause. These arise through the use of *hypothetical reasoning*: hypothesising a resource and then subsequently discharging that hypothesis at a later point in the proof, which corresponds to implication introduction on the glue side and lambda abstraction on the meaning side. Using this rule of inferenec, we can construct the first argument of either quantifier from the meaning of the verb, thereby allowing the quantifiers to be combined in either order, ultimately giving the two scope readings. Figures 1–2 show the two proofs.[4]

$$\dfrac{\begin{array}{c}\textbf{[someone]}\\ \mathbf{someone} : (s \multimap c) \multimap c\end{array} \quad \dfrac{\dfrac{\begin{array}{c}\textbf{[everything]}\\ \mathbf{everything} : (e \multimap c) \multimap c\end{array} \quad \dfrac{\begin{array}{c}\textbf{[chose]}\\ \lambda x.\lambda y.\mathbf{choose}(x,y) : s \multimap (e \multimap c)\end{array} \quad [x : s]^1}{\lambda y.\mathbf{choose}(x,y) : e \multimap c}}{\mathbf{everything}(\lambda y.\mathbf{choose}(x,y)) : c}}{\lambda x.\mathbf{everything}(\lambda y.\mathbf{choose}(x,y)) : s \multimap c}\multimap_{I_1}}{\mathbf{someone}(\lambda x.\,\mathbf{everything}(\lambda y.\mathbf{choose}(x,y))) : c}$$

Figure 1: Proof for *Someone chose everything* with wide scope for *someone*

$$\dfrac{\begin{array}{c}\textbf{[everything]}\\ \mathbf{everything} : (e \multimap c) \multimap c\end{array} \quad \dfrac{\dfrac{\begin{array}{c}\textbf{[someone]}\\ \mathbf{someone} : (s \multimap c) \multimap c\end{array} \quad \dfrac{\dfrac{\dfrac{\begin{array}{c}\textbf{[chose]}\\ \lambda x.\lambda y.\mathbf{choose}(x,y) : s \multimap (e \multimap c)\end{array} \quad [x : s]^1}{\lambda y.\mathbf{choose}(x,y) : e \multimap c} \quad [y : e]^2}{\mathbf{choose}(x,y) : c}}{\lambda x.\mathbf{choose}(x,y) : s \multimap c}\multimap_{I_1}}{\mathbf{someone}(\lambda x.\mathbf{choose}(x,y)) : c}}{\lambda y.\mathbf{someone}(\lambda x.\mathbf{choose}(x,y)) : e \multimap c}\multimap_{I_2}}{\mathbf{everything}(\lambda y.\mathbf{someone}(\lambda x.\mathbf{choose}(x,y))) : c}$$

Figure 2: Proof for *Someone chose everything* with wide scope for *everything*

In Figure 1, we first hypothesise a resource corresponding to the subject argument, s, allowing us to compose this with the meaning for the verb and produce a resource of type $e \multimap c$, which is exactly what the meaning constructor for *everything* is looking for as its scope. Once this meaning has been combined, we then discharge the hypothesis

[4]Hypotheses are decorated with numbers, which are then referred to when annotating implication introduction steps to indicate which hypothesis is being discharged at that point.

we were entertaining, introducing a new dependency on s on the glue side, and lambda abstracting over the variable it corresponds to (x) on the meaning side. Now we have a resource of type $s \multimap c$, which is what the the meaning constructor for *someone* is looking for, and so this applies next. Thus, we introduce the meaning for *everything* before the meaning for *someone*, and the latter therefore takes scope over the former.

For the inverse scope reading, we start in the same way, by hypothesising a resource for the subject, s, but then continue by hypothesising a resource for the object, e, as well. By then immediately discharging the hypothesis of s, we obtain the type $s \multimap c$ resource that *someone* is looking for, and so can combine this with the verb before we combine *everything*. Once we then discharge the hypothesis of e, we obtain the type $e \multimap c$ resource that *everything* is looking for, and complete the proof. This time *someone* was applied first and so *everything* takes wider scope.

The important point to note here is that both scope readings were available simply as a result of the properties of the composition logic, and did not require there to be a distinct syntactic parse for each reading, nor any difference in the meanings of the quantifiers from their use in an intransitive sentence where there is no interaction between different quantifiers.

3 The problem: constraining scope ambiguity

The fact that quantifier scope ambiguity "comes for free" in Glue is generally seen as a strength of the approach, and early work (for example, Dalrymple et al. 1997) took it for granted that it was desirable to always allow all possible quantifier scopes. However, there are in fact many situations where not all quantifier scopes *are* available, and we then need a way to *constrain* the scope possibilities otherwise provided by the glue logic.

Our running example in this paper will be the double-object construction in English. Larson (1990: 603–605) observes that in this construction, between the two complements, only the surface scope reading is available – the OBJ must scope over the $\text{OBJ}_{\text{THEME}}$, and the reverse scope reading is not possible.

(11) *Bertie gave* $[$*someone*$]_{\text{OBJ}}$ $[$*everything*$]_{\text{OBJ}_{\text{THEME}}}$.
$\rightsquigarrow$ One particular individual was given everything. $[\exists \gg \forall]$
$\not\rightsquigarrow$ Each thing was given to a possibly different person. $[\forall \not\gg \exists]$

As it stands, the Glue approach predicts that both scope readings should be possible here, contrary to fact. In Section 4 we therefore propose a novel approach to quantifiers in Glue, which gives a very general means of enforcing relative scope between two arbitrary scope-taking items. The goal of our proposal is to provide a way to constrain the relative scope of quantifiers while adding as little extra machinery as possible. Previous approaches to this problem, which we discuss in Section 5, have either been unsuccessful, unduly limited in their coverage, or involve complexifying the underlying logic or grammatical architecture in ways which may be seen as undesirable.

We will restrict our attention in this paper to the double object construction in English for expository ease, but the phenomenon of scope rigidity is widespread. Indeed, it has been noted that there is a general typological trend for languages with freer word order to be concomitantly less permissive of scope ambiguity (Bobaljik & Wurmbrand 2012),[5] albeit this connection is far from absolute.

For example, sentences using the unmarked SOV word order in Japanese exhibit scope rigidity, and can only have the surface scope interpretation where the SUBJ scopes over the OBJ; the inverse scope reading is not available (Hoji 1985):

(12) **SOV:**
Dareka-ga daremo-o aisiteiru.
someone-NOM everyone-ACC love
'Someone loves everyone.' $[\exists \gg \forall, \forall \not\gg \exists]$

When the alternative OSV word order is used, though, the sentence *is* scopally ambiguous, just like an English transitive sentence with two quantifiers:

(13) **OSV:**
Daremo-o dareka-ga aisiteiru.
everyone-ACC someone-NOM love
'Someone loves everyone.' $[\exists \gg \forall, \forall \gg \exists]$

A similar pattern obtains in Polish, where Karnowski (2001: 433) claims that SVO word order is unambiguous, with only the surface scope reading allowed, while OVS order is ambiguous, with both surface and inverse scope readings possible:

(14) **SVO:**
(Przynajmniej) jeden z germanistów przeczytał każdą powieść Bölla.
at.least one.NOM of Germanists.NOM read every.ACC novel.ACC Böll.GEN
'(At least) one Germanist read every novel by Böll.'
$\rightsquigarrow$ There is a Germanist who read every Böll novel. $[\exists \gg \forall]$
$\not\rightsquigarrow$ Every Böll novel is such that at least one Germanist has read it. $[\forall \not\gg \exists]$

(15) **OVS:**
Każdą powieść Bölla przeczytał (przynajmniej) jeden z germanistów.
every.ACC novel.ACC Böll.GEN read at.least one.NOM of Germanists.NOM
'(At least) one Germanist read every novel by Böll.'
$\rightsquigarrow$ There is a Germanist who read every Böll novel. $[\exists \gg \forall]$
$\rightsquigarrow$ Every Böll novel is such that at least one Germanist has read it. $[\forall \gg \exists]$

However, judgements about scope possibilities are notoriously delicate, and disagreements over the data are common. In the case of Polish, for example, Szczegielniak (2005: 25) reports different judgements about sentences like (14), and claims that SVO word order *does* give rise to scopal ambiguity, *contra* Karnowski (2001) (and Abels &

[5] In the generativist literature where LF is taken to be the locus of the syntax–semantics interface, such languages are said to "wear their LF on their sleeves" – see e.g. Szabolcsi (1997) on Hungarian.

Grabska 2022 provide suggestive experimental evidence in support of this position).[6]

Individual constructions or even lexical items can also impose scope rigidity. Cross-linguistically, double object constructions very commonly permit only a surface scope interpretation of their two complements, as we saw for English above. There are also several verbs that make "scope islands" out of their complements, preventing quantifiers inside from scoping over quantifiers outside. Gotham (2021: 150–151) gives the following examples highlighting the lexical nature of this phenomenon, since while *think* forms a scope island out of its complement, *ensure* does not:

(16) *A warden thinks that every prisoner escaped.*
$\rightsquigarrow$ There is a warden who thinks that every prisoner escaped. $[\exists \gg \forall]$
$\not\rightsquigarrow$ Every prisoner has a warden who thinks they escaped. $[\forall \not\gg \exists]$

(17) *An accomplice ensured that every prisoner escaped.*
$\rightsquigarrow$ There is an accomplice who ensured that every prisoner escaped. $[\exists \gg \forall]$
$\rightsquigarrow$ Every prisoner has an accomplice who ensured they escaped. $[\forall \gg \exists]$

In fact, it is not simply that some predicates create scope islands and others don't, but rather that the *combination* of certain predicates and certain quantifiers creates scope islands, while other combinations do not (Barker 2022). For example, while the complement of *ensure* is not a scope island for *every*, it is for *no* (Gotham 2021: 151):

(18) *An accomplice ensured that no prisoner escaped.*
$\rightsquigarrow$ There is an accomplice who ensured no prisoner escaped. $[\exists \gg \neg\exists]$
$\not\rightsquigarrow$ No prisoner is such that an accomplice ensured their escape. $[\neg\exists \not\gg \exists]$

And indefinites can escape from the complements of verbs that trap universals (Gotham 2021: 151):

(19) *Every warden thinks that a prisoner escaped.*
$\rightsquigarrow$ Every warden has a prisoner they think escaped. $[\exists \gg \forall]$
$\rightsquigarrow$ There is a prisoner that every warden thinks escaped. $[\forall \gg \exists]$

(This ability of indefinites to scope high is part of the motivation for treating them as distinct from other quantifiers in dynamic theories of semantics like Discourse Representation Theory: Kamp & Reyle 1993; Kamp et al. 2011, so this particular set of facts may or may not be probative here.)

The question of scope rigidity extends beyond quantifiers to other scope-taking items as well. A well-known example is English attributive adjectives, which take scope in the order they appear. An *alleged former gangleader* is different from a *former alleged gangleader*, for example (see Findlay & Haug 2022: sec. 2.1 for more examples and discussion). We will limit our analysis in this paper to quantifiers, but the techniques we develop can be generalised and extended to other cases such as adjectives too (though we leave demonstration of this to future work).

As this section has shown, there are various contexts in which we want to limit the scopal interactions of two quantifiers (or other scope-taking elements). The standard Glue analysis of quantifiers does not predict this, and instead assumes that all logically

[6] We thank Sebastian Zawada for discussion of the Polish data.

possible scope combinations are actually attested. However, we have also seen that the empirical situation is complex, and the basic facts of the matter are often far from settled. For this reason, what we present in this paper is relatively modest on the theoretical front. We offer a formal technique which allows the relative scope of any two quantifiers to be fixed, but we do not attempt to explain why this pattern should obtain in one particular construction and not another.

4 Our solution: licences for scope-taking items

4.1 Background: NPI licensing

Our proposal has its basis in Fry's (1997) analysis of negative polarity items (NPIs) such as *yet* or *anyone*, which are constrained to appear in the scope of negation or another downward-entailing operator which can act as its licensor:

(20) a. *Fred did not dance yet.* / **Fred danced yet.*
b. *Nobody chose anyone.* / **Fred chose anyone.*

Fry proposed that the meaning constructors for NPIs require the presence of a licence, ℓ, in the glue logic, and that such a licence is made available within the scope of NPI licensors like *not* or *nobody*. Fry assumes the meaning constructors for *nobody* and *anyone* in (21); we have rewritten his meaning constructors into the 'new glue' format, rather than the 'old glue' format used in Fry (1997).[7]

(21) a. Meaning constructor for *nobody* as NPI licensor:
$\mathbf{nobody} : \forall S.((n \otimes \ell) \multimap (S \otimes \ell)) \multimap S$
b. Meaning constructor for *anyone* as NPI:
$\mathbf{anyone} : \forall S.(a \multimap (S \otimes \ell)) \multimap (S \otimes \ell)$

These share the basic structure of the quantifiers we have already seen, but add extra constraints by conjoining certain resources with an NPI licensing resource, ℓ.[8] According to Fry's analysis, NPI licensors like *nobody* provide this licence within their scope – it is conjoined with both resources within the quantifier's (implicational) argument, which corresponds to the quantifier's scope. This licensing resource must be present in order for an NPI like *anyone* to appear in a well-formed proof: the argument of *anyone* only has ℓ on the right-hand side of the implication, and so cannot provide the resource itself. What is more, because the meaning constructor for *anyone* still has ℓ associated with its output, the licence persists so that a single negative polarity licensor can license more than one NPI in its scope, as in *Nobody chose anyone yet*. By contrast, the licence ℓ does not survive outside the scope of the NPI licensor: in (21a), ℓ is associated with S on the left-hand side of the outermost linear implication $\multimap$, but not on the right-hand

[7]See Asudeh & Dalrymple (in prep.) for an overview and history of notations for meaning constructors and the difference between 'old glue' and 'new glue'. We also give the quantifier meanings in their η-reduced form, postponing questions about the meaning side correspondents of the glue-side licences until Section 4.2.

[8]The symbol $\otimes$ represents multiplicative conjunction, one of the correspondents in linear logic of classical logic's conjunction, $\wedge$.

$$
\begin{prooftree}
\AxiomC{\textbf{[nobody]}}
\noLine
\UnaryInfC{$((n \otimes \ell) \multimap (c \otimes \ell)) \multimap c$}
\AxiomC{$[n]^2$}
\AxiomC{$[a]^1$}
\AxiomC{\textbf{[chose]}}
\noLine
\UnaryInfC{$a \multimap n \multimap c$}
\BinaryInfC{$n \multimap c$}
\BinaryInfC{c}
\AxiomC{$[\ell]^3$}
\RightLabel{$\otimes_I$}
\BinaryInfC{$c \otimes \ell$}
\RightLabel{$\multimap_{I_1}$}
\UnaryInfC{$a \multimap (c \otimes \ell)$}
\AxiomC{\textbf{[anyone]}}
\noLine
\UnaryInfC{$(a \multimap (c \otimes \ell)) \multimap (c \otimes \ell)$}
\BinaryInfC{$c \otimes \ell$}
\AxiomC{$[n \otimes \ell]^4$}
\RightLabel{$\otimes_{E_{2,3}}$}
\BinaryInfC{$c \otimes \ell$}
\RightLabel{$\multimap_{I_4}$}
\UnaryInfC{$(n \otimes \ell) \multimap (c \otimes \ell)$}
\BinaryInfC{c}
\end{prooftree}
$$

Figure 3: The linear logic side of the proof corresponding to *Nobody chose anyone*, using Fry's NPI-licensing resource, ℓ

side. Thus, the NPI licensor licenses any number of NPIs *within* its scope, but "cleans up" at the end by consuming the licensing resource.

Figure 3 shows the linear logic side of the proof for *Nobody chose anyone*, to illustrate how this works.[9] This proof uses two rules of inference which may not be so familiar to readers, since the use of multiplicative conjunction has fallen out of favour in recent Glue analyses. These are the rules of conjunction introduction and elimination, which correspond on the meaning side to pair construction and pairwise substitution respectively:

(22) **Conjunction introduction:**

$$\frac{x : A \qquad y : B}{\langle x, y \rangle : A \otimes B} \otimes_I$$

This first rule says if we have two resources A and B, then we are entitled to derive a new resource $A \otimes B$, while on the meaning side we form a pair out of the two meanings x and y which correspond to A and B respectively.

(23) **Conjunction elimination:**

$$\frac{\begin{array}{c} [x : A]^1 \; [y : B]^2 \\ \vdots \\ f : C \end{array} \qquad \begin{array}{c} \vdots \\ \langle a, b \rangle : A \otimes B \end{array}}{f[x \mapsto a, y \mapsto b] : C} \otimes_{E_{1,2}}$$

This second rule says that if assuming a resource A and a resource B allows us to derive a resource C, then, if we can independently prove $A \otimes B$, we are permitted to derive C. In other words, if we show that having A and having B would allow us to produce C, and then we show that we have A and B, we have shown that we can have C. On the meaning side, this corresponds to pairwise substitution: replacing the meanings x and y associated with our hypothesised resources with the meanings a and b from the pair associated with the actual conjoined resource.

Now, the specific details of this analysis of NPIs is not important for the proposal in this paper. But there is one crucial observation from the proof in Figure 3 which

[9] We omit the meaning sides at this stage to make the proofs easier to follow, since there are a number of complexities which arise, and which we will discuss in Section 4.2.

should be highlighted. The meaning constructor for *nobody* consumes resources which have been conjoined with the licence resource, whereas the meaning constructor for *anyone* produces such a resource. Since we need to eventually eliminate the licenses from the proof, *nobody* must enter the proof after *anyone*, and this therefore accounts for the scope behaviour, whereby *nobody* must outscope *anyone*. This is exactly the same pattern we will make use of in managing quantifier scope more generally.

4.2 Licensing quantifiers: introducing licensors

Our analysis adopts Fry's intuition that the presence of licensors is important in controlling scope relations. We propose that quantifiers all require a licence, but that, in general, they also provide that licence, and so license themselves. However, scope-constraining environments can restrict the availability of the relevant licence, "taking it hostage" and only making it available within another quantifier's scope. In this section, we will show how this can be achieved formally.

Updating the standard meaning constructors for the quantifiers *someone* and *everything* in (8), we propose the revised meaning constructors in (24). Each quantifier makes two contributions: a meaning constructor containing a licensing requirement ℓ^e or ℓ^s specific to each quantifier, and a licence resource of the same form which fulfils that licensing requirement.

(24) Licence-dependent meaning constructors for *someone* and *everything* and their licences:

a. $\mathbf{someone} : \forall S.((s \multimap S) \otimes \ell^s) \multimap S$
$\_ : \ell^s$

b. $\mathbf{everything} : \forall S.((e \multimap S) \otimes \ell^e) \multimap S$
$\_ : \ell^e$

We represent the meaning side of the licence as "_", since it serves only an ancillary role in constraining composition, and will not appear in the final meaning for the sentence.

On the glue side, the first meaning constructors contributed by each quantifier differ from the "standard" meaning constructors given above in (8) only in that there is an additional requirement that the relevant licence be available alongside whatever dependency the quantifier takes as its argument. Since the second meaning contribution of each quantifier *provides* exactly this licence, the cumulative effect is exactly the same as the meaning constructors given in (8), so for now this change gains us nothing. In the next section, however, we will show how this new setup allows us to impose constraints on the relative order of pairs of quantifiers.

Before that, however, we must consider the meaning sides of the quantifiers' meaning constructors. Given their more complicated glue types, we must also complexify their meanings in order to preserve the Curry-Howard correspondence that connects expressions in the glue logic to expressions in the lambda calculus. Specifically, since a conjunction in the linear logic corresponds to a pair on the meaning side, the argument that our quantifier meaning is looking for is now not just a function from individuals to truth values, but rather a pair containing that function as the first element and a licence meaning as the second. Given this, the meaning side of the first meaning constructor in (24a), for example, should be (25a) rather than (25b), where π_1 is the projection function that returns the first element of a pair:

(25) a. $\lambda\mathcal{P}.\mathbf{someone}(\pi_1(\mathcal{P}))$
b. $\lambda P.\mathbf{someone}(P)$

However, since the licensing machinery disappears in the final meaning, nothing is lost by ignoring this additional complexity throughout, and instead retaining the simpler meaning shown in (25b). This is what we do, therefore, disregarding the meaning contribution of licence resources in proofs, thus saving space and improving readability. Note that this does, however, mean that identical meaning sides will sometimes appear with different glue types, because the differences on the meaning side are being omitted.

We will now switch our running example to the double object construction containing two quantifiers in (11), repeated below as (26):

(26) *Bertie gave someone everything.*
$\rightsquigarrow$ One particular individual was given everything. $[\exists \gg \forall]$
$\not\rightsquigarrow$ Each thing was given to a possibly different person. $[\forall \not\gg \exists]$

Figures 4–5 illustrate the fact that, without further constraints, the new meaning contributions of the quantifiers allow both scopes, just as in standard Glue, even though we only want the surface scope reading. These proofs use the labelled f-structure in (27) and the additional meaning constructors in (28) for *Bertie* and *gave*:[10]

(27) F-structure for *Bertie gave someone everything*:

$$g\begin{bmatrix} \text{PRED} & \text{`GIVE}\langle\text{SUBJ, OBJ, OBJ}_{\text{THEME}}\rangle\text{'} \\ \text{SUBJ} & b\begin{bmatrix}\text{PRED} & \text{`BERTIE'}\end{bmatrix} \\ \text{OBJ} & s\begin{bmatrix}\text{PRED} & \text{`SOMEONE'}\end{bmatrix} \\ \text{OBJ}_{\text{THEME}} & e\begin{bmatrix}\text{PRED} & \text{`EVERYTHING'}\end{bmatrix} \end{bmatrix}$$

(28) Meaning constructors for *Bertie* and *gave*:
a. $\mathbf{b} : b$
b. $\lambda x.\lambda y.\lambda z.\mathbf{give}(x, y, z) : b \multimap (s \multimap (e \multimap g))$

4.3 Licensing quantifiers: imposing a licensing constraint

To enforce a constraint on scope ordering, we include a special scope-constraining meaning constructor (SCMC) which requires that the licence of the narrower scoping quantifier is conjoined with the resource corresponding to the wider scoping quantifier. You can think of this meaning constructor as "hijacking" the licence of the narrower scoping quantifier and only making it available within the scope of the wider scoping quantifier. In our running example, we want to enforce the surface scope order *someone* $\gg$ *everything*, so the meaning constructor in question has the following form:

[10] To save space in the proof, we use **b** as the meaning for *Bertie*. We also continue to ignore tense, as we have implicitly been doing throughout. The expression $\mathbf{give}(x, y, z)$ is to be interpreted as meaning "x gave y z".

$$
\dfrac{
\begin{array}{c}\textbf{[someone-1]}\\ \mathbf{someone} : ((s \multimap g) \otimes \ell^s) \multimap g\end{array}
\qquad
\dfrac{
\begin{array}{c}\textbf{[someone-2]}\\ \_ : \ell^s\end{array}
\qquad
\dfrac{
\dfrac{
\begin{array}{c}\textbf{[everything-1]}\\ \mathbf{everything} : ((e \multimap g) \otimes \ell^e) \multimap g\end{array}
\qquad
\dfrac{
\begin{array}{c}\textbf{[everything-2]}\\ \_ : \ell^e\end{array}
\qquad
\dfrac{
\dfrac{
\begin{array}{c}\textbf{[gave]}\\ \mathbf{give} : b \multimap (s \multimap (e \multimap g))\end{array}
\qquad
\begin{array}{c}\textbf{[Bertie]}\\ \mathbf{b} : b\end{array}
}{\mathbf{give}(\mathbf{b}) : s \multimap (e \multimap g)}
\qquad [y : s]^1
}{\mathbf{give}(\mathbf{b})(y) : e \multimap g}
}{\mathbf{give}(\mathbf{b})(y) : (e \multimap g) \otimes \ell^e}\,\otimes_I
}{\mathbf{everything}(\mathbf{give}(\mathbf{b})(y)) : g}
}{\lambda y.\mathbf{everything}(\mathbf{give}(\mathbf{b})(y)) : s \multimap g}\,\multimap_{I_1}
}{\lambda y.\mathbf{everything}(\mathbf{give}(\mathbf{b})(y)) : (s \multimap g) \otimes \ell^s}\,\otimes_I
}{
\dfrac{\mathbf{someone}(\lambda y.\mathbf{everything}(\mathbf{give}(\mathbf{b})(y))) : g}{\mathbf{someone}(\lambda y.\mathbf{everything}(\lambda z.\mathbf{give}(\mathbf{b})(y)(z))) : g}\,=_\eta
}
$$

Figure 4: *Bertie gave someone everything*, no scope constraint – surface scope reading, *someone* $\gg$ *everything*

$$
\dfrac{\begin{array}{c}\textbf{[everything-1]}\\ \mathbf{everything} : ((e \multimap g) \otimes \ell^e) \multimap g\end{array} \quad \dfrac{\begin{array}{c}\textbf{[everything-2]}\\ \_ : \ell^e\end{array} \quad \dfrac{\dfrac{\begin{array}{c}\textbf{[someone-1]}\\ \mathbf{someone} : ((s \multimap g) \otimes \ell^s) \multimap g\end{array} \quad \dfrac{\begin{array}{c}\textbf{[someone-2]}\\ \_ : \ell^s\end{array} \quad \dfrac{\dfrac{\dfrac{\dfrac{\begin{array}{c}\textbf{[gave]}\\ \mathbf{give} : b \multimap (s \multimap (e \multimap g))\end{array} \quad \begin{array}{c}\textbf{[Bertie]}\\ \mathbf{b} : b\end{array}}{\mathbf{give}(\mathbf{b}) : s \multimap (e \multimap g)} \quad [y : s]^1}{\mathbf{give}(\mathbf{b})(y) : e \multimap g} \quad [z : e]^2}{\mathbf{give}(\mathbf{b})(y)(z) : g}}{\lambda y.\mathbf{give}(\mathbf{b})(y)(z) : s \multimap g} \multimap_{I_1}}{\lambda y.\mathbf{give}(\mathbf{b})(y)(z) : (s \multimap g) \otimes \ell^s} \otimes_I}{\mathbf{someone}(\lambda y.\mathbf{give}(\mathbf{b})(y)(z)) : g}}{\lambda z.\mathbf{someone}(\lambda y.\mathbf{give}(\mathbf{b})(y)(z)) : e \multimap g} \multimap_{I_2}}{\lambda z.\mathbf{someone}(\lambda y.\mathbf{give}(\mathbf{b})(y)(z)) : (e \multimap g) \otimes \ell^e} \otimes_I}{\mathbf{everything}(\lambda z.\mathbf{someone}(\lambda y.\mathbf{give}(\mathbf{b})(y)(z))) : g}
$$

Figure 5: *Bertie gave someone everything*, no scope constraint – unwanted inverse scope reading, *everything* $\gg$ *someone*

(29) **Scope-constraining meaning constructor (SCMC):**

$$\lambda\_.\lambda x.\langle\_, x\rangle \;:\; \underbrace{\ell^e}_{\text{license for narrow scope quantifier}} \multimap (\underbrace{s}_{\text{resource for wide scope quantifier}} \multimap (\ell^e \otimes s))$$

The purpose of this meaning constructor is only to constrain quantifier scope, and it makes no other semantic contribution, so in proofs we will omit the complex meaning side and instead represent it using the symbol $\bigcirc$, to avoid notational clutter:

(30) **SCMC (abbreviated):**

$$\bigcirc : \ell^e \multimap (s \multimap (\ell^e \otimes s))$$

We will demonstrate shortly how this scope-constraining meaning constructor works, but first we address the question of where it comes from. Put simply, this will vary from phenomenon to phenomenon/construction to construction. Whatever it is that imposes the constraint on scope order, it is precisely by contributing a meaning constructor like (30) that it does so. If we assume that scope rigidity is a property of the double object construction generally, then we can introduce the SCMC via the relevant phrase-structure rule:

(31) $\textsc{OutScopes}(A, B) :=\ \ \bigcirc : \ell^B \multimap [A \multimap [\ell^B \otimes A]]$

(32)

$\text{V}' \rightarrow$	V	NP	NP
	$\uparrow = \downarrow$ $@\textsc{OutScopes}((\uparrow \textsc{obj}), (\uparrow \textsc{obj}_{\textsc{th}}))$	$(\uparrow \textsc{obj}) = \downarrow$	$(\uparrow \textsc{obj}_{\textsc{th}}) = \downarrow$

But we could also introduce such a constraint lexically, in the entry for a verb like *gave*:

(33) *gave* V $(\uparrow \textsc{pred}) = \text{‘give}\langle\textsc{subj,obj,obj}_{\textsc{th}}\rangle\text{’}$

$$\lambda x.\lambda y.\lambda z.\mathbf{gave}(x, y, z) :$$
$$(\uparrow \textsc{subj}) \multimap [(\uparrow \textsc{obj}) \multimap [(\uparrow \textsc{obj}_{\textsc{th}}) \multimap \uparrow]]$$
$$@\textsc{OutScopes}((\uparrow \textsc{obj}), (\uparrow \textsc{obj}_{\textsc{th}}))$$

In certain contexts one approach may be more obviously correct than the other. For instance, in the case of scope rigidity arising from word order, presumably a lexical approach would be much more complex than a c-structure-based one. In addition, there is nothing stopping this meaning constructor being associated with other components of the grammar, such as prosody, as well. This might be the right way to capture the effects of stress/focus in disambiguating scopally ambiguous sentences, although that may more properly be interpreted indirectly, via information structure (see e.g. Jackendoff 1972; Kadmon & Roberts 1986; Martí 2001).

However it is introduced to the sentence, the SCMC works the same. Let us see how this works for our running example. With the introduction of the meaning constructor in (30), the licence corresponding to *everything* is bundled together with the resource s associated with *someone*. This means that *everything* now requires both of these resources to be present before it can enter the proof. The s resource can be introduced via hypothetical reasoning, but once that hypothesis is discharged, a dependency on s will be introduced into the proof instead. The only way to remove such a dependency is via the application of the meaning constructor for *someone*, which consumes just such a dependency. So, after the application of the meaning of *everything*, a dependency only resolvable by application of the meaning of *someone* exists. The net result of this is that *everything* must enter the proof before *someone*, and therefore scope under it, or otherwise we will be left with an unresolved dependency on s and no way to remove it – thus, no valid proof. With the introduction of the SCMC, there is therefore now only one successful proof of the meaning of *Bertie gave someone everything*, where *everything* takes narrow scope. This is shown in Figure 6.

5 Alternative proposals for constraining quantifier scope

The need to impose constraints on quantifier scope in a Glue setting has been acknowledged in previous Glue work, and there have been several proposals for how this can be done.

5.1 Constraints on the form of proofs

Crouch & van Genabith (1999) propose to constrain scope order by constraining what counts as an admissible proof. According to their proposal, a node ordering constraint of the form $f{>}g$ requires that no instance of g occurs lower down in the proof than every instance of f, i.e. f outscopes g.

Gotham (2019: 118f.) criticizes Crouch & van Genabith's (1999) approach on two grounds. First, he notes that it relies on a particular (natural deduction-style) representation of proofs – the predicates "higher" and "lower" describe properties of the way natural deduction proofs are written, and are not defined for other styles such as proof nets – and points out that it is undesirable to build into the theory a requirement for proofs to be represented in a particular way. As he stresses (p. 119), "natural deduction derivations are representations of proofs, not the proofs themselves". Second, he notes that the approach in question implements a non-monotonic generate-then-filter strategy, where all proofs are generated, and then some are discarded as not of interest, despite being well-formed. With Gotham, we conclude that Crouch & van Genabith's (1999) proposal is not a desirable augmentation of Glue; see Gotham (2019: 118f.) for more detailed discussion.

5.2 Hard-coded scope orders

Gotham (2019) makes an alternative proposal to constrain quantifier scope, which involves expanding the fragment of linear logic that is used by adding a new type of term (integers) and a new function symbol, s, representing the successor function. To some extent, our proposal also expands the fragment of linear logic from the purely implicational fragment often assumed in modern work, by also including the $\otimes$ connective. However, we do note that this connective is a standard part of linear logic, and has previously been used in Glue analyses, e.g. of anaphora (such as Dalrymple 2001: ch. 11).

$$
\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\begin{array}{c}\textbf{[everything-2]}\\ \_ : \ell^e\end{array} \quad \begin{array}{c}\textbf{[SCMC]}\\ \bigcirc : \ell^e \multimap (s \multimap (\ell^e \otimes s))\end{array}}{\bigcirc : s \multimap (\ell^e \otimes s)} \quad [y : s]^1}{\bigcirc : \ell^e \otimes s} \quad \dfrac{\dfrac{\dfrac{\begin{array}{c}\textbf{[gave]}\\ \mathbf{gave} : b \multimap (s \multimap (e \multimap g))\end{array} \quad \begin{array}{c}\textbf{[Bertie]}\\ \mathbf{b} : b\end{array}}{\mathbf{gave}(\mathbf{b}) : s \multimap (e \multimap g)} \quad [y : s]^2}{\mathbf{gave}(\mathbf{b})(y) : e \multimap g} \quad [\_ : \ell^e]^3}{\mathbf{gave}(\mathbf{b})(y) : (e \multimap g) \otimes \ell^e}\otimes_I}{\mathbf{gave}(\mathbf{b})(y) : (e \multimap g) \otimes \ell^e}\otimes_{E_{2,3}} \quad \begin{array}{c}\textbf{[everything-1]}\\ \mathbf{everything} : ((e \multimap g) \otimes \ell^e) \multimap g\end{array}}{\dfrac{\mathbf{everything}(\mathbf{gave}(\mathbf{b})(y)) : g}{\lambda y.\mathbf{everything}(\mathbf{gave}(\mathbf{b})(y)) : s \multimap g}\multimap_{I_1}} \quad \begin{array}{c}\textbf{[someone-2]}\\ \_ : \ell^s\end{array}}{\lambda y.\mathbf{everything}(\mathbf{gave}(\mathbf{b})(y)) : (s \multimap g) \otimes \ell^s} \quad \begin{array}{c}\textbf{[someone-1]}\\ \mathbf{someone} : ((s \multimap g) \otimes \ell^s) \multimap g\end{array}}{\dfrac{\mathbf{someone}(\lambda y.\mathbf{everything}(\mathbf{gave}(\mathbf{b})(y))) : g}{\mathbf{someone}(\lambda y.\mathbf{everything}(\lambda z.\mathbf{gave}(\mathbf{b})(y)(z))) : g}=_\eta}
$$

Figure 6: Proof for *Bertie gave someone everything* with licences and scope constraint forcing *someone* ≫ *everything*

In Gotham's (2019) proposal, the linear logic resources on the glue side of meaning constructors are redefined as predicates of numerical terms, which bear some conceptual similarity to the licensing resources which we have proposed, in that their purpose is to constrain the proof space. A predicate can specify the relative scope of its arguments by requiring the resource for one of its arguments to be associated with the same numerical term as itself: for example, if a transitive verb specifies that the object resource and the resource for the verb are associated with the same variable, then the object must take narrow scope relative to the subject. In this way, restrictions on the relative scope of arguments are hard-coded into the meaning constructor of the predicate that selects them.

Gotham's (2019) proposal adds terms to the derivation whose purpose is to eliminate proofs of unwanted scopings, using the standard rules of linear logic. However, the approach has limitations. Though it can successfully constrain the relative scope of the arguments of a two-place predicate, Gotham (2019: 123–126) points out that it must be augmented with additional constraints if scope possibilities also depend on other factors such as linear order, and the logic itself must be further expanded with additional function symbols to handle scope relations involving arguments of a predicate with arity greater than two. Additionally, it is not clear that his proposal could (straightforwardly) handle scoping constraints that do not involve arguments of the same predicate, as in (18), where the two quantifiers of interest are arguments of two different predicates. By contrast, our approach simply expresses a scope ordering between any two quantifiers, quite independently of their relation to any predicate, the number of arguments their governor might have, or of their argument/adjunct status. Thus, we conclude that Gotham's (2019) approach is insufficiently general in comparison to the proposal presented in this paper.

5.3 Multistage proving

Other recent work also allows for the imposition of constraints on the scope of operators, but in a rather different way. Findlay & Haug (2022) propose a new level of representation in the projection architecture which groups meaning premises together to manage interactions between them. Zymla (2024) builds on this work in a computational implementation. In their approach, premises are grouped together in a structure called *proof structure*, which imposes limits on the interactions between the premises. In essence, the proof structure partitions the semantic resources into disjoint sets. Inside each set, no scope constraints are imposed: a proof is constructed from the premises according to the normal inference rules of linear logic. But the sets themselves are ordered, so that no resource from a lower set can scope over a resource in a higher set.

In this setup, it is easy to impose *total* scope islands. For example, if we want to impose the constraint that some clause is an absolute scope island, we make the proof structure group all the resources coming from material in that clause, forcing all that material to combine together before it interacts with the material governing that clause (see Findlay & Haug 2022: 154–156 for an example). It is not trivial to impose such a constraint with the licensing machinery described in this paper, though it is possible.

On the other hand, there is no very natural way to impose *pairwise* ordering constraints in the multistage proving approach of Findlay & Haug (2022). This would be important in a situation where we had at least three scope-taking elements, but where the relative ordering was only fixed between two of them, with the third item free to scope at any point. Imagine, for example, that we have a sentence with three scope-taking elements Q_1, Q_2, Q_3 and a verb V, and we want to impose the constraint that Q_2 outscopes Q_3 but that otherwise any scoping is permissible (i.e. we can have the order $Q_1 \gg Q_2 \gg Q_3$, the order $Q_2 \gg Q_1 \gg Q_3$, or the order $Q_2 \gg Q_3 \gg Q_1$). It is possible to achieve this effect in multistage proving by using disjunctive descriptions of proof structure, such that the sentence is associated with two distinct proof structures (either $\{Q_2, \{Q_1, Q_3, V\}\}$ or $\{Q_1, Q_2, \{Q_3, V\}\}$). But this is less natural than simply stating a constraint between Q_2 and Q_3 only, as can be done with the licensing approach described here.

Whether this is an advantage of our approach then depends on whether we find such situations in natural language. This empirical question is not at all straightforward to answer, since, as we saw above, judgements can already be quite fragile when just two scope-taking items are involved, and here we must necessarily have at least three. But here is a potential example of the structure in question:

(34) *Bertie didn't give someone everything.*

This is the negated version of our running example, where we know that the direct object *something* must outscope the secondary object *everything* ($\exists \gg \forall$). We have not discussed negation in this paper, but it too involves a scope-taking element ($\neg$) which can scope over or under other operators, and our treatment of it will be very similar to how we handle quantifiers. We suggest that (34) illustrates exactly the pattern described in the previous paragraph, with a fixed scope order between *something* and *everything*, but no such constraint on the negation, which can then scope at any point relative to the two quantifiers. This gives rise to three distinct readings (each of which can be brought out by pronouncing the sentence with a particular stress pattern):

(35) a. It's not the case that Bertie gave someone everything. $[\neg \gg \exists \gg \forall]$
(*Bertie* DIDN'T *give someone everything.*)
b. There's someone Bertie didn't give everything too. $[\exists \gg \neg \gg \forall]$
(*Bertie didn't give* SOMEONE *everything.*)
c. There's someone Bertie gave nothing to. $[\exists \gg \forall \gg \neg]$
(*Bertie didn't give someone* EVERYTHING.)

We leave to further research the difficult task of clarifying the empirical facts more rigorously, e.g. via behavioural or neurophysiological experiments, but if contrasts such as those described in (35) are valid, then the licensing approach offers a more natural explanation than the multistage proving approach does.

Before we leave the topic of multistage proving, it should be noted that Gotham (2021) presents a system where he achieves an effect similar to that of multistage proving by restricting the associativity of the logic, i.e. by not allowing in the general case the inference from $(\Gamma, (\Delta, \Sigma))$ to $((\Gamma, \Delta), \Sigma)$, thereby forcing Δ, Σ to combine first. Instead, brackets are assigned ordered mode indices (via indices on the implication connective) and rebracketing is allowed only when the inner bracket's mode is stronger than that of the outer bracket. Gotham's (2021) approach does have the advantage of being able to capture the interaction of islands and escapers of different strengths, as mentioned above (see Barker 2022), which is not straightforwardly possible in the approach of Findlay & Haug (2022). Nevertheless, we feel his general strategy is guilty of "generalising to the worst case". In the approach of Findlay & Haug (2022) and that of the present paper, associativity, i.e. scope ambiguity, is assumed to be present unless explicitly excluded; for Gotham (2021), the situation is reversed: every interaction of quantifiers is mediated by the mode numbers, and so any scope ambiguity must be explicitly licensed. We do not feel this is correct, but concede this may amount to little more than aesthetics. More substantively, Gotham's (2021) approach, just like the multistage proving approach of Findlay & Haug (2022), has no natural way to state arbitrary pairwise scope constraints.

6 Conclusion

Glue has the desirable property of modelling quantifier scope ambiguities as arising at the syntax–semantics interface itself, rather than requiring an otherwise unmotivated syntactic ambiguity. However, we do not always want to allow all such scope orderings – some constructions restrict them in various ways. In this paper, we have shown that vanilla (LFG+)Glue is in fact able to enforce arbitrary pairwise scope orderings, without modifications to the proof algorithm or underlying logic (save for the use of multiplicative conjunction, $\otimes$), and without complexification of the grammatical architecture. This makes it possible to impose constraints on scope ambiguity on a construction-by-construction basis.

References

Abels, Klaus & Dagmara Grabska. 2022. On the distribution of scope ambiguities in Polish. *Glossa: a journal of general linguistics* 7(1). https://doi.org/10.16995/glossa.8170.

Asudeh, Ash. 2022. Glue Semantics. *Annual Review of Linguistics* 8. 321–341. https://doi.org/10.1146/annurev-linguistics-032521-053835.

Asudeh, Ash. 2023. Glue semantics. In Mary Dalrymple (ed.), *The handbook of Lexical Functional Grammar* (Empirically Oriented Theoretical Morphology and Syntax 13), 651–697. Language Science Press. https://doi.org/10.5281/zenodo.10185964.

Asudeh, Ash & Richard Crouch. 2001. Glue semantics for HPSG. In Frank Van Eynde, Lars Hellan & Dorothee Beermann (eds.), *Proceedings of the 8th International Conference on Head-Driven Phrase Structure Grammar*, 1–19. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/2/hpsg01.html.

Asudeh, Ash & Mary Dalrymple. In prep. Glue semantics. In *Handbook of linguistic semantics: Bridging theory, philosophy and cognition*, Springer Nature.

Barker, Chris. 2022. Rethinking scope islands. *Linguistic Inquiry* 53(4). 633–661. https://doi.org/10.1162/ling_a_00419.

Bobaljik, Jonathan David & Susi Wurmbrand. 2012. Word order and scope: transparent interfaces and the 3/4 signature. *Linguistic Inquiry* 43(3). 371–421. https://muse.jhu.edu/article/481121.

Chomsky, Noam. 1976. Conditions on rules of grammar. *Linguistic Analysis* 2. 303–351.

Crouch, Richard & Josef van Genabith. 1999. Context change, underspecification and the structure of Glue language derivations. In *Semantics and syntax in Lexical Functional Grammar*, 117–189. MIT Press.

Curry, Haskell B. & Robert Feys. 1958. *Combinatory logic: volume I*. Amsterdam: North Holland.

Dalrymple, Mary. 2001. *Lexical Functional Grammar* (Syntax and Semantics 34). San Diego, CA: Academic Press.

Dalrymple, Mary, John Lamping, Fernando C. N. Pereira & Vijay A. Saraswat. 1997. Quantifiers, anaphora, and intensionality. *Journal of Logic, Language and Information* 6(3). 219–273. https://doi.org/10.1023/A:1008224124336.

Dalrymple, Mary, John Lamping & Vijay Saraswat. 1993. LFG semantics via constraints. In Steven Krauwer, Michael Moortgat & Louis des Tombe (eds.), *Proceedings of the Sixth Conference of the European Chapter of the Association for Computational Linguistics (EACL 1993)*, 97–105. Association for Computational Linguistics. https://doi.org/10.3115/976744.976757.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford Reference Guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Findlay, Jamie Y. & Dag T. T. Haug. 2022. Managing scope ambiguities in Glue via multistage proving. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 Conference*, 143–163. Stanford, CA: CSLI Publications. https://lfg-proceedings.org/lfg/index.php/main/article/view/18.

Frank, Anette & Josef van Genabith. 2001. GlueTag: linear logic based semantics for LTAG – and what it teaches us about LFG and LTAG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'01 Conference*, 104–126. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2001/pdfs/lfg01frankgenabith.pdf.

Fry, John. 1997. Negative polarity licensing at the syntax–semantics interface. In *35th Annual Meeting of the Association for Computational Linguistics and 8th Conference of the European Chapter of the Association for Computational Linguistics (ACL-EACL 97)*, 144–150. Madrid: Association for Computational Linguistics. https://doi.org/10.3115/976909.979636.

Girard, Jean-Yves. 1987. Linear logic. *Theoretical Computer Science* 50(1). 1–102. https://doi.org/10.1016/0304-3975(87)90045-4.

Gotham, Matthew. 2018. Making Logical Form type-logical: Glue semantics for Minimalist syntax. *Linguistics & Philosophy* 41(5). 511–556. https://doi.org/10.1007/s10988-018-9229-z.

Gotham, Matthew. 2019. Constraining scope ambiguity in LFG+Glue. In Miriam Butt, Tracy Holloway King & Ida Toivonen (eds.), *Proceedings of the LFG'19 Conference*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2019/lfg2019-gotham.pdf.

Gotham, Matthew. 2021. Approaches to scope islands in LFG+Glue. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'21 Conference*. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2021/lfg2021-gotham.pdf.

Haug, Dag T. T. & Jamie Y. Findlay. 2023. Formal semantics for Dependency Grammar. In *Proceedings of the Seventh International Conference on Dependency Linguistics (Depling 2023)*, 22–31. Association for Computational Linguistics. https://aclanthology.org/2023.depling-1.3/.

Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar* (Blackwell Textbooks in Linguistics 13). Oxford: Blackwell.

Hoji, Hajime. 1985. *Logical form constraints and configurational structures in Japanese*. Ph.D. thesis, University of Washington.

Howard, William A. 1980. The formulae-as-types notion of construction. In *To H. B. Curry: essays on combinatory logic, lambda calculus, and formalism*, 479–490. London: Academic Press. Circulated in unpublished form from 1969.

Jackendoff, Ray S. 1972. *Semantic interpretation in generative grammar* (Current Studies in Linguistics). Cambridge, MA: MIT Press.

Kadmon, Nirit & Craige Roberts. 1986. Prosody and scope: the role of discourse structure. In Anne M. Farley, Peter T. Farley & Karl-Erik McCullough (eds.), *Proceeding from the 22nd meeting of the Chicago Linguistics Society [Part 2]: Papers from the parasession on pragmatics and grammatical theory*, 16–28. Chicago, IL: Chicago Linguistic Society.

Kamp, Hans, Josef van Genabith & Uwe Reyle. 2011. Discourse Representation Theory. In Dov M. Gabbay & Franz Guenthner (eds.), *Handbook of philosophical logic* (2nd edn.), vol. 15, 125–394. Berlin: Springer.

Kamp, Hans & Uwe Reyle. 1993. *From discourse to logic*. Dordrecht: Kluwer.

Karnowski, Pawel. 2001. Zum relativen Quantorenskopus im Polnischen. In Gerhild Zybatow, Uwe Junghanns, Grit Mehlhorn & Luka Szucsich (eds.), *Current issues in formal Slavic linguistics* (Linguistik International 5), 426–435. Berlin: Peter Lang.

Larson, Richard K. 1990. Double objects revisited: reply to Jackendoff. *Linguistic Inquiry* 21(4). 589–632. https://www.jstor.org/stable/4178697.

Martí, Luisa. 2001. Intonation, scope, and restrictions on quantifiers. In Karine Megerdoomian & Leora Anne Bar-el (eds.), *Proceedings of the 20th West Coast Conference on Formal Linguistics (WCCFL 20)*, 372–385. Somerville, MA: Cascadilla Press.

May, Robert. 1977. *The grammar of quantification*. Ph.D. thesis, MIT.

May, Robert. 1985. *Logical form: its structure and derivation* (Linguistic Inquiry Monographs 12). Cambridge, MA: MIT Press.

Muskens, Reinhard. 1996. Combining Montague Semantics and discourse representation. *Linguistics and Philosophy* 19(2). 143–186. https://doi.org/10.1007/bf00635836.

Szabolcsi, Anna. 1997. Strategies for scope taking. In Anna Szabolcsi (ed.), *Ways of scope taking*, 109–154. Dordrecht: Kluwer.

Szczegielniak, Adam. 2005. *Relativization that you did ...* (MIT Occasional Papers in Linguistics 24). Cambridge, MA: MIT Press.

Zymla, Mark-Matthias. 2024. Ambiguity management in computational Glue semantics. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 285–310. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/59.

Categories don't take precedence: Evidence from Welsh

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Abstract

The morphological component of an $\mathrm{L_R FG}$ grammar is responsible for selecting the word forms (Vocabulary Items, or VIs) which express a given sentence. VIs may realize only a subset of the information in a sentence, but **MostInformative**$_\mathrm{f}$ ($\mathrm{MI_f}$) and **MostInformative**$_\mathrm{c}$ ($\mathrm{MI_c}$), which evaluate the f- and c-structure information a VI realizes (respectively), ensure that sentences are expressed using the fewest VIs that realize the most information possible. Welsh has positive, negative and neutral forms of the copula in the present and imperfect paradigms which compete to realize copula-containing structures. The Welsh data regarding which form is selected in different contexts is used to show two important conclusions: (1) that constraining equations have a different status to defining equations in VIs, the former not contributing to the evaluation of $\mathrm{MI_f}$, and (2) that $\mathrm{MI_f}$ outranks $\mathrm{MI_c}$ when the two metrics return different VIs according to their evaluation.

1 Overview

This paper explores complex blocking relationships in Lexical-Realizational Functional Grammar ($\mathrm{L_R FG}$; among others, Melchin, Asudeh & Siddiqi 2020; Asudeh & Siddiqi 2022; Asudeh, Bögel & Siddiqi 2023; Asudeh & Siddiqi 2023; Asudeh, Melchin & Siddiqi 2024b; Asudeh & Siddiqi 2024, 2026). These relationships are explored with reference to the distribution of different forms of the copula in Welsh.[†]

In the present and imperfect, the Welsh copula has polarity-sensitive forms.[1]

(1)	Rwyt	ti	’n	dawel.	
	r-ʊɪt	tiː	=n	dawel.	
	POS-be.PRS.2SG	2SG	=PRED	quiet.	
	‘You are quiet.’				
(2)	Dwyt	ti	ddim	yn	dawel.
	d-ʊɪt	tiː	ðɪm	ən	dawel.
	NEG-be.PRS.2SG	2SG	NEG	PRED	quiet
	‘You aren’t quiet.’				

(3)	Beth	rwyt	ti	’n	hoffi?	
	beθ	**r**-ʊɪt	tiː	=n	hɔfi?	
	what	**POS**-be.PRS.2SG	2SG	=PROG	like.NF	
	‘What do you like?’					
(4)	Beth	dwyt	ti	ddim	yn	hoffi?
	beθ	**d**-ʊɪt	tiː	ðim	ən	hɔfi?
	what	**NEG**-be.PRS.2SG	2SG	NEG	PROG	like
	‘What don’t you like?’					

The positive and negative forms of the copula sometimes fail to occur where they might otherwise be expected to do so based on the polarity of the clause. We will later demon-

[†]We would like to thank the audience at LFG25 and our reviewers for their invaluable questions and comments. We would also like to thank the $\mathrm{L_R FG}$ Lab for detailed feedback on particular points of analysis, especially Danil Alekseev, Oleg Belyaev, Bronwyn Bjorkman, and Dan Siddiqi.

[1]No other verb or tense-inflection of the copula displays this behaviour, though see Borsley & Jones (2005: 50) for two verbs with negative forms.

strate this, showing that the forms are sensitive to clause-type and other contextual factors in addition to polarity.

In this paper, we will recap arguments that the neutral form's distribution can be successfully captured if we treat it as an unmarked/default form, relative to the positively and negatively specified forms, as argued in an LFG analysis of the data in Dowle (2025). Then, we'll show what implications this data has for the nature of blocking relationships in L_RFG. There are two points of particular interest. Firstly, 3SG neutral forms are sensitive to their subject's definiteness but not the clause's polarity, while the reverse is true for 3SG positive forms. There is an apparent tension in that one form seems more specific about its subject, and the other seems more specific about its polarity. Secondly, the sequence of complementizer and positive form is ungrammatical. This has different consequences depending on clause type. In declarative clauses, positive forms block the complementizer. In if-clauses, the complementizer blocks the positive form (occurring instead with the neutral form). This paper explores what these data entail for the nature of blocking in L_RFG.

As a realizational model of morphology,[2] L_RFG assumes that functional and categorical information is introduced by phrase structure rules into the c-structure tree of LFG. The job of the morphology is to then find the forms that best express the information in the tree. It assesses the lexicon (a.k.a. Vocabulary in L_RFG) to find possible exponents among the Vocabulary Items (VIs). It can only select forms that either match or are subsets of the information in the tree. Often there are multiple forms that meet this criterion but only one form can be chosen. This is done according to the Elsewhere Principle (Kiparsky 1993), i.e. the most informative form wins. This notion has been formalised in L_RFG by a family of constraints, including **MostInformative**$_f$, which compares f-structure information, and **MostInformative**$_c$, which compares c-structure information (MI_f and MI_c for short; see Section 3.2). This paper will demonstrate that constraining equations are not evaluated as part of MI_f, making them importantly distinct from defining equations in VIs, and also that when MI_f and MI_c select different forms according to their own criteria, it is MI_f that matters rather than MI_c. This has implications for the formalisations of MI_f and MI_c within the theory.

2 Data

2.1 Forms of the copula

Table 1 contains some paradigms, illustrating the relevant copular forms (Jones & Gilby 2004). These are the citation forms, but in spoken Welsh more reduced forms are typically found (King 2016: 180-1, §226-7).

[2]For some approaches to realizational morphology interfaced with LFG, see Butt & Sadler (2004), Bögel et al. (2008), Dalrymple (2015) and Thomas (2021).

	1SG	2SG	3SG	1PL	2PL	3PL
POS	r-ɔið-un	r-ɔið-et	r-ɔið	r-ɔið-en	r-ɔið-eχ	r-ɔið-en
NEG	d-ɔið-un	d-ɔið-et	d-ɔið	d-ɔið-en	d-ɔið-eχ	d-ɔið-en
NEUT	ɔið-un	ɔið-et	ɔið	ɔið-en	ɔið-eχ	ɔið-en

Table 1: Modern Welsh tripartite system of imperfect forms of the copula

	1SG	2SG	3SG	1PL	2PL	3PL
POS	r-ədu	r-ʊɪt		r-əd-ɪn	r-əd-ɪχ	ma(ɪ)n
NEG	d-ədu	d-ʊɪt	see below	d-əd-ɪn	d-əd-ɪχ	d-əd-in
NEUT	əd-u	ʊɪt		əd-ɪn	əd-ɪχ	əd-in

Table 2: Modern Welsh tripartite system of present-tense forms of the copula

	Definite subject	*Indefinite subject*
POS	ma(ɪ)	
NEG	d-əd-i	d-ɔis
NEUT	əd-i	ɔis

Table 3: Third-person singular present-tense forms of the copula

Note that there is generally a very regular pattern: neutral forms are the most basic; positive forms consist of a prefixed *-r* plus the neutral form; negative forms consist of a prefixed *-d* and the neutral form. The third-person stem (in singular and plural) is suppletive. The same suppletive stem is used in the third-person singular both when the subject is definite and when it is indefinite.

The 3SG forms are, unsurprisingly, underspecified for person and number (Dowle 2022; Borsley 2009). When a subject pronoun is fronted, it is this form that occurs, regardless of the person and number specifications of the fronted pronoun. It is also these forms which occur with lexical noun phrases, whether singular or plural, because person-number agreement in Welsh is restricted to occurring with personal pronouns. The restriction on person–number forms only occurring with (definite) pronouns also explains why there is no definite–indefinite split in the 3PL part of the table. In this paper we will still use the term '3SG' for the relevant forms, as a convenient label, since we are primarily interested in considering the ways in which neutral forms are underspecified compared to positive and negative forms.

2.2 Distribution of Forms

Sometimes the positive and negative forms fail to occur where we might otherwise expect them to, and the polarity-neutral form of the copula occurs instead.

2.2.1 Responsives

Positive and negative forms are both blocked in responsives. Responsives are the most basic possible answers to polar questions in Welsh; they typically consist of a form of the copula and no other material (See Jones 1999 for in-depth discussion).

(5) Wyt ti 'n iawn?
ʊɪt tiː =n jaun?
be.PRS.2SG 2SG =PRED okay?
'Are you okay?'

a. (*R-)Ydw.
(***r-**)əd-u.
(***POS**-)be.PRS-1SG
'Yes.'

b. Nac (*d)ydw.
nak (***d-**)əd-u.
NEG (***NEG**-)be.PRS.1SG
'No.'

2.2.2 Polar questions

As the above example also shows, positive forms fail to occur in polar questions, whilst negative forms are fine here:

(6) * Rwyt ti 'n
r-ʊɪt tiː =n
POS-be.PRS.2SG 2SG =PRED
iawn?
jaun?
okay
Intended: 'Are you okay?'

(7) Wyt ti 'n iawn?
ʊɪt tiː =n jaun?
be.PRS.2SG 2SG =PRED okay
'Are you okay?'

(8) Dwyt ti ddim yn gallu dod i 'r parti?
d-ʊɪt tiː ðɪm ən gaɬi dɔːd i =r parti?
NEG-be.PRS.2SG 2SG NEG PROG can.NF come.NF to =the party
'Can't you come to the party?'

2.2.3 If-clauses

Positive forms appear to be blocked in if-clauses.[3] 'If-clause' refers to the antecedent's clause, rather than the consequent's clause, in antecedent–consequent pairs like the following:

(9) Os (*r)ydw i 'n gallu dod, bydda
ɔs (***r-**)əd-u iː =n gaɬi dɔːd, bəð-a
if (***POS-**)be.PRS-1SG 1SG =PROG can.NF come.NF, be.FUT-FUT.1SG
i 'n dweud wrthot ti.
iː =n dwəɪd urth-ɔt tiː.
1SG =PROG say.NF at-2SG 2SG
'If I can come, I will tell you.'

However, positive forms of the copula are in fact only blocked from occurring adjacent to the complementizer, *os* 'if'. Welsh has focus-fronting constructions, in which an XP

[3] Although see for some nuance on this point, regarding recent dialect changes.

appears pre-verbally and receives mild contrastive focus. The restriction on positive forms in if-clauses does not hold when the if-clause contains a focus-fronted phrase, which intervenes between the complementizer *os* 'if' and the copula:

(10) Os [Mari]$_{FOC}$ rwyt ti wedi alw, bydd popeth yn
ɔs [mari]$_{FOC}$ **r**-ʊɪt tiː wɛdi alu, bið pɔpeθ ən
if [Mari]$_{FOC}$ **POS**-be.IMPF.2SG 2SG PERF call.NF be.FUT everything PRED
iawn.
jaun.
okay
'If it's *Mari* you've called, everything will be okay.'

Some types of fronted phrases (e.g. subjects and predicates) require neutral forms to follow them in all clause types, including if-clauses.

Negative forms are fine in if-clauses even in the absence of fronting:

(11) Os dydw i ddim yn gallu dod, bydda
ɔs **d**-əd-u iː ðɪm ən gaɬi dɔd, bəð-a
if **NEG**-be.PRS.1SG 1SG NEG PROG can.NF come.NF be.FUT-FUT.1SG
i 'n dweud wrthot ti.
iː =n dwəɪd wrth-ɔt tiː.
1SG =PROG say.NF at-2SG 2SG
'If I can't come, I will tell you.'

2.2.4 Declarative clauses

Ordinary declarative clauses are a special case. Instead of *being* blocked, positive forms are the ones that *do* the blocking here. Specifically, these forms block the positive declarative main clause (PDMC) complementizer, which in southern dialects takes the form *vɛ*.[4]

(12) (*Fe) mae Sam yn pobi bisgedi.
(*vɛ) maɪ Sam ən pɔbi bɪsged-i.
C$_{PDMC}$ POS.be.PRS Sam PROG bake.NF biscuit-PL
'Sam is baking biscuits.'

(13) (*Fe) rydw i 'n pobi bisgedi.
(*vɛ) r-əd-u i =n pɔbi bɪsged-i.
C$_{PDMC}$ POS-be.PRS-1SG 1SG =PROG bake.NF biscuit-PL
'I'm baking biscuits.'

Vɛ does not appear to convey any functionally-incompatible information. It is fine with other verbs, and even with other copula forms that don't show polarity sensitivity:

(14) (Fe) hoffwn i fynd.
(vɛ) hɔf-un i vɪnd.
C$_{PDMC}$ like-COND.1SG 1SG go.NF
'I would like to go.'

[4] See Borsley et al. (2007: 35) for some further discussion on the forms and distribution of positive declarative main clause complementizers in Modern Welsh.

(15) (Fe) es i.
(vɛ) ɛs iː.
C$_{\text{PDMC}}$ go.PST.1SG 1SG
'I went.'

(16) (Fe) fydda i 'n pobi bisgedi heno.
(vɛ) vəða iː =n pɔbi bisged-i henɔ.
C$_{\text{PDMC}}$ be.FUT.1SG 1SG =PROG bake.NF biscuit-PL tonight
'I will be baking biscuits tonight.'

There is a contrast here with if-clauses. In if-clauses, the complementizer (*ɔs*) and the positive copular form are incompatible, but the result is that the complementizer *ɔs* 'if' is used with a neutral form; hence *ɔs əd-w* rather than *ɔs r-əd-w* in (9). In declarative clauses, the complementizer and positive copular form are again incompatible, but the result is that the positive form occurs on its own; hence *rydw* in (13) instead of *vɛ r-əd-w*. The solution to complementizer–positive-form incompatiblity in if-clauses (to use the neutral instead of positive form) is not available in a declarative clause:

(17) * Fe ydw i 'n pobi bisgedi heno.
vɛ əd-w iː =n pɔbi bisged-i henɔ.
C$_{\text{PDMC}}$ be.PRS-1SG 1SG =PROG bake.NF biscuit-PL tonight
Intended: 'I am baking biscuits tonight.'

Recall that the presence of a focus-fronted phrase resolved the incompatibility between *os* 'if' and the positive copular form. There is no positive *main clause* complementizer that occurs alongside focused phrases, but there is a subordinate clause one (which *only* occurs when there is a focused phrase).[5] In a declarative subordinate clause with focus-fronting, we can see that there is no incompatibility between the complementizer and the positive form of the copula:

(18) Dw i 'n meddwl taw [Mari]$_{\text{FOC}}$ rwyt ti
du iː =n mɛðul **taʊ** [mari]$_{\text{FOC}}$ r-ʊɪt tiː
be.PRS.1SG 1SG =PROG think.NF **C$_{\text{SUB.FOC}}$** [Mari]$_{\text{FOC}}$ POS-be.PRS 2SG
wedi alw.
wɛdi alu.
PERF call.NF
'I think that you called *Mari*.'

One possibility to account for this data is to propose a functional restriction: *vɛ* cannot occur with imperfect or present verb forms. Only the copula morphologically expresses these tenses (such that they are distinct from the future or conditional), and so this achieves the desired distribution of *vɛ*. We will later reject this idea, instead preferring a unified account of the restriction against complementizer-adjacency for positive forms in both if-clause and declarative clauses.[6]

[5] See Borsley et al. (2007: 128) for more detail.

[6] It is not clear whether the negative form of the copula behaves the same way in declarative clauses. There is (in spoken Welsh) no negative main clause complementizer, and the subordinate clause negative complementizer takes the form *na(d)*, with final *d* surfacing before vowel-initial forms. Thus, the segmen-

3 Analysis

3.1 Generalizations

The above data demonstrates that although both positive and negative forms exhibit restrictions beyond the simple polarity restrictions indicated by their labels, the negative form is much less restricted than the positive one. Responsives are the only context in which negative forms are blocked. We attribute this to the special complementizer, *nak*, which occurs in these contexts.[7] The positive forms have a more complex set of restrictions. Sometimes, there is a restriction against positive forms of the copula occurring in clauses of particular types, a kind of global restriction. This is true of responsives and polar interrogatives. Sometimes, positive forms are prevented from occurring adjacent to a complementizer, a local restriction. This is true in if-clauses and declaratives. Unlike a clause-type restriction, this kind of restriction is characterised by (1) existence of an overt complementizer for the clause and (2) cancellation of the effect if there is an intervening focus-fronted phrase. We showed that the local kind of restriction appears to have different effects in different contexts. In if-clauses, the blocking of **ɔs ɾ-əd-u* leads to occurrence of *ɔs əd-u*. In declaratives, the blocking of **vɛ ɾ-əd-u* leads to the occurrence of *ɾ-əd-u* on its own, not **vɛ əd-u*. There is also the matter of the same suppletive form *maɪ* blocking the (hypothetical) regular positive-definite and positive-indefinite forms. These are the facts to be accounted for in this section.

Some of the data appears to support a semantic or pragmatic approach to the distribution of the forms. After all, positive forms are blocked in two non-assertive contexts: if-clauses and polar interrogatives. However, blocking positive forms of 'be' from non-assertive contexts does not account for the data. Firstly, it does not explain why the positive forms are blocked from responsives. Secondly, it does not explain why the presence of fronted material in an if-clause has an ameliorating effect on the restriction against positive forms in if-clauses. Indeed, close inspection of the data shows that positive forms are not blocked from if-clauses: they are blocked from being adjacent to the complementizer found in if-clauses (as well as the one found in declarative clauses). Therefore, we treat this as a syntactic phenomenon.

3.2 Blocking Principles

L_RFG assumes a set of blocking principles to choose the actual exponent from the set of possible exponents. The final formalization of these principles will appear in Asudeh & Siddiqi (2026), but for a recent formalization, see Asudeh & Siddiqi (2023). Here we present just the intuitions behind the two of the five principles that are relevant to this paper.

tations *na d-əd-i*, in which the complementizer and negative form co-occur, and *nad əd-i*, in which the complementizer and neutral form co-occur, are equally plausible. The same is true for the now-literary main complementizer *ni(d)*. Indeed, it is the ambiguity of segmentation that led to the development of negative forms in the first place. We assume the *na d-əd-i* analysis, because it is not necessary to assume that negative forms are incompatible with complementizers more generally, and so assuming they are incompatible in these cases adds unnecessary complexity.

[7] Negative forms and positive forms are also blocked when subjects are fronted, although we set aside this data in this paper; see Dowle (2025) for discussion of how this could also be addressed in a way which does not disrupt the analysis presented here.

(19) **MostInformative$_c$**: Of the candidate vocabulary items for exponence, which match the categorial information of the node(s) to be exponed, choose the vocabulary item that contains the most categories; if there is no such candidate do nothing.

For example, choose a VI whose category list is [A,B] over a VI whose category list is [A].

(20) **MostInformative$_f$**: Of the candidate vocabulary items for exponence, whose f-descriptions define an f-structure that subsumes the f-structure of the node(s) to be exponed, choose the vocabulary item that defines the f-structure at the top of the subsumption lattice, i.e. the f-structure that is properly subsumed by all other candidate f-structures.

For example, choose a VI whose defining equations are $\{(\uparrow \text{ATTR}_1) = \text{VAL}_1, (\uparrow \text{ATTR}_2) = \text{VAL}_2\}$ over $\{(\uparrow \text{ATTR}_1) = \text{VAL}_1\}$; if there is no such candidate do nothing.

In short, MI$_c$ privileges vocabulary items that contain more c-structural category information, whereas MI$_f$ privileges vocabulary items that contain more f-structural information. Thus, MI$_c$ is about categories and prefers VIs that express more categories from the c-structure, while MI$_f$ is about function and prefers VIs that express more function, in terms of functional structure. A key contribution of this paper is to show that constraining equations are not relevant to the calculation of MI$_f$, since they do not *define* but rather restrict possible f-structures. The difference between defining and constraining equations in relation to MI$_f$ has not previously been considered in L$_R$FG, nor has it been discussed in relation to blocking in mainstream LFG (Andrews 1990). A further contribution is some evidence to suggest that MI$_f$ may override MI$_c$ if they provide conflicting selections.

3.3 Main Vocabulary Items

Here we present the main VIs relevant to the data under consideration. The copula as a whole sits under the I node of the c-structure tree in L$_R$FG, just as in mainstream LFG. In L$_R$FG, each morpheme, not just each word, has its distribution represented in the c-structure and so the I node is further decomposed into the different segmentable morpheme positions, with associated functional information. VIs expone these terminal nodes. We consider neutral forms of the copula to be sequences of a T morpheme, expressing tense, and an Agr morpheme, expressing subject agreement (although the indefinite form lacks any Agr exponent). Positive and negative forms additionally consist of a Pol morpheme. Note that this is the position associated with the expression of positive or negative concord, not the syntactic category associated with the main marking of negation (which could be Neg, Adv or some other category). Pol is probably a minor category not found in many languages. Together, these morpheme categories sit under I and form the copula.[8]

[8]Templates like @TENSE! and @AGREEMENT! abbreviate the possible values for TENSE and agreement-related f-structure features (such as SUBJ INDEX). For example, one of the options that @TENSE! provides is (↑ TENSE) = PRES, which is appropriate for a present-tense clause. We don't define them in this paper, because to do so would be to provide a full account of tense and agreement in Welsh.

(21) I $\rightarrow$ $\left\{ \begin{array}{c} \text{Pol} \\ \uparrow=\downarrow \end{array} \middle| \begin{array}{c} \sqrt{} \\ \text{@ROOT(\_)} \end{array} \right\}$ $\begin{array}{c} \text{T} \\ \uparrow=\downarrow \\ \text{@TENSE!} \end{array}$ $\begin{array}{c} \text{Agr} \\ \uparrow=\downarrow \\ \text{@AGREEMENT!} \end{array}$

The rule additionally captures that Pol does not occur with root-containing verbs in I.[9]

Here are the two VIs for the *d-* and *r-* prefixes.

(22) prefix to make negative forms:
$\langle$ [Pol], $\langle\!\langle$ ($\uparrow$ NEG) $=_c \oplus$ $\rangle\!\rangle$ $\rangle \xrightarrow{\nu}$ *d-*
$\langle\!\langle$ ($\uparrow$ TENSE) $=_c$ {PRES | IMPF} $\rangle\!\rangle$

(23) prefix to make positive forms:
$\langle$ [C, Pol], $\langle\!\langle$ $\neg$ ($\uparrow$ NEG) $\rangle\!\rangle$ $\rangle \xrightarrow{\nu}$ *r-*
$\langle\!\langle$ ($\uparrow$ TENSE) $=_c$ {PRES | IMPF} $\rangle\!\rangle$
$\langle\!\langle$ ($\uparrow$ FORCE) $\neq$ {RESP | POL-Q} $\rangle\!\rangle$

Both VIs contain only constraining functional equations. The notation '$\langle\!\langle$ ' and ' $\rangle\!\rangle$' is used to overtly indicate constraining equations.[10] Both of these prefixes are constrained by negation, but do not themselves define the polarity of the clause. Recall that sentential negation is expressed later in the sentence by e.g., *ðɪm* (cf. 11); if overt negation is found, *d-* is licensed, but in its absence, clauses are positive, the NEG feature is absent from the structure, and *r-* can occur. We treat negation as a privatively-valued feature, and we use $\oplus$ as the only possible feature value for a privative feature, to notationally distinguish it from a positive value (+) for a binary feature. At f-structure, a feature must have a value if it is present, as a formal requirement of AVMs; this is why even a privative feature must have a value specified. In addition to negation-sensitivity, both *r-* and *d-* are restricted to present or imperfect clauses; as only the copula expresses these tenses in a way which is morphologically distinct from the future or conditional, this also restricts the polarity markers to occurring with the copula.

Unlike *d-*, *r-* shows sensitivity to force, being prevented from occurring in a structure that is responsive or polar-interrogative. The f-structure feature FORCE is a re-naming of the familiar STMT-TYPE feature of LFG.[11] FORCE has the following possible values in Welsh: {RESP | POL-Q | WH-Q | COND | DECL}. These are morphosyntactic features, reflecting Welsh morphosyntactic distinctions, which go beyond the distribution of forms of 'be'. For example, Colloquial Welsh disfavours pro-drop in many contexts including ordinary declarative clauses, but still requires it in responsives.[12] Finally, the *r-* exponent spans both the C and Pol nodes; this captures the adjacency restriction between

Without lexical items in the c-structure, L_RFG in its current formulation uses phrase-structure rules to introduce the necessary f-structure features for a sentence; the VIs then expone these category–feature pairs.

[9] Although this may be too restrictive for those speakers who allow the prefix with certain content verbs (Borsley & Jones 2005: 50). These minor cases can be dealt with via a third disjunction.

[10] This notation is first introduced in L_RFG by Asudeh et al. (2024a), in response to feedback from practitioners of Minimalism/Distributed Morphology that the constraining equations were not always readily identifiable to those outside the theory; LFGers can simply disregard the extra notation.

[11] Again, this naming is intended to make the role of the feature more readily interpretable to people less familiar with LFG.

[12] Readers may wonder why a single feature INT isn't used for both polar and interrogative questions. This allows for a more efficient expression of the effect of fronting phrases on the form of 'be' that occurs. Certain fronted phrases (subjects, predicates) require the neutral form to follow them, and this is true

positive forms and overt complementizers, as we shall see in more detail in subsequent sections.

The following VIs capture the present-tense stem (T-node) of the copula, according to whether the subject is definite or indefinite (see Section 3.4):

(24) copula stem:
$\langle\ [\mathrm{T}],\quad (\uparrow \textsc{tense}) = \textsc{pres}\quad \rangle \xrightarrow{\nu}$ *əd*
$\langle\!\langle\ (\uparrow \textsc{subj def}) =_c \oplus\ \rangle\!\rangle$

(25) INDEF copula stem:
$\langle\ [\mathrm{T}],\ (\uparrow \textsc{tense}) = \textsc{pres}\quad \rangle \xrightarrow{\nu}$ *ois*
$\langle\!\langle\ \neg(\uparrow \textsc{subj def})\ \rangle\!\rangle$

The following are some examples of the kind of VIs used to expone the Agr node. Note that none of these can occur with the indefinite copula stem, due to conflicting definiteness requirements. The templates of the type @1SG.SUBJECT abbreviate $(\uparrow \textsc{subj pred}) = \text{‘pro’}$, $(\uparrow \textsc{subj def}) = \oplus$, $(\uparrow \textsc{subj index pers}) = 1$, and $(\uparrow \textsc{subj index num}) = \textsc{sg}$, with different person and number values as applicable.[13]

(26) 1SG ending:
$\langle\ [\mathrm{Agr}],\quad @1\textsc{sg.subject}\quad \rangle \xrightarrow{\nu}$ *-u*
$\langle\!\langle\ (\uparrow \textsc{tense}) =_c \textsc{pres}\ \rangle\!\rangle$

(27) 3PL ending:
$\langle\ [\mathrm{Agr}],\quad @3\textsc{pl.subject}\quad \rangle \xrightarrow{\nu}$ *-in*
$\langle\!\langle\ (\uparrow \textsc{tense}) =_c \textsc{pres}\ \rangle\!\rangle$

(28) 3SG/DEF ending:
$\langle\ [\mathrm{Agr}],\quad (@3\textsc{sg.subject})\quad \rangle \xrightarrow{\nu}$ *-i*
$\langle\!\langle\ (\uparrow \textsc{tense}) =_c \textsc{pres}\ \rangle\!\rangle$
$\langle\!\langle\ (\uparrow \textsc{subj def}) =_c \oplus\ \rangle\!\rangle$

The suppletive present-tense, 3SG positive form, *maɪ*, being a portmanteau form, spans C, Pol, T and Agr. This portmanteau form blocks the analytic 3SG positive forms that could otherwise be derived by the above VIs: **ɪ-əd-i* and **ɪ-ois* (see Section 3.4).

(29) $\langle\ [\mathrm{C, Pol, T, Agr}],\quad (\uparrow \textsc{tense}) = \textsc{pres}\quad \rangle \xrightarrow{\nu}$ *maɪ*
$\langle\!\langle\ \neg\ (\uparrow \textsc{neg})\ \rangle\!\rangle$
$\langle\!\langle\ (\uparrow \textsc{force}) \neq \{\textsc{resp} \mid \textsc{pol-q}\}\ \rangle\!\rangle$

in both constituent questions and declaratives with fronting. If constituent questions are treated as the same clause type as polar questions, in selecting the neutral forms by default, then those fronted phrases which are *not* followed by the neutral form must be listed, alongside those that require the neutral form in declaratives being listed. Previous LFG work has also assumed a syntactic distinction between constituent and polar questions, using the QUESTION-TYPE feature with possible values {CONSTITUENT | POLAR} (Butt et al. 2017); we simplify by representing WH-Q and POL-Q as distinct values of a single feature type, FORCE, rather than using both STMT-TYPE and QUESTION-TYPE, though this is not essential to the analysis.

[13] We assume that verb-subject agreement involves INDEX features, as per Wechsler & Zlatić (2003). We follow Sadler (1997) in treating PRED = ‘pro’ contributions in Welsh verb-agreement forms as obligatory, contra most pro-drop languages. For further discussion see Dowle (2022) and Dowle (2026).

3.4 Definiteness marking and suppletion

The VIs provided reflect the fact that, unlike the suppletive positive form, the negative and neutral third-person singular forms of the copula are sensitive to the definiteness value of their subjects. Table 2 is repeated here as Table 4.

	Definite subject	*Indefinite subject*
POS	ma(ɪ)	
NEG	d-əd-i	d-ɔis
NEUT	əd-i	ɔis

Table 4: Third-person singular present-tense forms of the copula

It is important to establish that they *constrain* rather than define this value. NPs are indefinite by default; a definite article or definite possessor marks them as definite:

(30) a. draenog
dramɔg
hedgehog
'a hedgehog'

b. y draenog
ə dramɔg
the hedgehog
'the hedgehog'

c. draenog y dyn
dramɔg ə diːn
hedgehog the man
'the man's hedgehog'

In contrast, the definiteness value of a NP cannot be set by a copular form. A definite negative or neutral form with an unmarked NP does not result in a definite reading:

(31) * Dydy draenog ddim yn cysgu.
d-əd-i dramɔg ðɪm ən kəsg-i
NEG-be-PRES hedgehog NEG PROG sleep.NF
Intended: 'The hedgehog isn't sleeping.'

Thus, a definite article or possessor in some way defines the definiteness of the whole NP, but the copula verb form does not. This is captured by the use of a constraining equation for definiteness in the VIs for the definite and indefinite forms.

The suppletive form *maɪ* blocks hypothetical forms **r-əd-i and *r-ois*. This leads us to conclude that despite the extra constraining equations in **r-əd-i* and **r-ois*, the fact that *maɪ* is a portmanteau is sufficient for it to be selected instead. Thus, constraining equations cannot override $\mathrm{MI_C}$.

maɪ	**r-əd-i*	**r-ois*
1 VI	3 VIs	2 VIs
C, Pol, T, Agr	C, Pol, T, Agr	C, Pol, T
(↑ TENSE) = PRES	(↑ TENSE) = PRES	(↑ TENSE) = PRES
⟨⟨ (↑ FORCE) ≠ {RESP ∣ POL-Q} ⟩⟩ ⟨⟨ ¬ (↑ NEG) ⟩⟩	⟨⟨ (↑ FORCE) ≠ {RESP ∣ POL-Q} ⟩⟩ ⟨⟨ ¬ (↑ NEG) ⟩⟩ ⟨⟨ (↑ SUBJ DEF) $=_c$ ⊕ ⟩⟩	⟨⟨ (↑ FORCE) ≠ {RESP ∣ POL-Q} ⟩⟩ ⟨⟨ ¬ (↑NEG) ⟩⟩ ⟨⟨ ¬(↑ SUBJ DEF) ⟩⟩

Table 5: Comparison of *maɪ* vs *r-əd-i* and *r-ois*

3.5 Complementizer positions in Welsh, and if-clauses with fronting

As we have seen, we have several complementizer-like elements in Welsh: *vɛ*, *taʊ* and *ɔs* (among others); *vɛ* occurs without fronted material and directly precedes the verb, while *taʊ* occurs with fronted material and directly precedes said fronted material.

(32) Fe fydd y dyn yn nesaf.
vɛ viːð ə diːn ən nesav
C$_{\textbf{PDMC}}$ be.FUT the man PRED next
'The man will be next.'

(33) Dw i 'n meddwl taw [y dyn]$_{\text{FOC}}$ fydd yn nesaf.
du iː =n mɛðul **taʊ** [ə diːn]$_{\text{FOC}}$ viːð ən nesav
be.PRS.1SG 1SG =PROG think.NF **C$_{\textbf{SUB.FOC}}$** [the man]$_{\text{FOC}}$ be.FUT PRED next
'I think that *the man* will be next.'

The conditional complementizer *ɔs* is unusual because it can occur with fronted material or without it. When it occurs with fronted material, it occurs before it; when it occurs without it, it is next to the verb (there is no flexibility as to its position).

(9′) Os ydw i 'n gallu dod, bydda i 'n dweud wrthot ti.
ɔs əd-u iː =n gaɬi dɔːd, bəð-a iː =n dwəɪd urth-ɔt tiː.
if be.PRS-1SG 1SG =PROG can.NF come.NF be.FUT-FUT.1SG 1SG =PROG say.NF at-2SG 2SG
'If I can come, I will tell you.'

(10) Os [Mari]$_{\text{FOC}}$ rwyt ti wedi alw, bydd popeth yn iawn.
ɔs [mari]$_{\text{FOC}}$ r-ʊɪt tiː wɛdi alu, bið pɔpeθ ən jaun.
if [Mari]$_{\text{FOC}}$ POS-be.IMPF.2SG 2SG PERF call.NF be.FUT everything PRED okay
'If it's *Mari* you've called, everything will be okay.'

We assume that there are two complementizer-like positions in Welsh, one high one, which we call Foc, and one lower one, which we call C. Most things, like *taʊ* (Foc) and *vɛ* (C) belong to only one or the other category and are distributed accordingly:

(34) $$\text{FocP} \rightarrow \underset{((\uparrow \text{FORCE}) = \text{COND})}{\text{Foc}} \quad \underset{(\uparrow \text{UDF}) = \downarrow}{\text{XP}}$$

(35) $$\text{CP} \rightarrow \underset{\uparrow=\downarrow}{\text{FocP}} \quad \underset{\uparrow=\downarrow}{\text{C}'}$$

(36) $$\text{C}' \rightarrow \underset{@\text{FORCE}!}{\text{C}} \quad \underset{\uparrow=\downarrow}{\text{IP}}$$

The @FORCE! lists all of these as possible values for (↑ FORCE), discussed above: {RESP | POL-Q | WH-Q | COND | DECL}.

(37) $\langle$ [C], $\langle\!\langle$ (↑ FORCE) $=_c$ DECL $\rangle\!\rangle$ $\rangle \xrightarrow{\nu}$ *vɛ*
$\langle\!\langle$ ¬ (GF ↑) $\rangle\!\rangle$
$\langle\!\langle$ ¬(↑ NEG) $\rangle\!\rangle$
$\langle\!\langle$ ¬(↑ UDF) $\rangle\!\rangle$

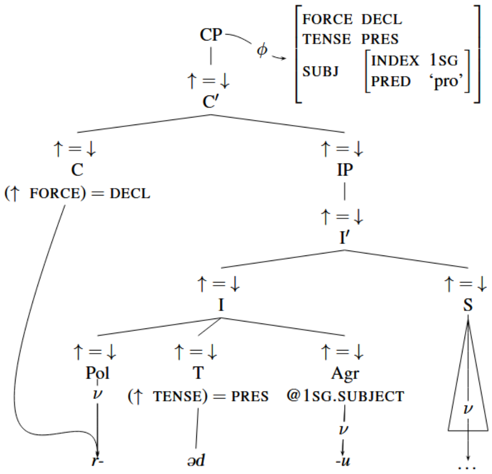
(38) $\langle$ [Foc], $\langle\!\langle$ (↑ FORCE) $=_c$ DECL $\rangle\!\rangle$ $\rangle \xrightarrow{\nu}$ *taʊ*
$\langle\!\langle$ (GF ↑) $\rangle\!\rangle$
$\langle\!\langle$ ¬(↑ NEG) $\rangle\!\rangle$

The conditional *ɔs* has a disjunctive category specification because it can appear in either position (the feature (↑ FORCE) = COND can appear in both C and Foc accordingly):

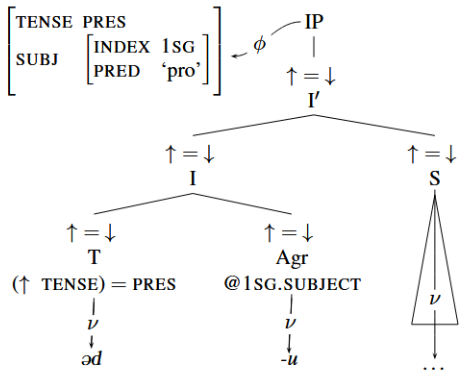
(39) $\langle$ [{ C $\langle\!\langle$ ¬(↑ UDF) $\rangle\!\rangle$ | Foc $\langle\!\langle$ (↑ UDF) $\rangle\!\rangle$ }] , (↑ FORCE) = COND $\rangle \xrightarrow{\nu}$ *ɔs*

Coupled with the assumption that positive forms of the copula span the C node, we have an explanation for the blocking of positive forms next to the complementizers *ɔs* and *vɛ*. Compare the kinds of structures spelled out by *r-əd-u* with those spelled out by *əd-u*:

(40)

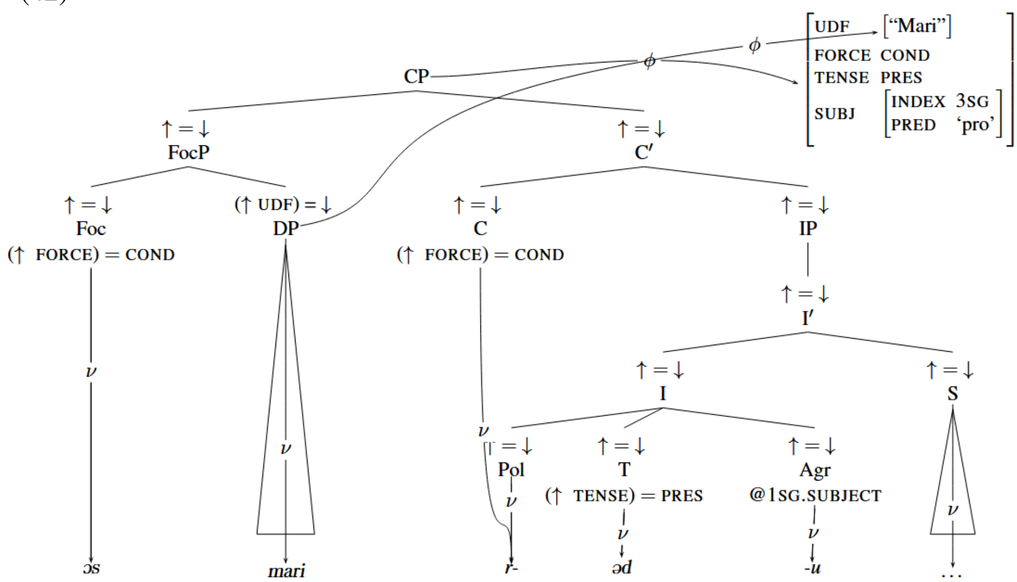


(41)



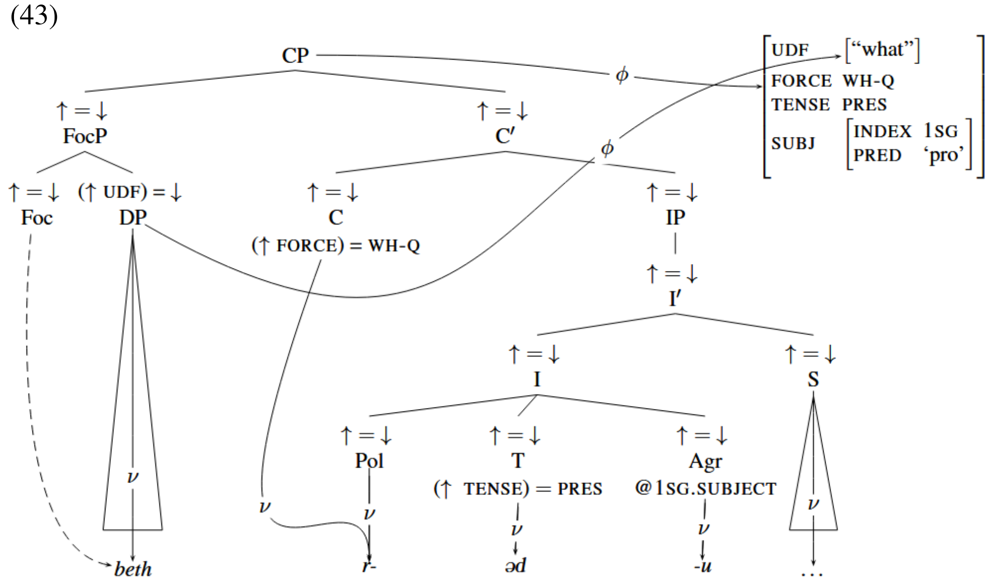
We now have an explanation as to why the presence of focus-fronting material in ‘if’-clauses prevents blocking between *ɔs* and positive forms: *ɔs* is in competition with the positive copula in sentences without fronted material, but not when there is fronted material. Here’s an if-clause with fronting, in which *r-əd-u* isn’t blocked:

(42)



The structure is very similar in a declarative clause with fronting or a constituent question.

(43)

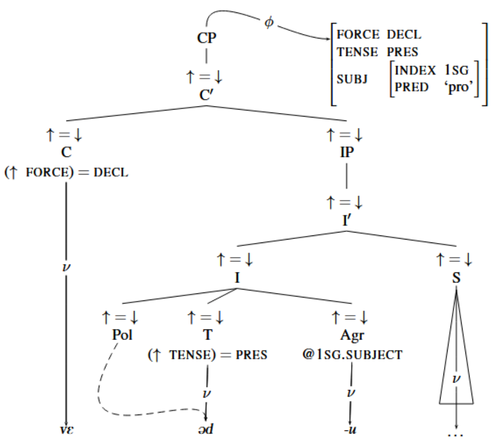


At this stage, our analysis predicts the ungrammaticality of *ɔs r-əd-u* and *vɛ r-əd-u*. It does not yet explain why the ungrammaticality of these sequences has different outcomes in if-clauses as compared to declaratives.

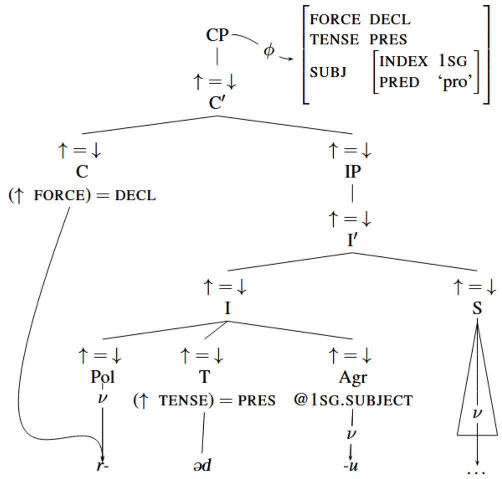
3.6 The difference between if-clauses and declaratives

One of the key questions to be resolved is why positive forms like *r-əd-u* block *vɛ əd-u* (in declarative clauses) but do not block *ɔs əd-u* (in if-clauses). As far as $\mathrm{MI_c}$ is concerned, *r-əd-u* should always beat these sequences as it expresses more c-structure nodes. The complementizer-containing sequences involve the unexpressed Pol node being Pac-Man spanned, thus making them less informative with respect to $\mathrm{MI_c}$. Pac-Man spanning is an operation that ensures no c-structure nodes are left unexpressed by requiring that a node with no actual exponent in the Vocabulary gets "gobbled up" by the exponent of a neighbouring node, thus avoiding null exponence.[14] Despite the $\mathrm{MI_c}$ evaluation being the same in both cases, we have reverse grammaticality judgements in the two contexts:

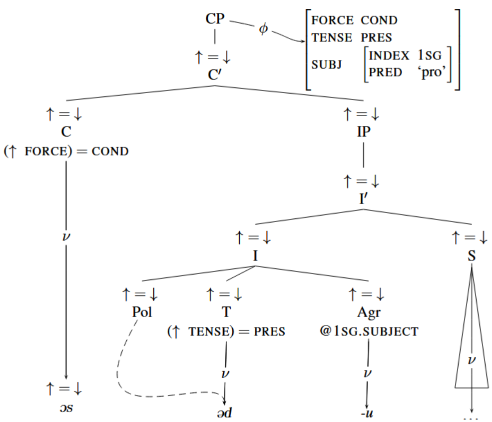
(44) (ungrammatical)



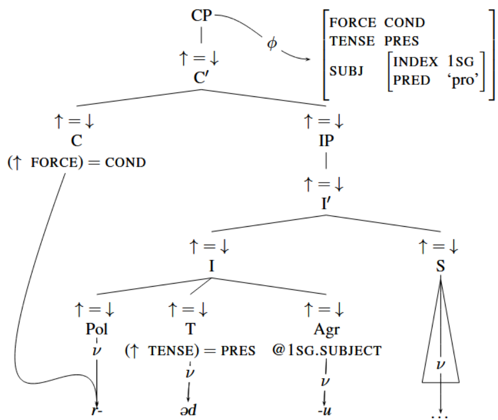
(45) (grammatical)



(46) (grammatical)



(47) (ungrammatical)



The fact that the sequence *ɔs əd-u* blocks *r-əd-u* in if-clauses tells us that *something* must be able to override $\mathrm{MI_c}$. An obvious candidate is $\mathrm{MI_f}$—in keeping with previous intuitions that $\mathrm{MI_f}$ is more important than phonological specificity (called **MostSpecific**) because "concepts tend to find a way to be expressed" (Asudeh & Siddiqi 2024).

[14] For a brief discussion of Pac-Man spanning, see Asudeh, Bögel & Siddiqi (2023: 24, 39). Asudeh & Siddiqi (2026) contains more extended discussion, and formalization, of Pac-Man spanning.

r-əd-u	**ve əd-u*	*os əd-u*
C, Pol, T, Agr	C, T, Agr	C, T, Agr
(↑ TENSE) = PRES @1SG.SUBJECT	(↑ TENSE) = PRES @1SG.SUBJECT	(↑ TENSE) = PRES @1SG.SUBJECT (↑ FORCE) = COND
⟨⟨ (↑ FORCE) ≠ {RESP ∣ POL-Q} ⟩⟩ ⟨⟨ ¬ (↑ NEG) ⟩⟩	⟨⟨ (↑ FORCE) $=_c$ DECL ⟩⟩ ⟨⟨ ¬ (↑ NEG) ⟩⟩ ⟨⟨ ¬ (GF ↑) ⟩⟩ ⟨⟨ ¬ (↑UDF) ⟩⟩	

Table 6: Comparison of functional information in *r-əd-u* vs *ve əd-u* and *ɔs əd-u*

The data makes clear that $\mathrm{MI_c}$ can be overridden. If $\mathrm{MI_c}$ were to always take precedence, there would be no way to account for the fact that the C, T, Agr sequence *os əd-i* ever wins over *r-əd-u.* The if-clause data thus leads us to the conclusion that $\mathrm{MI_f}$ takes precedence over $\mathrm{MI_c}$. Unlike *r-əd-u*, *ɔs əd-u* overtly marks the conditional force of the clause, and this is why *ɔs əd-u* is not blocked by the span. Although constraining equations can't be violated, they cannot override $\mathrm{MI_c}$, whilst defining equations must.

Because of the way feature unification works in LFG, meaning that two defining equations specifying compatible values for the same feature can resolve into an f-structure with a single value for the feature in question, we could also have chosen to represent the VIs in the following way, with *vɛ* containing a defining equation:

r-əd-u	**ve əd-u*	*os əd-u*
C, Pol, T, Agr	C, (Pol), t, Agr	C, T, Agr
(↑ TENSE) = PRES @1SG.SUBJECT	(↑ TENSE) = PRES @1SG.SUBJECT (↑ FORCE) = DECL	(↑ TENSE) = PRES @1SG.SUBJECT (↑ FORCE) = COND
⟨⟨ (↑ FORCE) ≠ {RESP ∣ POL-Q} ⟩⟩ ⟨⟨ ¬ (↑ NEG) ⟩⟩	 ⟨⟨ ¬ (↑ NEG) ⟩⟩ ⟨⟨ ¬ (GF ↑) ⟩⟩ ⟨⟨ ¬ (↑UDF) ⟩⟩	

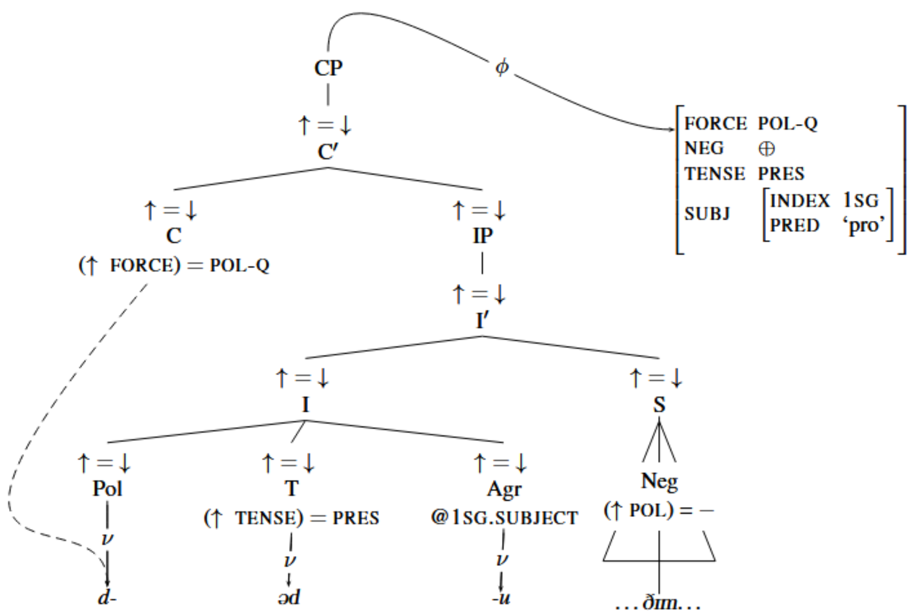
Table 7: Alternative comparison of func. information in *r-əd-u* vs *ve əd-u* and *ɔs əd-u*

Clauses can be interpreted as declarative by default; *vɛ* is optional in declarative clauses; see (14), (15), and (16). This does not mean that *vɛ* cannot contribute a defining equation for this feature, but it does mean that it cannot be the only thing to do so, and that a constraining equation possibility exists instead. As the defining equation approach is the only approach which makes it impossible to predict the selection of *r-əd-u* over **vɛ əd-u*, our observations of the data lead us to adopt the equally-available constraining approach in Table 6 instead. Blocking relationships thus provide us with a principled means for choosing between defining equations and constraining equations for VIs. We illustrated in Section 3.4 that constraining equations do not outcompete $\mathrm{MI_c}$; here we use that insight to arrive at the analysis which can capture the observed blocking relationship.

3.7 Negative forms

Recall that negative forms are blocked in responsives, but fine in polar questions, declaratives, and if-clauses. Negative Pol doesn't contain any clause-type restriction on its distribution. It's fine in negative polar questions.

(48)



There is no VI for ⟨ C, (↑ FORCE) = POL-Q ⟩ in Modern Welsh, so C is Pac-Man spanned, as indicated by the dashed line. This is also true in main-clause negative declaratives.[15]

We propose that negative forms are blocked from responsives not because of a functional restriction but because of the negative responsive complementizer. *ŋak əd-u* is chosen over *d-əd-u* in this context, because it is both $\mathrm{MI_f}$ and $\mathrm{MI_c}$: it realises more nodes (C, Pol, T, Agr vs. Pol, T, Agr), and it expresses more functional information:

(49) $\langle$ [C, Pol], $\begin{array}{c}(\uparrow \text{POL}) = –\\ (\uparrow \text{FORCE}) = \text{RESP}\end{array}$ $\rangle \xrightarrow{\nu}$ *nak*

(50) $\langle$ [Pol], $\begin{array}{c}\langle\langle\, (\uparrow \text{NEG}) =_c \oplus \,\rangle\rangle\\ \langle\langle\, (\uparrow \text{TENSE}) =_c \{\text{PRES}|\text{IMPF}\} \,\rangle\rangle\end{array}$ $\rangle \xrightarrow{\nu}$ *d-*

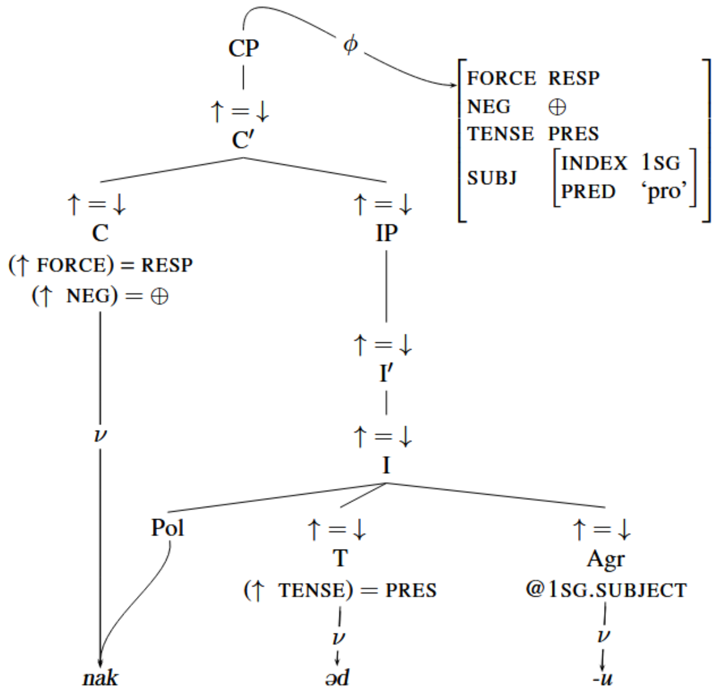
nak əd-u	*d-əd-u*
(↑ TENSE) = PRES	(↑ TENSE) = PRES
@1SG.SUBJECT	@1SG.SUBJECT
(↑ FORCE) = RESP	
(↑ NEG) = ⊕	
	$\langle\langle$ (↑ NEG) $=_c$ ⊕ $\rangle\rangle$

Table 8: Comparison of functional information in *nak əd-u* vs *d-əd-u*

[15] In subordinate clauses, the C is expressed as *na*.

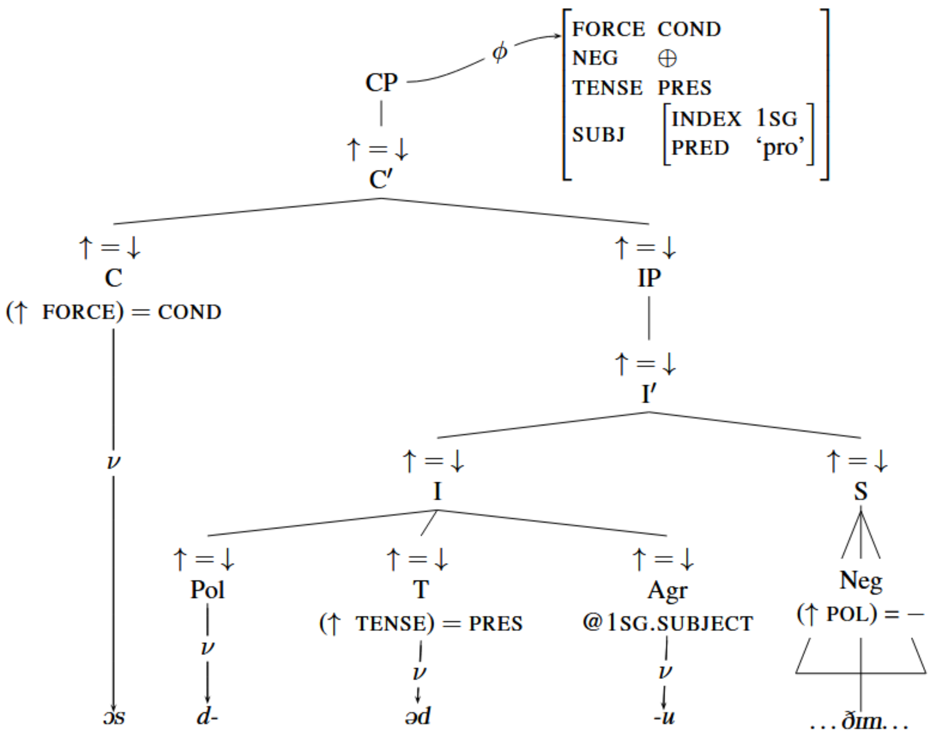
This gives the following structure:

(51)



In negative if-clauses, since ɔs is just an ordinary C, (not a C-Pol span like *nak*) the negative copula is correctly predicted to occur.

(52)



4 Conclusion

The morphological component in L_RFG has two mechanisms for comparing forms based on syntactic information, MI_f and MI_c. These are used to select the maximally informative VI possible, to express a sentence's c-structure tree. Welsh has positive, negative and neutral forms of the copula, but only in the present and imperfect tense. The positive and negative forms are usually derived by the addition of an *r-* or *d-* prefix to the neutral form, although there are some suppletive third-person forms in the present-tense paradigm. The negative form of the copula is allowed in many more contexts than the positive–responsives are the only context in which they are blocked. They get blocked in responsives because *nak*, the negative responsive marker, spans the Pol head that *d-* would normally express.

The positive forms are completely blocked from responsives and polar interrogatives via a functional restriction. Positive forms of the copula span the C node, which blocks them from occurring with *vɛ* and next to *ɔs* (C elements). Focus-fronting material allows positive forms to occur in if-clauses, because the focus-fronting material forces *ɔs* into a higher position (Foc). This is also why a universal functional restriction is not appropriate for the blocking of the positive forms next to *ɔs* 'if', because positive forms are not blocked from if-clauses entirely; it is only an adjacency restriction.

The negative and neutral present tense 3SG copular forms show a subject definiteness sensitivity, which must be captured by a constraining equation. The fact that the same suppletive form *maɪ* blocks both the definite-agreement form and the indefinite-agreement form shows that constraining equations don't override MI_c.

In if-clauses without fronting, the sequence *ɔs əd-u* beats *r-əd-u* because it wins on MI_f grounds — it has more defining equations. Thus, defining equations do override MI_c. In positive declaratives, *vɛ əd-u* is blocked by *r-əd-u*. This can be explained if its force specification is treated as a constraining equation, making it unable to override *r-əd-u* on MI_f grounds. *r-əd-u* then wins on MI_c grounds. Treating the force specification as a constraining equation is justified because *ve* is optional, suggesting that declarative force can be contributed by independent means (e.g. as a default value) and does not necessarily require the feature to be defined (and then exponed) in C. Thus, given the insights regarding the relative ordering of MI_c, constraining equations and defining equations established on the basis of the suppletive third-person stem, the interactions of the positive declarative complementizer and positive forms can be captured.

In sum, MI_f and MI_c both operate independently of constraining equations. This allows MI_c to override constraining equations that might otherwise make a form count as 'more informative'. Constraining equations are not evaluated as part of MI_f, either. MI_f takes precedence over MI_c, whereas constraining equations do not. This distinction between how defining and constraining equations are evaluated by the MI principles reflects their differing effects on f-structure in LFG: constraining equations only check whether f-structure information has been independently added by some defining equations and must thus be evaluated only once the f-structure has been defined. Here we do not assume ordering between defining versus constraining equations in VIs, but nevertheless similarly accord constraining equations a secondary role of expressing *morphological conditioning* (see Asudeh et al. 2024a for discussion in the context of L_RFG) rather than expressing morphological information.

A Appendix: Discussion on binary and privative features

In $L_R FG$, the same features present in the f-structure are used in the morphology, to organise the distribution of VIs. We might therefore expect the features in the f-structure to match the requirements of the morphological component i.e. a privative feature is sufficient to capture a morphological situation in which there are two possible allomorphs: one conditioned by the presence of the privative feature, and one conditioned by its absence. Even if the absence of the feature is overtly morphologically marked in some context, this is easy to capture in $L_R FG$ because $L_R FG$ inherits from LFG the possibility of stating negative constraints.

This creates a situation in which syntactic/featural markedness and morphological markedness do not necessarily align: the absence of a feature at f-structure can be overtly marked morphologically. We propose that it should be a principle of $L_R FG$ that the feature make-up of a grammar should reflect morphological marking. Thus, negative constraints should condition the absence of morphological marking, not the occurrence of an equally-morphologically-marked (overt) form. We partially used this line of argumentation to argue that indefinite NPs in Welsh are characterised by the absence of a DEF feature, not the presence of a ($\uparrow$ DEF) = – feature value. We said that unmarked NPs are underspecified, and are interpreted as indefinite unless a definite feature is added by something in the environment.

However, we also adopted a privative approach to polarity, which may seem contradictory, given the presence of both the *r*- and *d*- prefixes, and both the *vɛ* and *nak* complementizers. The existence of such forms shows that positive and negative polarity concord are equally capable of being part of the overt expression of a form; under the above principle, this means that a binary feature should be used, even though it is not strictly *necessary*, formally, as demonstrated.

Nevertheless, a more fine-grained approach suggests that a privative feature is still justified: if each type of context is considered separately (Table 9), we find that we never have a minimal pair in which positive and negative marking are equally morphologically marked. Negation is always more marked. There is no positive equivalent of the sentential negator *ðim*, for example. Thus, the privative approach is justified, especially given that actual polarity marking (as opposed to polarity concord) only overtly marks the negative, and not the positive.

Context	positive marking	negative marking
sentence without PRES/IMPF copula	unmarked	*ðim*
sentence with PRES/IMPF copula	*r*- on its own	*d*- and *ðɪm*
responsives	unmarked	*nak*

Table 9: Positive utterances are always less marked than negative counterparts

References

Andrews, Avery D. 1990. Unification and morphological blocking. *Natural Language & Linguistic Theory* 8(4). 507–557. https://doi.org/10.1007/bf00133692.

Asudeh, Ash, Bronwyn Bjorkman, Frances Dowle, Neil Myler, Daniel Siddiqi & Lisa Sullivan. 2024a. Fusional morphology, metasyncretism, and secondary exponence: A morphemic, realizational approach to Latin declension. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 45–68. Konstanz: PubliKon.

Asudeh, Ash, Tina Bögel & Daniel Siddiqi. 2023. Modelling exponents. In Miriam Butt Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 conference*, 22–44. PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/38.

Asudeh, Ash, Paul B. Melchin & Daniel Siddiqi. 2024b. Constraints all the way down: DM in a representational model of grammar. In Robert Autry, Gabriela de la Cruz, Luis A. Irizarry Figueroa, Kristina Mihajlovic, Tianyi Ni, Ryan Smith & Heidi Harley (eds.), *Proceedings of the 39th West Coast Conference on Formal Linguistics*, 468–476. Cascadilla Press. https://www.lingref.com/cpp/wccfl/39/paper3661.pdf.

Asudeh, Ash & Dan Siddiqi. 2024. The story of *er*. In Miriam Butt Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 conference*, 69–89. PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/47.

Asudeh, Ash & Daniel Siddiqi. 2022. Realizational morphosemantics in $\mathrm{L_RFG}$. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 conference*, 20–40. CSLI Publications. https://lfg-proceedings.org/lfg/index.php/main/article/view/20.

Asudeh, Ash & Daniel Siddiqi. 2023. Morphology in LFG. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 855–901. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185976.

Asudeh, Ash & Daniel Siddiqi. 2026. *Constraint-based morphosyntax*. Cambridge University Press. Forthcoming; with Oleg Belyaev, Bronwyn M. Bjorkman, Tina Bögel, Frances Dowle, Michael Everdell, Paul B. Melchin, Neil Myler, Will Oxford, and Lisa Sullivan.

Bögel, Tina, Miriam Butt & Sebastian Sulger. 2008. Urdu ezafe and the morphology-syntax interface. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'08 conference*, 129–149. CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/13/papers/lfg08boegeletal.pdf.

Borsley, Robert D. 2009. On the superficiality of Welsh agreement. *Natural language and linguistic theory* 27(2). 225–265. https://doi.org/10.1007/s11049-009-9067-3.

Borsley, Robert D. & Bob Morris Jones. 2005. *Welsh negation and grammatical theory*. Cardiff: University of Wales Press.

Borsley, Robert D, Maggie Tallerman & David W. E. Willis. 2007. *The syntax of Welsh*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511759932.

Butt, Miriam, Tina Bögel & Farhat Jabeen. 2017. Polar *kya* and the prosody-syntax-pragmatics interface. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'17 conference*, 125–145. Stanford: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG-2017/lfg2017-bbj.pdf.

Butt, Miriam & Louisa Sadler. 2004. Verbal morphology and agreement in Urdu. In U. Junghans & L. Szucsich (eds.), *Syntactic structures and morphological information*, 57–100. Berlin: Mouton de Gruyter.

Dalrymple, Mary. 2015. Morphology in the LFG architecture. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'15 conference*, 64–83. Stanford: CSLI Publications.

Dowle, Frances. 2022. A new analysis of Welsh agreement. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 conference*, 124–143. CSLI Publications. https://lfg-proceedings.org/lfg/index.php/main/article/view/14.

Dowle, Frances. 2025. Neutral forms of *be* as default forms: The utility of underspecification and blocking in a Welsh morphosyntactic phenomenon. *Transactions of the Philogocial Society* https://doi.org/10.1111/1467-968x.70002.

Dowle, Frances. 2026. *Agreement in Welsh*. D.Phil. thesis, University of Oxford. To appear.

Jones, Ann & Meic Gilby. 2004. *BBC learn Welsh grammar guide: The ideal aid to speaking and writing, up-to-date and easy to use*. Talybont: Y Lolfa.

Jones, Bob Morris. 1999. *The Welsh Answering System*. Berlin, New York: Mouton de Gruyter.

King, Gareth. 2016. *Modern Welsh: A comprehensive grammar* (3rd edn.). London & New York: Routledge. https://doi.org/10.4324/9780203987063.

Kiparsky, Paul. 1993. Pāṇinian linguistics. In Ronald Asher & Seumas Simpson (eds.), *Encyclopedia of languages and linguistics*, vol. 6, 2918–2923. Oxford, New York: Pergamon Press. https://web.stanford.edu/~kiparsky/Papers/encycl.pdf.

Melchin, Paul B., Ash Asudeh & Daniel Siddiqi. 2020. Ojibwe agreement in Lexical-Realizational Functional Grammar. In Miriam Butt & Ida Toivonen (eds.), *Proceedings of the LFG'20 conference*, 268–288. Stanford: CSLI Publications. https://csli-publications.stanford.edu/LFG/LFG-2020/lfg2020-mas.pdf.

Sadler, Louisa. 1997. Clitics and the structure-function mapping. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'97 conference*. Stanford: CSLI Publications.

Thomas, Amanda. 2021. *Divergence and mismatches in Portuguese morphology and syntax*. D.Phil. thesis, University of Oxford.

Wechsler, Stephen & Larisa Zlatić. 2003. *The many faces of agreement*. Stanford, CA: CSLI Publications.

Pronominal agreement and the changing face of Austronesian voice: The view from Sipora Mentawai

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Abstract

Sipora Mentawai (SM) shows a restructured Malayo-Polynesian Western Region voice system in which inherited Actor Voice (AV) morphology is retained but no longer supports a productive reduced 'Indonesian-type' AV/UV alternation. Instead, the language occupies a semi-alternating position on an alternation continuum: residual voice material persists, alongside TAM and information-structure correlates, but there is no longer an alternation between two grammatical voices; only between AV and non-voice-marked verbs, which in main clauses are, save some edge cases, obligatorily marked for agreement. AV *m-* assigns SUBJ to the ACTOR macrosemantic role; ensures it has a privileged position in the information structure; and assigns REALis mood to verbs on which it appears. Agreement morphology can be either grammatical or anaphoric, and carries no mood assignment. This account presents a detailed and novel case of how reduced 'Indonesian-type' voice systems are subject to attrition into 'semi-alternating' systems.

1 Introduction

The languages of Indonesia, particularly those in the Western Region linkage of Malayo-Polynesian (MP) (cf. Smith 2025), are widely discussed in typological work for exhibiting 'symmetrical voice' systems (Arka 2003b; Foley 1998, 2008; Riesberg 2014; Ross 2002).[†] In this tradition, symmetrical voice refers to systems with (at least) two voice constructions that differ in which core argument is privileged (SUBJ/PIVOT/PSA), without a straightforward active/passive derivational asymmetry; importantly, symmetricality is diagnosed by a bundle of grammatical properties (especially core status and PIVOT effects), not by morphology alone. Sipora Mentawai (SM)[1], however, shows a restructured (and more strongly reduced) profile: an AV prefix *m-*[2] is retained, reflecting the widespread Proto-Austronesian Actor Voice infix **-um-*[3], but SM does not show a productive AV/UV alternation in main clauses of the type familiar from Indonesian-type symmetrical voice languages. Instead, SM has a system of pronominal agreement – including both

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[1]Sipora Mentawai (SM) (mwv, ISO639-3, Sumatran, Austronesian (AN)) is a Mentawai isolect spoken by around 25,000 people as an L1 on Sipora, one of the Mentawai islands off the coast of West Sumatra within Indonesia's Barrier Islands. It is by far the most widely spoken Mentawai isolect, and enjoys widespread use as an L2 and *lingua franca* by speakers of other, non-mutually intelligible Mentawai isolects on the other islands as well as in the Mentawai diaspora on mainland Sumatra. It is classified as a Sumatran language (Billings & McDonnell 2024), alongside its geographic neighbours Nias and Enggano, and as such sits within the Western Region linkage of the Malayo-Polynesian group of Austronesian languages (Smith 2025).

[2]Here we use 'voice' in the broad cross-linguistic sense of a grammatical category encoding linking/diathesis.

[3]Proto-Austronesian (PAN) is the ancestral proto-language of Proto-Malayo-Polynesian (PMP) as well as numerous Formosan languages; both PMP and PAN are ancestral to SM at different time-depths.

anaphoric and grammatical agreement in the sense of Bresnan & Mchombo (1987) – and verbs that take grammatical agreement do not take AV morphology. They may, however, participate in superficially 'passive-like' orderings where the OBJ is fronted. Embedded clauses, which may show 'bare' (i.e., non-voice-marked and non-agreement-marked) verbs, reveal a number of intriguing patterns about the relation between the relic voice morphology and the mapping of grammatical functions, supporting a view where AV *m-* synchronically identifies the grammatical function SUBJ with the most prominent argument, rather than participating in a symmetrical voice alternation with UV.

This paper presents an LFG analysis of the systems of voice and agreement in SM, drawing on recent fieldwork data. §2 defines a number of terms which are used throughout the remainder of the text, including 'Indonesian-type' (§2.1); 'symmetrical voice' (§2.2) and related terms, before characterising the voice system in SM as 'semi-alternating' (§2.5). §3 describes the interrelated systems of voice, agreement, aktionsart morphology, and mood in SM. The unique category of 'aktionsart' morphology is described (§3.1), along with its ability to 'host' AV *m-*. Agreement morphology is then outlined (§3.2), along with its inability to co-occur with AV *m-* on a verb; then, the complicated interactions between the three categories of aktionsart morphology, voice, and agreement are detailed, first in matrix clauses (§3.3) and then in subordinate clauses (§3.4). §3.5 describes the remarkable freedom in the ordering of constituents in SM, and the ways in which both AV *m-* and agreement morphology serve to selectively restrict possible orderings. Having described the properties we want to model, §4 sets about accounting for these in LFG, through a mixture of Phrase Structure Rules and lexical entries for relevant morphemes.

2 On 'Indonesian-type' voice systems

Before an explanation of the voice system in SM can be undertaken, it is necessary to define a few key terms which are frequently used in the discussion of 'Indonesian-type' voice systems. These are: 'Indonesian-type' (§2.1); 'symmetrical voice' (§2.2); 'voice alternation' (§2.3); 'non-alternating language' (§2.4); and 'semi-alternating voice' (§2.5).

2.1 'Indonesian-type' voice systems

The term 'Indonesian-type', which tends to be used to contrast with a 'Philippine-type' in Austronesianist linguistics (Ross 2002; Chen & McDonnell 2019), refers to a voice system with two (as opposed to four, in Philippine-type) minimal voices: Actor Voice and Undergoer Voice. The notion of 'Indonesian-type' voice systems is often conflated with the development of valence-increasing morphology from reflexes of PMP **i* and **akən* or **an* (Kaufman 2009a). We use 'Indonesian-type' as a typological heuristic for a reduced symmetrical voice profile, not as a claim of homogeneity across 'Indonesian' or Western MP Region languages: Indonesian-type languages are, for our purposes, those which display a minimal alternation between AV and UV. Indonesian-type languages are 'reduced' in comparison to Philippine-type languages in at least two ways: 1) the reduction in the number of grammatical voices, and 2) the greater possibilities for degree-of-symmetry reduction (Arka 2017), where the consequences of the morphological marking across arguments become more uneven.

2.2 Symmetrical Voice

Voice symmetricality[4] refers to the 'equality' in markedness of AV and UV: in a perfectly 'symmetrical' voice language, neither AV nor UV is more marked, either morphologically or in terms of the demotion of some argument to non-core (Riesberg 2014). Symmetricality exists on a continuum, in terms of how Actor and Undergoer in the different voices behave with respect to various tests of 'core'-hood: accessibility to extraction/relativisation; control and binding; and the possibility of OBL-like encoding, among others (Arka 2017). Perhaps the canonical example of a symmetrical voice is Balinese (Arka 2003a): note that in the sentence below the ACTOR *tiang* cannot be elided even though it is the syntactic OBJ.[5]

(1) a. [SUBJ/A tiang] ny-epak [OBJ/U cicing-e]
1SG AV-kick dog-DEF

b. [SUBJ/U cicing-e] ∅-sepak [OBJ/A *(tiang)]
dog-DEF UV-kick 1SG

'I kicked the dog.'[6] (Artawa 1998: 8) (Balinese)

2.3 Voice alternation

Languages which show 'alternating' voice systems are those in which different grammatical voices alter the relations between SUBJ/OBJ and ACTOR/UNDERGOER, *without* the implication that the relation between the grammatical voices is necessarily symmetrical. Hence, languages with true passive constructions are alternating but not symmetrical. True passives, in contrast to UV constructions, obligatorily demote the Actor to OBL status, typically accompanied by stronger detransitivising and discourse-backgrounding effects than UV. An example of a language with a true passive is Indonesian itself (Arka & Manning 1998):

(2) a. [SUBJ/A Amir] mem-baca [OBJ/U buku itu]
Amir AV-read book that
'Amir read the book.'

b. [SUBJ/U buku itu] di-baca [OBL/A (oleh Amir)]
book that PASS-read by Amir
'The book was read (by Amir).' (Indonesian)

[4]This term originates with Foley (1998) (published as Foley 2008), and was subsequently developed in the Austronesianist literature, including in Arka (2003b).

[5]The notation *( ) indicates that a bracketed element may not be deleted; ( ) indicates that an element is freely deletable. Abbreviations used in glossing, in addition to those found in the Leipzig rules, are: AV=Actor Voice; DIR=Directional; INC=Inceptive; INCH=Inchoative; PERS=Personal; REAL=Realis U=Undergoer; UV=Undergoer Voice

[6]The use of only one translation for the two sentences reflects the oft-remarked upon (e.g., Arka & Manning 1998: 2; Woollams 1996: 46) fact that it is difficult to capture the 'unmarkedness' of U-initial orderings in symmetrical voice languages in English translation, since the English passive involves demotion of the A to non-core. The use of passives in translations of OBJ-fronted sentences in SM and passives in Indonesian reflects the fact that these orderings are, indeed, pragmatically marked in the source language.

2.4 Non-alternating language

In non-alternating languages, the linking of semantic roles to grammatical functions is typically fixed, with comparable discourse functions such as topicalisation being handled by other resources such as word order. These languages tend to have no overt voice morphemes. An example of an MP language with a non-alternating system is Kambera (Klamer 1996): there is no voice morphology in the language, and a ‘passive-like’ ordering is created instead through a purely syntactic dislocation where the OBJ is moved into sentence-initial position without any change to the morphology of the verb. Such languages represent the extreme end of the attrition of voice morphology on the continuum of voice symmetricality.

(3) a. ka [SUBJ nyuna] na-tinu-nya [OBJ na lau]
CONJ 3SG 3SG.NOM-weave-3SG.DAT ART sarong
‘So that she weaves the sarong.’ (lit. ‘She she-weaves-it the sarong.’)

b. ka [OBJ na lau] na-tinu-nya [SUBJ nyuna]
CONJ ART sarong 3SG.NOM-weave-3SG.DAT 3SG
‘So that the sarong was woven by her.’ (lit. ‘The sarong she-weaves-it she.’)
(Klamer 1996: 13) (Kambera)

2.5 Semi-alternating voice

‘Semi-alternating voice’ refers to systems where voice-related alternations survive only partially, being restricted, uneven, or construction-specific, and no longer form a fully productive, grammar-wide alternation paradigm. In the Austronesian case, this typically means that former AV/UV morphology remains in form, but its productivity and paradigmicity is in some way diminished. Semi-alternating Austronesian languages can contain some remnants of alternating voice systems, but these are not systematic throughout the whole language: productive AV/UV opposition in main clauses is not clearly supported. Semi-alternating systems can develop out of alternating systems through the attrition of voice morphology at both a formal and functional level (Arka 2024), where the presence of all the listed options would imply an alternating system; the presence of none of them a non-alternating system; and some subset of them a semi-alternating system:

1. Formal level: are there morphological forms expressing both AV and UV?
2. Functional level:
   (a) As a selector of the mapping between syntactic (SUBJ/OBJ) and semantic macro-roles (ACTOR/UNDERGOER).
   (b) As a selector of PIVOT function.
   (c) As a marker of discourse-pragmatic prominence.
   (d) As a TAM encoder.

As this paper will argue, SM appears best described as a language of this type: AV *m-* identifies SUBJ with ACTOR; requires SUBJ to be discourse-prominent; and encodes TAM (here, REAL mood), but there is no corresponding UV form, nor evidence for a true UV or passive construction in main clauses where the OBJ is identified with ACTOR morphologically.

3 Voice and agreement in Sipora Mentawai

3.1 Aktionsart morphemes and the form of voice

Understanding voice in SM requires first understanding what we will call for now 'aktionsart morphemes'.[7] These are a number of prefixes which appear on verb stems and perform predictable yet diverse operations in terms of aktionsart. All verbs in main clauses, aside from a small lexically-specified list of exceptions, *must* take either an aktionsart morpheme or an agreement morpheme (§3.2). The aktionsart morphemes are listed in full below.[8]

Intransitive morphemes	Transitive morphemes
ma- 'durative' *pu-* 'inceptive' *tu-* 'inchoative/involitive'	*pasi-* 'transitive' *paN-* 'distributive'
pa- 'middle/reciprocal'	

Table 1: Sipora Mentawai aktionsart morphemes.

AV *m-* only appears when it is 'hosted' by the aktionsart morphology.[9] Aktionsart morphemes which begin with /p/ have their initial segment replaced by /m/ when AV is present - AV *m-* plus *pasi-* yields *m-asi-*; *paN-* yields *m-aN-*; and *pu-* yields *m-u-*. This rather idiosyncratic state of affairs can be traced back to Proto-Malayo-Polynesian (PMP) (Kaufman 2009b), where AV (at this point still part of an alternating system) had the form **-um-*; when it was hosted by morphemes beginning with *p-* this combined with a phonotactic prohibition against sequences of successive labials (Blust 2013, 2023) to produce alternating sets of Actor Voice *mX-* versus non-Actor Voice *pX-*, where *X* is any subsequent string of segments.

3.2 Agreement

Like in the nearby and closely related Enggano (Hemmings to appear; Hemmings & Dalrymple to appear), SM has two sets of pronominal agreement affixes which appear on

[7]This is necessarily a term of convenience. These morphemes may in some cases attach to nominal stems, but always derive verbs of a unified aspectual 'character', as implied by their glosses; their high level of integration and lexicalisation with the stem motivates the use of the term aktionsart, i.e., *lexical* aspect. A full discussion of the status and category of this rather unique morphemic category is, needless to say, well beyond the scope of this paper; they are discussed here only with regard to their capacity to host voice morphology.

[8]The capital N-, as it is conventionally written in Austronesianist linguistics, stands for Homorganic Nasal substitution (Blust 2004), a morphophoneme widespread throughout MP languages which replaces the initial consonant of its stem with a nasal at the same place of articulation or similar, typically with some degree of language-specific idiosyncracy as to exactly what realisations exist in what environments. In SM, its realisations are NC[+cor,-voice]→/n/; NC[-cor,-voice]→/ŋ/; NV→/ŋV/; NC[+voice]→C[+voice].

[9]There are minor exceptions to this: the verbs *ei* 'go' and *oi* 'come', which happen to be the only vowel-initial members of a larger closed subset of frequent verbs which do not require aktionsart morphemes in main clauses, can be host to AV *m-* without any aktionsart morphology, as in sentence (5) and elsewhere. In these instances the morpheme has the form *m-*. These are the only instances where *m-* adds a segment rather than replacing one, and in doing so provides impetus for conceiving of this as a prefix rather than infix or access process synchronically.

verbs. Unlike Enggano, however, where both sets are prefixed to the verb, in SM there is both a prefix and a suffix set.[10]

	1SG	1PL.INCL	1PL.EXCL	2SG	2PL	3SG	3PL
Prefix	*ku-*	*ta-*	*ku- kai*	*nu-*	*nu- kam*	*i-*	*ra-*
Suffix	*-ku*	*-ta*	*-mai*	*-nu*/C_ *-m*/V_	*-mui*	*-na*	*-ra/-da*

Table 2: Pronominal agreement paradigms in Sipora Mentawai

The suffix set is historically older, with each form being traceable to one of the two suffixal genitive pronoun sets of Proto-Malayo-Polynesian (PMP). These pronouns were used both to provide a POSS to NPs and also to provide an ACTOR to verbs, but only in Undergoer Voice. Note, however, that the suffixes in SM show no such restriction to Undergoer Voice, but instead encode the SUBJ in both relative clauses (4) and main clause verbs marked with PRF *-(ng)an* (5). The POSS paradigm in SM is identical in form to this verbal suffix set aside from the member for 3SG, where the verbal suffix set has *-na* and the POSS set has *=nia*, the latter being the expected reflex given the form in PMP. Correspondences are given below (PMP forms from Ross 2006); note that PMP *h is lost in all Sumatran languages (Billings & McDonnell 2024).[11]

	1SG	1PL.INCL	1PL.EXCL	2SG		2PL	3SG	3PL
SM verbal agreement suffixes	*-ku*	*-ta*	*-mai*	*-nu*/C_	*-m*/V_	*mui*	*-na*	*-da*
SM POSS	*=ku*	*=ta*	*=mai*	*=nu*/C_	*=m*/V_	*=mui*	*=nia*	*=ra/=da*
PMP POSS	**=ku*	**=ta*	**=mami*	**=nihu*	**=mu*	**=muihu*	**=nia*	**=da*
PMP set	GEN1	GEN1	GEN1	GEN2	GEN1	GEN1	GEN1	GEN

Table 3: Correspondences of suffixal agreement set with SM and PMP possessive paradigms

(4) katukolobat=nia kele' si=kua-m si=boiki'
meaning=DEF like REL-say-2SG REL=before
'The meaning is as you said before.'

(5) m-ei ekeu ka koat, itco-ku-ngan kapa'
AV-go 2SG LOC sea see-1SG-PRF boat
'Go to the sea, I saw a boat!' (Sipora Mentawai)

The prefix set, meanwhile, seems to be a local innovation: corresponding sets are found in other Barrier Island languages, including Nias (Brown 2001), Sigulai (Akoli et al. 2025), Devayan (Mullan 2025), and Enggano (Hemmings to appear; Hemmings & Dalrymple to appear). The prefix set appears in main clauses, without regard for the TAM marking of the verb.

[10]All plosive-initial suffixes are realised with gemination of the initial consonant in the environment V_; this is understood to be the result of a general morphophonological rule rather than allomorphs requiring individual specification. [r] is a free variant of /d/.

[11]POSS pronoun sets are traditionally written as enclitics in Austronesianist linguistics because these tend to attach to the rightmost constituent of the NP rather than its head. However, the derived verbal set in SM, which only attach to verbs, behave like affixes, for instance appearing between the stem and other verbal morphology.

(6) a-i-ga-gaba enung-an=nia, a-i-alak-an nia
REAL-3SG-PROG-look.for move-NMLZ=3SG.POSS REAL-3SG-take-PRF 3SG
'He's looking for a way out, (but) he's already trapped.' (of a fish in a net)

Unusually (though similar to Enggano, Hemmings to appear), the forms for 1PL.EXCL and 2PL consist not of a single prefix indicating both PERS and NUM, but rather of a prefix which indicates only PERS and the free form of the relevant pronoun postposed to the verb, as in (7).

(7) ku-ei kai ka laggai
1-go 1PL.EXCL LOC village
'We (excl.) are going to the village.

At least in the case of the SM forms, these are all transparent grammaticalisations (with induced monosyllabification) of free forms (Ross's (2006) PMP NOM1 set), with the exception of 2 *nu-*, which seems to have been remodelled after the suffix set. The 1 and 2 prefixes are historically derived from SG forms.

SM verbal agreement prefixes	*ku-* 1	*ta-* 1PL.INCL	*i-* 3SG	*ra-* 3PL
PMP free pronouns	**aku* 1SG	**ita* 1PL.INCL	**ia* 3SG	**sida* 3PL

Table 4: Correspondences of SM prefixal agreement set with PMP free (NOM1) pronouns

In sentences where either a prefix or a suffix can be used (i.e., perfective matrix clauses), equivalent sentences drawing from opposite pronominal sets produce identical translations.

(8) a. ra-abbit-nan abak=nia ka koat
3PL-take-PRF canoe=DEF LOC ocean
b. abbit-ra-ngan abak=nia ka koat
take-3PL-PRF canoe=DEF LOC ocean
'They took the canoe to the ocean.'

In the typology of Bresnan & Mchombo (1987), the agreement markers in SM can perform both grammatical (9-a) and anaphoric (9-b) agreement. In other words, they can either agree with an external SUBJ DP, or act as a pronominal SUBJ in themselves.

(9) a. simanteu i-jigu jo'jo'
male 3SG-hit dog
'The man hit the dog.'
b. i-jigu jo'jo'
3SG-hit dog
'He hit the dog.'

3.3 The interplay between voice, agreement, and mood

All verbs in main clauses must host either AV *m-* or agreement, but cannot host both (hence the ungrammaticality of (10-c) and (11-c)). Since AV only has form when hosted by aktionsart morphemes on all verbs other than *ei* (11) and *oi*, this means for all other verbs that if AV is present, aktionsart morphology is also present to host it (e.g., *paN*-DISTR in (10-a)).

(10) a. ina m-an-eu' iba
mother AV-DISTR-cook fish
'Mother cooks fish.'
b. i-seu' iba
3SG-cook fish
'She cooks fish.'
c. *i-ma-neu iba

(11) a. m-ei sita ka gerat
AV-go 1PL.EXCL LOC outside
'Let's go out.'
b. ta-ei ka gerat
1PL.INCL-go LOC outside
'We (incl.) have to go out.'
c. *ta-m-ei ka gerat

The aktionsart morphemes *ma-* 'durative' (12), *tu-* 'inchoative' (13), and *pa-* 'middle/reciprocal' (14) never host AV morphology. Note that both *ma-* and *tu-* derive unaccusative verbs, while *pa-* derives verbs with low transitivity and bidirectional action.

(12) a. ma-goiso' abak
DUR-small canoe
'The canoe is small.'
b. *m-ma-goiso' abak

(13) a. lalep nera tu-ragat
house that INCH-collapse
'The house collapsed.'
b. *lalep nera m-u-ragat

(14) a. jo'jo' nera pa-kukru ka gerat
dog that RECP-chase LOC yard
'The dogs were chasing each other in the yard.'
b. *jo'jo' nera m-a-kukru ka gerat

Agreement and aktionsart morphology can co-occur, and in doing so reveal the underlying /p/-initial forms of some of the aktionsart morphemes (*pasi-* TR in (15) and *pu-* INC in (16)).[12] This is most common in contexts involving anaphoric rather than grammatical agreement, and extends to all aktionsart morphemes, including those that derive unaccusative verbs (i.e., *ma-* DUR, as in (17) and *tu-* INCH, as in (18)).

(15) ta' nu-itco' kam i-pasi-taptap bibilet?
NEG 2-see 2PL 3SG-TR-wash clothes
'Don't you (pl.) see her washing the clothes?'

[12] These forms also surface in imperatives, where aktionsart is optional but sometimes appears.

(16) a-i-pu-oni teteu
REAL-3SG-INC-name grandfather
'It is named 'grandfather'.' (lit. 'It has the name 'grandfather'.')

(17) ta-ngena i-ma-ra'
1PL.INCL-wait 3SG-DUR-cooked
'We wait for it to be cooked through.'

(18) lalep=ra a-i-tu-patpat
house=3PL.POSS REAL-3SG-INCH-closed
'Their house is closed.'

The /p/-initial forms are also present when the agreement is suffixal rather than prefixal (e.g., 3SG suffix *-na* in (19)), which shows that this is a grammatical rather than morphophonological alternation.

(19) si Yosep m-asi-bukkup si Yudas, si Yudas
PERS.SG Yosep AV-TR-punch PERS.SG Yudas PERS.SG Yudas
pu-gerei-na-ngan
INC-scream-3SG-PRF
'Yosep hit Yudas, Yudas screamed.'

AV *m-* also interacts with MOOD: verbs which are host to *m-* are REALis (20-a), whereas those without are IRRealis by default (20-b).[13]

(20) a. sia m-asi-matei-ake' sikkoinan
3PL AV-TR-dead-CAUS crocodile
'They killed the crocodile.' REAL
b. ra-matei-ake' sikkoinan
3PL-dead-CAUS crocodile
'They will kill the crocodile.' IRR

3.4 Subordinate clauses

REL clauses are headed by the relativising proclitic *si=*. Verbs in REL clauses can take suffixal agreement (§3.2) and TAM (e.g., *CV-* PROG in (21)), but *not* AV *m-* (hence the ungrammaticality of (21-b)).

(21) a. ra-perep [REL si=pu-ga-gailak]
3PL-sleep REL=INC-PROG-lie.down
'They sleep lying down.'
b. *ra-perep si=m-u-ga-gailak

Where a REL clause is transitive, its SUBJ may be provided through agreement marking, and in this way the controlling GF in the matrix clause may be disambiguated - e.g., (22),

[13] The REALis/IRRealis distinction in SM is a fundamental tool of the grammatical system, and in many ways serves the role played by TENSE systems in Indo-European languages, but it should not be mistaken for a tense system in itself. We reflect REALis as English PAST or PRES in translation and IRR as either English FUT, since REALis (known) events are more likely to be PAST temporally, but this is an inherent limitation of translating from a REAL/IRR language to a tensed language such as English.

where the local pronominal SUBJ is specified as being 3PL by the agreement marker, so *tai kebbukatta* must be the SUBJ to *kau* 'give', since it matches these PERS/NUM values, rather than *nganga siburu'* 'the old language', which is SG.

(22) nganga si=buru' [REL si=kau-ra tai
language REL=old REL=give-3PL PERS.PL
kebbuk-at=ta]
older.sibling-NMLZ=1PL.INCL.POSS
'The old language that was given by our ancestors.'

However, if agreement marking is not present, as in (23) the argument of a matrix clause which controls into a REL clause is often ambiguous, if the semantics of the verb and its arguments do not provide a clue as to which argument is being controlled. Note that the absence of both AV *m-* and agreement, which gives rise to such ambiguities, is unique to subordinate clauses and would be ungrammatical in a main clause.

(23) nera sikkoinan [REL si=pasi-matei-ake' simanteu]
that crocodile REL=TR-dead-CAUS male
'That's the crocodile that killed the man.' OR 'That's the crocodile that the man killed.'

In XCOMP/XADJ clauses, the marking of the verb for voice is more variable, and depends on the argument structure of the verb in the matrix clause: if this does not obligatorily subcategorise for a controlled XCOMP SUBJ as with *oba'* 'want' (24-a), then AV *m-* is obligatory. However, if the matrix verb *does* obligatorily subcategorise for XCOMP SUBJ, as with (25) then the verb within XCOMP may or may not take AV *m-*, with no discernible change in meaning.

(24) a. ku-oba' [XCOMP m-asi-kau bulagat kai Tiur]
1-want AV-TR-give money DIR Tiur
'I want to give money to Tiur.'
b. *ku-oba' pasi-kau bulagat kai Tiur

(25) a. aku m-asi-guglu-ake' si Tiur [XCOMP [SUBJ _]
1SG AV-TR-command-CAUS PERS.SG Tiur
m-asi-kukru jo'jo' nera]
AV-TR-chase dog that
b. aku m-asi-guglu-ake' si Tiur [XCOMP [SUBJ _] pasi-kukru
1SG AV-TR-command-CAUS PERS.SG Tiur TR-chase
jo'jo' nera]
dog that
'I told Tiur to chase the dog.'

It is also worth touching on one structure which is *not* a true subordinate clause, but which resembles it superficially: anaphoric agreement which links to a prior IP. As implied by the name, sentences with anaphoric agreement can link anaphorically to prior sentences in a discourse where the same SUBJ has been referred to. But, essentially, since anaphoric agreement provides a local (pronominal) SUBJ, these are syntactically independent IPs. Thus, a similar meaning can be created by a matrix clause controlling into an XCOMP (26) and two IPs where the second bears anaphoric agreement (26-a).

(26) a. a-m-ei aku ka pelabuhan [$_{\text{XADJ}}$ m-asi-gaba iba s=abeu]
PRF-AV-go 1SG LOC harbour AV-TR-look.for fish REL=large
b. [$_{\text{IP}}$ a-m-ei aku ka pelabuhan] [$_{\text{IP}}$ ku-gaba iba s=abeu]
PRF-AV-go 1SG LOC harbour 1-look.for fish REL=large
'I went to the harbour to look for big fish.'

3.5 Flexibility of constituent ordering

The ordering of constituents in SM is, particularly for a language of the Western Region of MP, remarkably free. Intransitives can freely appear in both SUBJ-initial and V-initial orderings (cf. (12) and (13)). Additionally, there is an auxiliary-first ordering, where the AUX *ai* inflects for aspect. In the AUX-first ordering, the SUBJ DP must precede the verb. This is true for transitive sentences as it is with intransitives; all verbs except unaccusatives must take AV *m-* rather than agreement marking.

(27) a. m-u-urai nia
AV-INC-sing 3SG
[VS]
b. ai nia m-u-urai
AUX 3SG AV-INC-sing
'She is singing.' [AUXSV]
c. ai-an nia m-u-urai
AUX-PRF 3SG AV-INC-sing
'She was singing.' [AUXSV]
d. *ai m-u-urai nia [*AUXVS]
e. ai nia m-asi-tut simakobu
AUX 3SG 3SG-TR-follow pig.tailed.langur
'He is following the pig-tailed langur.' (NOT 'The pig-tailed langur is following him.') [AUXSVO]
f. *ai m-asi-tut nia simakobu [*AUXVSO]

Transitive sentences without AUX *ai* where the main verb bears AV *m-* can be of the orders SVO or VSO. VSO orders are more common in contexts where the SUBJ has been established anaphorically and is thus low-prominence (backgrounded).

(28) a. aku m-asi-saki-ake' gette'
1SG AV-TR-buy-CAUS yam
[SVO]
b. m-asi-saki-ake' aku gette'
AV-TR-buy-CAUS 1SG yam
'I sell yams.' [VSO]

Transitive sentences where the verb bears agreement instead of AV *m-* are rather different in the orders they permit: SVO; VOS; and OVS are allowed, but not SOV; VSO; or OSV. Like with sentences where the verb bears AV *m-*, the SUBJ-initial order is most common when the SUBJ is topical or contrastive in the discourse, and the other orderings when it is backgrounded.

(29) a. sikkoinan a-i-sotn-an aku
crocodile REAL-3SG-bite-PRF 1SG
[SVO]
b. a-i-sotn-an aku sikkoinan
REAL-3SG-bite-PRF 1SG crocodile
'A crocodile bit me.' [VOS]
c. aku a-i-sotn-an sikkoinan
1SG REAL-3SG-bite-PRF crocodile
'I was bitten by a crocodile.' [OVS]
d. *sikkoinan aku a-i-sotn-an [*SOV]
e. *a-i-sotn-an sikkoinan aku [*VSO]
f. *aku sikkoinan a-i-sotn-an [*OSV]

The grammaticality of both SVO and OVS orderings for sentences with agreement-marked (or more precisely, non-voice-marked) verbs creates an interesting situation when both SUBJ and OBJ DPs in such a sentence have PERS and NUM values which are compatible with those of the agreement morpheme: the same sentence can be interpreted as either SVO *or* OVS. Crucially, the OBJ-initial ordering is pragmatically marked, and may only be used when a) the SUBJ is well-established in discourse; and b) the OBJ is contrastive, or in some way unexpected/novel.

(30) *Yosep aikukru jo'jo' nera*
a. [$_{SUBJ}$ Yosep] a-i-kukru [$_{OBJ}$ jo'jo' nera]
Yosep REAL-3SG-chase dog that
'Yosep chased the dog.' (preferred) [SVO]
b. [$_{OBJ}$ Yosep] a-i-kukru [$_{SUBJ}$ jo'jo' nera]
Yosep REAL-3SG-chase dog that
'Yosep was chased by the dog.' (requires discourse context) [OVS]

If the SUBJ does not have the required PERS/NUM values to agree with the agreement marking, for instance if it is a question word, then only the OBJ-initial order is a licit interpretation.

(31) kasei a-i-kukru jo'jo' nera
who REAL-3SG-chase dog that
'Who was chased by the dog?' (NOT 'Who chased the dog?') [OVS]

This demonstrates that even in non-AV-bearing sentences where the 'undergoer' of the action appears pre-verbally, it remains the syntactic OBJ, since the agreement goes with the (post-verbal) SUBJ. Thus, SUBJ in main clauses (though not in subordinate clauses) is always coextensive with the 'actor' of the sentence, and OBJ with the 'undergoer'. The superficially 'passive-like' OVS ordering, although OBJ-initial and pragmatically marked, is not actually a passive or UV construction where the OBJ is actually ACTOR, but rather a fronting transformation more closely resembling that of Kambera (§2.4) and other MP languages where the voice morphology has eroded, either in whole or in part.

3.6 Summary of voice and agreement properties

This brief subsection summarises the functions of Actor Voice *m-* and its interactions with other elements of the morphology, particularly agreement, for reference in later theoretical sections. These are:

1. AV *m-* can never appear on the same verb as agreement morphology, but in main clauses either voice or agreement morphology *must* be present.
2. In REL clauses, AV *m- cannot* be present; relatedly, which argument is being controlled by the main clause is ambiguous when the REL clause is transitive and the SUBJ is not provided by agreement morphology.
3. In XCOMP clauses, if the main clause which provides the SUBJ does not obligatorily subcategorise for XCOMP SUBJ, then the verb of the XCOMP clause must have AV *m-*.
4. AV *m-* restricts possible constituent orderings to those where SUBJ precedes OBJ; agreement marking is more free through disallows VSO; V-final orderings are never permitted.
5. AV *m-* cannot appear on unaccusative or reciprocal verbs, but agreement morphology can.
6. All verbs which host AV *m-* have REAL mood.

4 LFG analysis

4.1 The verb template

As a preliminary to the following subsections, which discuss pronominal agreement and voice in the context of their position within the verb, it is pertinent to provide the templatic structure of the verb in SM, which is given in (32).

(32) V $\rightarrow$ (MOOD.PREF) + (AGR.PREF) + (VOICE.PREF) + AKT.PREF + (ASP.REDUP) STEM + (AGR.SUFF) + (ASP.SUFF)

The slots STEM and AKT.PREF are the only slots which are used on all verbs.[14] Not all slots are can be used on the one verb, since some assign conflicting values to the same attribute. Namely, ASP.REDUP and ASP.SUFF both assign to the attribute ASP, and PRON.PREF and PRON.SUFF both assign to SUBJ. The slots MOOD.PREF, ASP.REDUP, and ASP.SUFF are all single-member slots which assign values to ASP or MOOD:

(33)	a.	*a-*	MOOD.PREF	(↑MOOD)=REAL
	b.	*CV-*	ASP.REDUP	(↑ASP)=PROG
	c.	*-an*	ASP.SUFF	(↑ASP)=PRF

[14]There are a few exceptions to the requirement for AKT.PREF, including (↑ADJUNCT TYPE)=REL and the aforementioned lexically-specified list of exceptions including *ei* 'go' and *oi* 'come'; these are not especially relevant to the points at hand and will not be modelled in detail here.

As is convention in LFG since Bresnan & Mchombo (1987), we can represent multi-functionality between grammatical and anaphoric agreement by adding the optional ((↓PRED)='PRO') to the lexical entries of agreement markers, which is mapped to SUBJ by (↑SUBJ)=↓: if a PRED value for SUBJ is provided by an external DP, then the pronominal PRED is simply not used. A sample lexical entry for 3SG agreement prefix *i-* is given in (34); others in the PRON.PREF slot are assumed to differ only in terms of their PERS and NUM values.

(34)	*i-*	PRON.PREF	(↑SUBJ)=↓ (↑PERS)=3 (↑NUM)=SG (↑ADJUNCT TYPE)≠REL	((↑PRED)='PRO')

Since the suffixal agreement set can appear in clauses which are either relative or have MOOD value PRF, members of this set can be modelled as requiring a disjunct between the ADJUNCT TYPE of REL and the morphological form indicating PRF at m-str (Butt et al. 1997; Findlay et al. 2023). The constraining equation (↑ADJUNCT TYPE)≠REL restricts *i-*, as a member of PRON.PREF, to appearing only in non-relative clauses; the distribution for members of PRON.SUFF is managed by the disjunct {(↑ADJUNCT TYPE)=REL|(↑μASP)=PRF} - i.e., either the clause must be relative, *or* the ASP value PRF must be projected to the m-str (Butt et al. 1996). A sample PRON.SUFF entry is given for *-na* in (35).

(35)	*-na*	PRON.SUFF	(↑SUBJ)=↓ (↑PERS)=3 (↑NUM)=SG {(↑ADJUNCT TYPE)=REL|(↑μASP)=PRF}	((↑PRED)='PRO')

The prohibition on the co-ocurrence of VOICE.PREF and either PRON.PREF or PRON.SUFF relates to the function of AV *m-*, the only member of the VOICE.PREF slot, and will be covered in §4.3.

4.2 C-structure

Key features of SM syntax as presented here can be described with the following Phrase Structure Rules. We posit S as a small clause unit that is used to deal with non-finite clauses.

(36)

$$\mathrm{CP} \rightarrow \underset{(\uparrow \mathrm{DF\text{-}C})=\downarrow}{\mathrm{XP}} \quad \mathrm{C'}$$

$$\mathrm{C'} \rightarrow \mathrm{C} \quad \mathrm{IP}$$

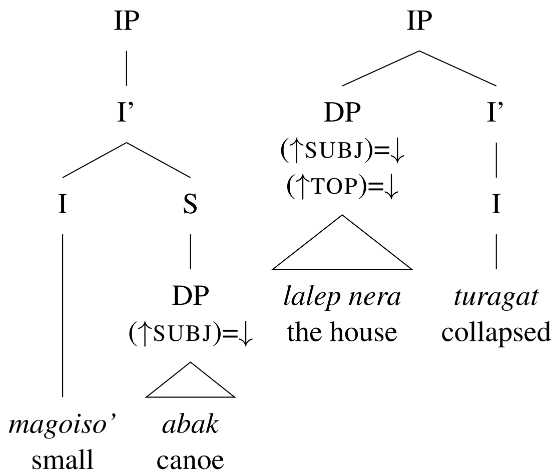
$$\mathrm{IP} \rightarrow \underset{(\uparrow \mathrm{TOP})=\downarrow}{\mathrm{XP}} \quad \mathrm{I'}$$

$$\mathrm{I'} \rightarrow \mathrm{I} \quad \mathrm{S}$$

$$\mathrm{S} \rightarrow \underset{(\uparrow \mathrm{GF})=\downarrow}{\mathrm{DP}} \quad \mathrm{V} \quad \underset{(\uparrow \mathrm{GF})=\downarrow}{\mathrm{DP}}$$

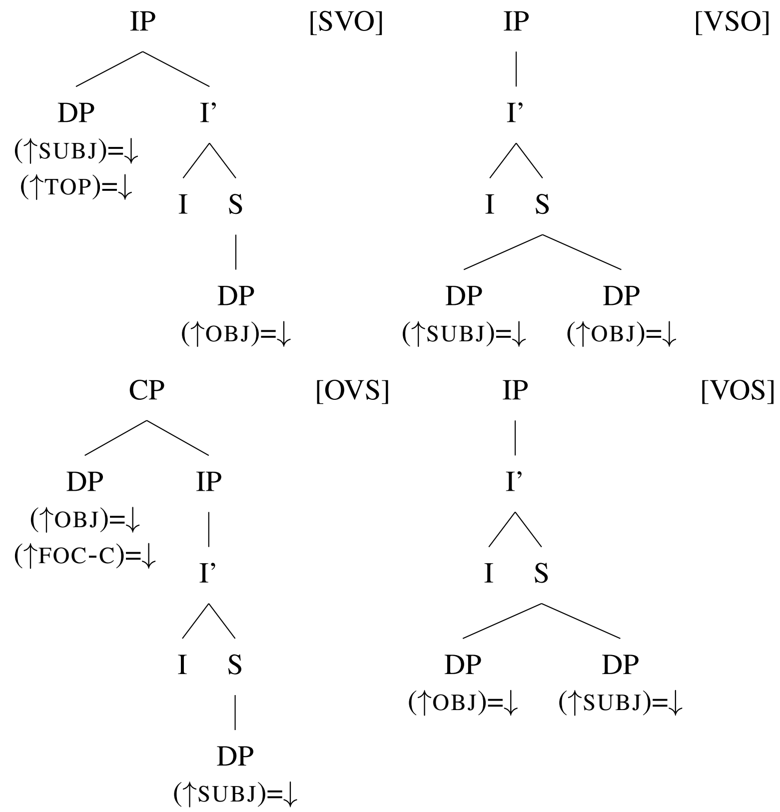
These are capable of generating all the key constituent orders which we saw in §3.5. The two possible orderings of intransitives are generated below (diagramming (12) and (13)) - in both cases, the single GF is assigned SUBJ; in the SUBJ-first ordering this receives default TOP as its DF; in the verb-first ordering it is backgrounded. We can understand this in information-structure terms (Arka & Sedeng 2018) as the SUBJ in Spec of IP being [+given], while the SUBJ that sits within S, which is not associated with a specific DF, is [-given].

(37)



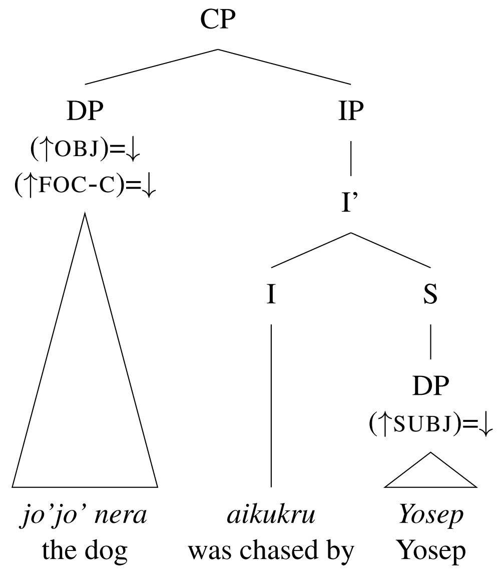
In transitive sentences, these rules generate all possible orderings other than those which are word-final (i.e., OSV and SOV), since I is always to the left of any DPs that sit within S. The selection of which of the generated orders (SVO, VSO, OSV, and VOS) is grammatical with which verb type (voice-marked or agreement-marked) is determined by the morphology (§4.3). Note that Spec position of IP carries with it the assignment of a contrastive Discourse Function DF-C (i.e., a DF which has the value [+contrast], following Arka 2021) - either contrastive topic or focus, depending on information-structure factors provided in discourse.

(38)



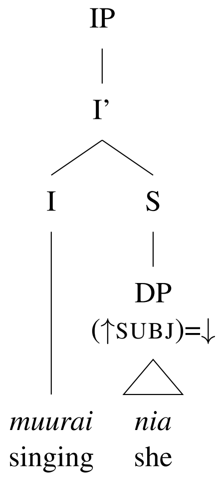
OVS is the only ordering to make use of Spec of CP, which assigns the relevant argument contrastive focus – this is the reason that the OBJ-fronted order is so pragmatically marked, as demonstrated by (30-b), diagrammed below. This also requires the backgrounding of SUBJ in the discourse – instead of being in a TOP-marked position (Spec of IP), it sits within S and receives no special DF.

(39)



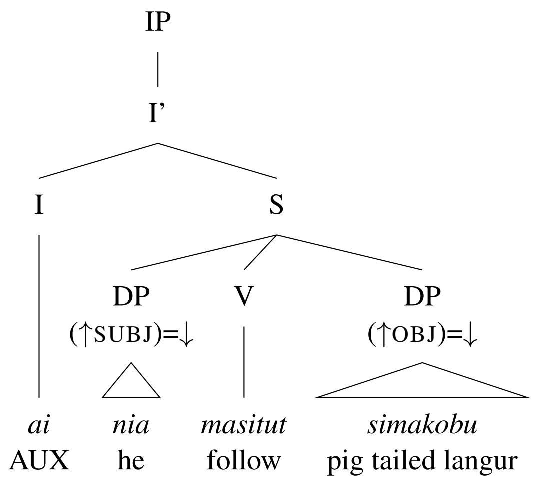
The head of IP can be either an AUX element I (below, diagramming (27-a)) or a lexical V (in (41)), since both share the same categorical features of [+predicative, +transitive] (Bresnan et al. 2015: 103). This allows us to generate both AUX-initial and V-initial orderings in intransitives, since both instantiate the same category I.

(40)



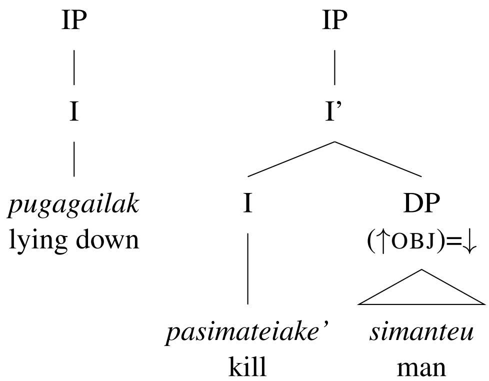
The structure of S also explains the prohibition on VSO ordering (where V is the lexical verb) in sentences which have an AUX verb: if the I slot is filled by AUX, then its sister S must not have two DPs following a verb, but rather place the verb in between the two DPs (this still allows in principle for OVS, which will be dealt with in §4.3). DPs within S are 'unmarked', in the sense that they are not associated with any particular DF, though DPs which are further left are still more prominent.

(41)



RELative clauses are also IP, as shown by their ability to take inflection (e.g., *pugagailak* ‘lying down’ below, from (21), which must be I since it takes (inflectional) aspect *CV-* PROG). Since every IP must contain a SUBJ, and since all transitive REL clauses obligatorily have one of their arguments controlled from the matrix clause, the postverbal DP in a REL clause is always a local OBJ - as below, with *simanteu* ‘man’, though note that its assignment to ACTOR or UNDERGOER is not clear, since neither the matrix clause nor the relative clause in (23), reproduced below, contains AV *m-*. which would clarify the mapping of OBJ *simanteu* ‘man’ to the ACTOR (§4.3).

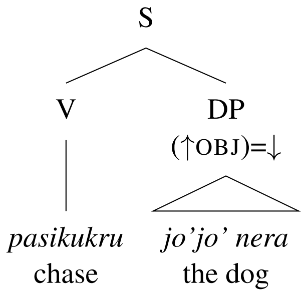
(42)



(43) nera sikkoinan [REL si=pasi-matei-ake’ [OBJ/A?U? simanteu]
that crocodile REL=TR-dead-CAUS male
‘That’s the crocodile that killed the man.’ (OBJ=U) OR
‘That’s the crocodile that the man killed.’ (OBJ=A)

XCOMP clauses, meanwhile, are represented with unit S, since they always have an OBJ DP and are non-finite (contain a V, not I). Although the c-structure permits two DPs within S, the local SUBJ is always controlled (gapped) by an argument within the matrix clause, so the DP within XCOMP is always an OBJ – as below, diagramming (25-b).

(44)



4.3 The function of Actor Voice *m-*

This subsection will outline the behaviour of AV *m-*, the remnant of the voice alternation in SM. AV *m-* can be understood as a morpheme which maps SUBJ to ACTOR; requires linear precedence of SUBJ over OBJ; and assigns (↑MOOD)=REAL to any verb it appears on, overruling the default optional ((↑MOOD)=IRR). We can thus represent the lexical entry of *m-* as:

(45) *m-* VOICE.PREF (↑SUBJ)σ=↑σACTOR (↑MOOD)=REAL

The first component of AV *m-*, which is not represented in the lexical entry, is a requirement for linear precedence and information-structural prominence of SUBJ>OBJ.

This requirement for SUBJ prominence is the reason that, out of all the possible orderings generated by the PSRs, only SVO and VSO are permitted when *m-* appears on the verb: these are the only orderings where SUBJ is more prominent than OBJ. This is true also in sentences with AUX *ai*, where OSV is disallowed (VSO and VOS being ruled out by the c-structure). The only ordering specifically prohibited for agreement-carrying verbs that is not ruled out by the c-structure (§4.2) is VSO; this can be interpreted as an information-structural dispreference for fronting SUBJ when it is not prominent.

AV *m-*	Agreement marking
SVO	SVO
VSO	OVS
	VOS

Table 5: Constituent orders permitted with particular verb morphology.

The inability for AV *m-* and agreement morphology to co-occur on the same verb is a result of this same entry: if the SUBJ is pronominal, and provided by the verb, it is not prominent in any information-structure sense; the requirement for linear precedence also stipulates that it must be a SUBJ DP which precedes OBJ.

This requirement for SUBJ prominence is also why AV *m-* cannot appear on unaccusative verbs: the SUBJ of these verbs is not prominent, and therefore cannot be 'elevated' on the prominence hierarchy. The same principle is responsible for the prohibition on AV *m-* on reciprocal/middle voice verbs: these are low in transitivity and do not have an information structurally-prominent SUBJ. Thus, SM is a 'split-intransitive' language, i.e., one that groups the SUBJ of intransitive verbs as sometimes more like transitive SUBJ and sometimes more like OBJ according to semantic properties, here unergativity/unaccusativity – similar to geographically nearby Acehnese (Durie 1987), but a historically independent development.

The second component, the identification of local SUBJ with macrosemantic ACTOR, explains the behaviour of bare verbs in subordinate clauses and the prohibition against co-occurence on the same stem as agreement morphology.

An XCOMP clause, like a REL clause, will always need one of its arguments to be controlled from a matrix clause. For some matrix clause verbs, such as *oba'* 'want', an XCOMP SUBJ argument will be non-core. In these cases, the XCOMP clause will require the explicit identification of a SUBJ. The entry (↑SUBJ)σ=↑σACTOR tells the XCOMP verb that the ACTOR found in its own argument structure is coreferential with some SUBJ, and thus the XCOMP that it needs to look for a SUBJ in the matrix clause. In cases where the verb of a matrix clause, such as *gugluake'* 'command', imposes an obligatory XCOMP SUBJ, this will always be identified some argument in the matrix clause by the argument frame of the matrix clause verb (i.e., imposes (↑XCOMP SUBJ)=(↑SUBJ)). Hence, the assignment of the local SUBJ, i.e., XCOMP SUBJ, to ACTOR of the local verb is redundant. This explains why, with such verbs, AV *m-* can be freely deleted in the XCOMP clause with no change to meaning or ambiguity.

In REL clauses, AV *m-* is never present - this is possibly the result of the nominalising property of the Determiner *si=* REL making the contents of the REL clause opaque to aspects of the verb morphology. Without AV *m-*, however, there is no language-internal requirement in SM for SUBJ to correspond to either ACTOR or UNDERGOER. Although the c-structure will only ever provide a SUBJ as the DP within a REL clause (§4.2), the mapping to macrosemantic role is underspecified. This also further demonstrates that non-voice-marked voice are *not* carrying a UV morpheme that simply has a zero form, as in Balinese - if that were the case, the mapping would always be to UNDERGOER. In practice, the controller of SUBJ is often identified through agreement.

The prohibition against *neither* agreement morphology or AV *m-* occurring, at least aside from on unaccusative verbs, stems from the fact that these verbs demand an identification of SUBJ, either a local pronominal PRED or through the identification of SUBJ with a macrosemantic role, of which the only option is ACTOR.

The final component of the lexical entry, (↑MOOD)=REAL, is used to deal with the fact that verbs which bear *m-* are reliably REALis in mood. All verbal stems are assigned an optional (↑MOOD)=IRR, which is overruled by REAL where it appears.

5 Conclusion

This paper has provided an account of the semi-alternating voice system of Sipora Mentawai, an underdescribed language variety of Western Indonesia. It has outlined how, in place of a reduced symmetrical voice alternation between Actor and Undergoer voices, the relic Actor Voice prefix *m-* persists and assigns SUBJ to ACTOR macrosemantic role, but with no corresponding Undergoer Voice. Instead, a system of agreement morphology on the verb permits the fronting of OBJ through a 'passive-like' dislocation. This is demonstrated through agreement on the verb, which always identifies SUBJ as being ACTOR. The distinction between syntactic and macrosemantic roles language-internally is justified by a number of patterns involving subordinate clauses, where AV *m-* reliably associates SUBJ with ACTOR but its absence creates an ambiguity in the relation between syntactic and macrosemantic roles. This paper thus adds to the existing literature on voice systems of the Western Region of MP by showing how a voice system can be 'semi-alternating', preserving TAM and information-structure correlates of a former voice alternation while having lost its symmetricality.

References

Akoli, Marcelinus Y F, I Wayan Arka & Yuchen Li. 2025. Conservative but not frozen: Sigulai and the diverging Austronesian voice systems of the Barrier Islands languages. Australian Linguistics Society Conference, Gold Coast, Australia. https://www.indonesianlanguages.org/wp-content/uploads/2025/08/Sigulai-Abstract-for-the-ALS-finalversion.pdf.

Arka, I Wayan. 2003a. *Balinese Morphosyntax: A Lexical-Functional Approach* (Pacific Linguistics 547). Canberra: Australian National University.

Arka, I Wayan. 2003b. Voice systems in the Austronesian languages of Nusantara: Typology, symmetricality and Undergoer orientation. *Linguistik Indonesia* 21(1). 113–139.

Arka, I Wayan. 2017. The Core-Oblique distinction in some languages of Indonesia and beyond. *Linguistik Indonesia* 35(2). 101–144. https://doi.org/10.26499/li.v35i2.66.

Arka, I Wayan. 2021. Pivot and puzzling relativisation in Indonesian. In I Wayan Arka, Ash Asudeh & Tracy Holloway King (eds.), *Modular design of grammar: Linguistics on the edge*, 181–202. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780192844842.003.0012.

Arka, I Wayan. 2024. Attrition of voice symmetricality in the Austronesian voice system: Insights from Indonesia's Barrier Island languages and beyond. 15th International Conference of the Association for Linguistic Typology, Singapore. https://enggano.ling-phil.ox.ac.uk/static/papers/Arka-ALT2024%20final2.pdf.

Arka, I Wayan & Christopher Manning. 1998. Voice and grammatical relations in Indonesian: A new perspective. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'98 Conferences*, Stanford: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG3-1998/lfg98arkamanning.pdf.

Arka, I Wayan & I Nyoman Sedeng. 2018. Information structure in Sembiran Balinese. In Sonja Riesberg, Asako Shiohara & Atsuko Utsumi (eds.), *Perspectives on information structure in Austronesian languages* (Studies in Diversity Linguistics 21), 139–175. Berlin: Language Sciences Press. https://doi.org/10.5281/zenodo.1402543.

Artawa, I Ketut. 1998. *Ergativity and Balinese syntax*, vol. 42-44 (NUSA Linguistic Studies of Indonesian and Other Languages of Indonesia). Jakarta: Badan Penyelenggara Seri NUSA. http://sealang.net/archives/nusa/pdf/nusa-v42.pdf.

Billings, Blaine & Bradley McDonnell. 2024. Sumatran. *Oceanic Linguistics* 63(1). 112–174. https://doi.org/10.1353/ol.2024.a928205.

Blust, Robert A. 2004. Austronesian nasal substitution: A survey. *Oceanic Linguistics* 43(1). 73–148. https://doi.org/10.1353/ol.2004.0004.

Blust, Robert A. 2013. *The Austronesian Languages* (Asia-Pacific Linguistics 8). Canberra: Australian National University.

Blust, Robert A. 2023. Repair and drift in Austronesian languages: Avoidance of dissimilar labials as the onsets of successive syllables. *Oceanic Linguistics* 62(2). 304–323. https://doi.org/10.1353/ol.2023.a913563.

Bresnan, Joan, Ash Asudeh, Ida Toivonen & Steven Wechsler. 2015. *Lexical-Functional Syntax* (2nd edn.). Oxford: Wiley-Blackwell. https://doi.org/10.1002/9781119105664.

Bresnan, Joan & Sam A Mchombo. 1987. Topic, pronoun, and agreement in Chicheŵa. *Language* 63(4). 741–782. https://doi.org/10.2307/415717.

Brown, Lea. 2001. *A Grammar of Nias Selatan*. PhD thesis, Unversity of Sydney.

Butt, Miriam, Mary Dalrymple & Anette Frank. 1997. An architecture for linking theory in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'97 Conference*, Stanford: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG2-1997/lfg97butt-dalrymple-frank.pdf.

Butt, Miriam, María-Eugenia Niño & Frédérique Segond. 1996. Multilingual processing of auxiliaries within LFG. In Dafydd Gibbons (ed.), *Natural Language Processing and speech technology: Results of the 3rd KOVENS Conference, Bielefeld*, 111–122. Berlin: de Gruyter. https://doi.org/10.1515/9783110821895-013.

Chen, Victoria & Bradley McDonnell. 2019. Western Austronesian voice. *Annual Review of Linguistics* 5(18). 173–195. https://doi.org/10.1146/annurev-linguistics-011718-011731.

Durie, Mark. 1987. Grammatical relations in Acehnese. *Studies in Language* 11. 365–399. https://doi.org/10.1075/sl.11.2.05dur.

Findlay, Jamie Y, Roxanne Taylor & Anna Kibort. 2023. Argument structure and mapping theory. In Mary Dalrymple (ed.), *Handbook of LFG* (Empirically Oriented Theoretical Morphology and Syntax 13), 699–778. Berlin: Language Sciences Press. https://doi.org/10.5281/zenodo.10185966.

Foley, William A. 1998. Symmetrical voice systems and precategoriality in Philippine languages. Workshop on voice and grammatical functions in Austronesian languages, LFG98, Sydney.

Foley, William A. 2008. The place of Philippine languages in a typology of voice systems. In Peter K Austin & Simon Musgrave (eds.), *Voice and grammatical relations in Austronesian languages*, 22–44. Stanford: CSLI Publications.

Hemmings, Charlotte. To appear. Verbal morphosyntax in Enggano. In I Wayan Arka, Charlotte Hemmings & Mary Dalrymple (eds.), *Enggano: Historical and Contemporary Perspectives* (Asia-Pacific Linguistics), Canberra: Australian National University.

Hemmings, Charlotte & Mary Dalrymple. To appear. Relative clauses in Enggano. In I Wayan Arka, Charlotte Hemmings & Mary Dalrymple (eds.), *Enggano: Historical and Contemporary Perspectives* (Asia-Pacific Linguistics), Canberra: Australian National University.

Kaufman, Daniel. 2009a. Austronesian typology and the nominalist hypothesis. In Alexander Adelaar & Andrew Pawley (eds.), *Austronesian historical linguistics and culture history: A festschrift for Bob Blust* (Pacific Linguistics 601), 187–215. Canberra: Australian National University.

Kaufman, Daniel. 2009b. Inner causatives and the reconstruction of the Proto-Austronesian affixes *pa-, *pa<R> and *pa<N>-. International Conference on Austronesian Linguistics XI, Aussois, France. https://bahasawan.com/wp-content/uploads/2020/01/On-Austronesian-pa-paR-and-paN-H.pdf.

Klamer, Marian. 1996. Kambera has no passive. In Marian Klamer (ed.), *Voice in Austronesian*, vol. 39 (NUSA Linguistic Studies of Indonesian and Other Languages of Indonesia), 12–30. Jakarta: Badan Penyelenggara Seri NUSA. http://sealang.net/archives/nusa/pdf/nusa-v39-p12-30.pdf.

Mullan, Keira. 2025. Grammatical relations and person marking in Barrier Islands languages. Australian Linguistics Society Conference, Gold Coast, Australia. https://www.indonesianlanguages.org/wp-content/uploads/2025/08/Keira-ALS-Person-marking-in-Barrier-Islands-languages.pdf.

Riesberg, Sonja. 2014. *Symmetrical Voice and Linking in Western Austronesian Languages* (Pacific Linguistics 646). Berlin: de Gruyter Mouton. https://doi.org/10.1515/9781614518716.

Ross, Malcolm. 2002. The history and transitivity of western Austronesian voice and voice-marking. In Fay Wouk & Malcolm Ross (eds.), *The history and typology of western Austronesian voice systems* (Pacific Linguistics 518), 17–62. Australian National University. https://doi.org/10.15144/PL-518.17.

Ross, Malcolm. 2006. Reconstructing the case-marking and personal pronoun systems of Proto-Austronesian. In Henry Y Chang, Lilian M Huang & Dah-an Ho (eds.), *Streams Converging Into an Ocean: Festschrift in Honor of Professor Jen-Kuei Li on his 70th Birthday* (Language and Linguistics Monograph Series W5), 521–563. Taipei: Academia Sinica.

Smith, Alexander D. 2025. Late Malayo-Polynesian: A new model of Austronesian linguistic relations. *Diachronica* 42(5). 646–698. https://doi.org/10.1075/dia.23062.smi.

Woollams, Geoff. 1996. *A Grammar of Karo Batak, Sumatra* (Pacific Linguistics C130). Canberra: Australian National University. https://doi.org/10.15144/PL-C130.

From pronoun to clausal correlate: The versatility of the Hungarian demonstrative

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Abstract

This paper offers a comprehensive LFG-account of three Hungarian constructions that can host what at first seem to be instances of the selfsame demonstrative pronoun: adnominal demonstratives, demonstrative correlates of finite *that*-clauses, and demonstrative correlates of noun phrases in topic left dislocation. We treat synchronic variation in this domain as a result of different historical paths of grammaticalization, and provide an outlook on the pertinent diachrony.

1 Introduction: Aims and claims[†]

The Hungarian demonstrative pronoun has a versatile character. Besides functioning as a par excellence pronominal demonstrative, it also features in a special adnominal demonstrative construction, where it co-occurs with the definite article. Furthermore, what looks like the selfsame demonstrative element also functions as the correlate of finite *that*-clauses and of noun phrases in topic left dislocation. In this paper, we aim to capture this variation in the synchronic system by developing an LFG-based account that recognizes the ties between the apparently different functions of the demonstrative element.

Our fundamental claim is that the demonstrative elements in these constructions are grammaticalized variants of the basic demonstrative pronoun. Where relevant, we briefly discuss the diachrony of these constructions to be able to have a better grasp on the synchronic data. In our analysis of the pertinent historical changes, we follow existing LFG research treating grammaticalization as a complex, possibly non-unidirectional historical change (see, especially, Vincent 2001, Börjars & Vincent 2017, Booth & Butt 2023, and Lowe 2015).

The structure of this paper is as follows. Section 2 is a succinct overview of the descriptive background. The adnominal construction, the finite *that*-clause construction, and the topic left dislocation construction are discussed in Sections 3, 4 and 5, respectively. Section 6 concludes the paper.

2 Descriptive background

Hungarian has a two-way demonstrative system with the distal form *az* 'that' and the proximal form *ez* 'this' (henceforth: az_1 and ez_1). Unlike personal pronouns, demonstratives inflect for number and case in a transparent manner, in analogy with lexical noun phrases. Consider (1) and (2) for illustration:[1]

[†] György Rákosi and Péter Szűcs acknowledge the support of Project no. 143417, which has been implemented with the support provided by the Ministry of Innovation and Technology of Hungary from the National Research, Development and Innovation Fund, financed under the K22 funding scheme.
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[1] We use the following abbreviations in the glosses:
1,2,3: first, second and third person, ACC: accusative case, AUX: auxiliary, COMP: complementizer, COND: conditional, DAT: dative case, DEF: definite conjugation, IMP: imperative, INDEF: indefinite conjugation, INE: inessive case, INF: infinitive, NOM: nominative case, PL: plural, POSS: possessive marking on the possessum, PRT: verbal particle, SG: singular.

(1) *Kati* *látta* *az*$_1$-*t*.
Kate saw.DEF.3SG that-ACC
'Kate saw that.'

(2) *Kati* *látta* *az*$_1$-*ok-at*.
Kate saw.DEF.3SG that-PL-ACC
'Kate saw those.'

$$\begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{CASE} & \text{ACC} \\ \text{DEF} & + \\ \text{DEICTIC} & + \\ \text{PROXIMAL} & - \\ \text{INDEX} & \begin{bmatrix}\text{PERS} & 3\\ \text{NUM} & \text{PL}\end{bmatrix}\end{bmatrix}$$

The f-structure on the right spells out the feature content of the plural demonstrative. In particular, we assume in this paper that the deictic force of the demonstrative pronoun is decomposed into a DEICTIC feature proper, representing the core attention-directing function of demonstratives; and a PROXIMAL feature, which captures the referential distance effects. We also assume that this demonstrative is a D, and it projects a DP in all of its uses (see Dékány 2021: 102 for pertinent discussion).

In the adnominal demonstrative construction, the demonstrative (identical to the pronoun in form) co-occurs with the definite article, which, like in many other languages, is a historical derivative of the demonstrative pronoun itself (see Diessel 1999 for an overview, and Egedi 2014 on the diachrony of the Hungarian definite article). The adnominal demonstrative, which we refer to as *az*$_2$, shows NUMBER and CASE agreement with the noun head.

(3) *János* *látta* *az*$_2$-*ok-at* *a* *film-ek-et*.
John saw.DEF.3SG that-PL-ACC the film-PL-ACC
'John saw those films.'

The distal demonstrative form also functions as an associate of finite *that*-clauses (*az*$_3$, see example 4), or of a noun phrase in left dislocation (*az*$_4$, see example 5).

(4) *János* *az*$_3$-*t* *mondta,* *hogy* *a* *film* *érdekes.*
John that-ACC said.DEF.3SG COMP the film interesting
'John said that the film is interesting.'

(5) *A* *film-et,* *az*$_4$-*t* *János* *is* *látta*.
the film-ACC that-ACC János too saw.DEF.3SG
'Those films, John saw them, too.'

What the demonstrative constructions in (3), (4) and (5) share, we argue, is that some version of the demonstrative pronoun stands in juxtaposition with another constituent. We discuss these three constructions in the next three sections respectively, and spell out our LFG analysis for each.

3 Adnominal demonstratives

3.1 On the diachrony of adnominal demonstratives

The agreeing adnominal demonstrative construction spread in the Middle Hungarian period (16th-18th centuries), gradually replacing the non-agreeing construction that dominated Old Hungarian. Example (6) is a 17th century example of the old, non-agreeing demonstrative, which shows no number or case concord with the noun head. Example (7) is its Modern Hungarian equivalent featuring the agreeing demonstrative.[2]

[2] Example (6) is from the Corpus of Middle Hungarian Memoires and Dramas (Gugán et al. 2023).

(6)	**non-agreeing adnominal construction**					(1657-1658)
	ez	*eddig*	*irt*	*hadakozás-ok-ban*		
	this	so.far	written	fighting-PL-INE		
	'in these fightings written (about) so far'					
(7)	**agreeing adnominal construction**					(Modern Hung.)
	ez-ek-ben	*az*	*eddig*	*irt*	*hadakozás-ok-ban*	
	this-PL-INE	the	so.far	written	fighting-PL-INE	
	'in these fightings written (about) so far'					

The birth of the agreeing adnominal construction was concomitant with the rise of the definite article (which itself is an Old Hungarian derivative of the distal demonstrative): native speakers of the age juxtaposed, it seems, the definite article, which had just gained general currency, and the demonstrative within the confines of a single nominal construction.

Egedi (2025) provides a comprehensive discussion of the historical changes that led to the contemporary system, arguing that the initial stage involved a truly appositive construction. Two kinds of arguments support this view. First, in Middle Hungarian, discourse particles and lexical possessors could intervene between the demonstrative and the noun phrase, unlike in Modern Hungarian. Note the position of the possessor in our examples in (8) and (9): while it must precede the demonstrative in Modern Hungarian (8), we see a demonstrative > dative possessor > possessum linear order in (9).[3]

(8)	*a*	*természet-nek*	*ez-t*	*az*	*adó-já-t*	(Modern Hung.)
	the	nature-DAT	this-ACC	the	tax-POSS.3SG-ACC	
	'this tax of nature'					
(9)	*ez-t*	*a*	*természet-nek*	*adó-já-t*		(1710)
	this-ACC	the	nature-DAT	tax-POSS.3SG-ACC		
	'this tax of nature'					

Second, the proximal demonstrative pronoun could co-occur with the proximal adnominal demonstrative in some Middle Hungarian texts (11), unlike in contemporary Hungarian, where this is not an option (10).[4] It is reasonable to assume that, as in (11), the pronominal demonstrative could form an appositive construction with a noun phrase containing the old non-agreeing demonstrative determiner.

(10)	*neked*	*adom*	*mind-ez-t*	*a*	*hatalm-at*	(Modern Hung.)
	DAT.2SG	give.1SG	all-this-ACC	the	power-ACC	
	'I give you all this power'					

[3] Interestingly, the intervening material typically seems to have broad scope over the whole construction in Middle Hungarian examples, as far as it can be judged from the textual contexts. Examples (8) and (9) thus apparently have the same semantics. Example (9) is from the Corpus of Middle Hungarian Memoires and Dramas (Gugán et al. 2023).

[4] (11) is an example from a 1590 translation of the Bible (source: Old Hungarian Corpus, Simon et al. 2014). Egedi (2025) notes that this construction mostly appears in Middle Hungarian religious texts.

(11) *te* *néked* *adom* [[*mind-ez-t*] [*ez* *hatalm-at*]] (1590)
you DAT.2SG give.1SG all-this-ACC this power-ACC
'I give you all this power'

(12) *mindezt* — demonstrative pronoun; *ez* — old demonstrative determiner

$$\left[\begin{array}{ll} \text{PRED} & \text{'PRO'} \\ \text{CASE} & \text{ACC} \\ \text{DEF} & + \\ \text{DEICTIC} & + \\ \text{PROXIMAL} & + \\ \text{SPEC} & \left[\text{PRED 'ALL'}\right] \\ \text{INDEX} & \left[\begin{array}{ll} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{array}\right] \end{array}\right] \qquad \left[\begin{array}{ll} \text{DEF} & + \\ \text{DEICTIC} & + \\ \text{PROXIMAL} & + \\ \text{INDEX} & \left[\text{PERS } 3\right] \end{array}\right]$$

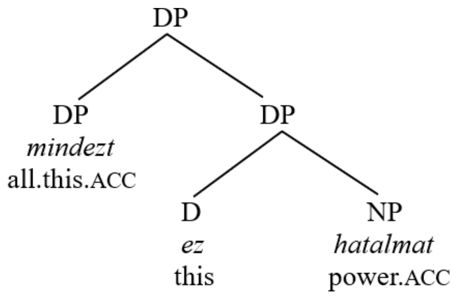
We therefore argue that the demonstrative construction in (11), representing the initial stage of the development of the current agreeing adnominal construction, *is* a true appositive structure. The analysis that we propose in (15) below is inspired by Sadler and Nordlinger's (2009) treatment of nominal apposition and juxtaposition constructions in Australian languages. In their account, several NPs can co-specify a given grammatical function, even in a discontinuous manner. The semantic relation between the NPs can vary widely from generic–specific or part–whole relations to inclusory constructions. For illustration, see the example in (13) and the corresponding f-structure in (14).

(13) *Garidini* *bungmanyini* *gin.amany* *yanybi.* (Wambaya)
husband.ERG old.man. ERG AUX.3SG get
'(Her) old man husband came and got (her).' (Sadler & Nordlinger 2009: 433)

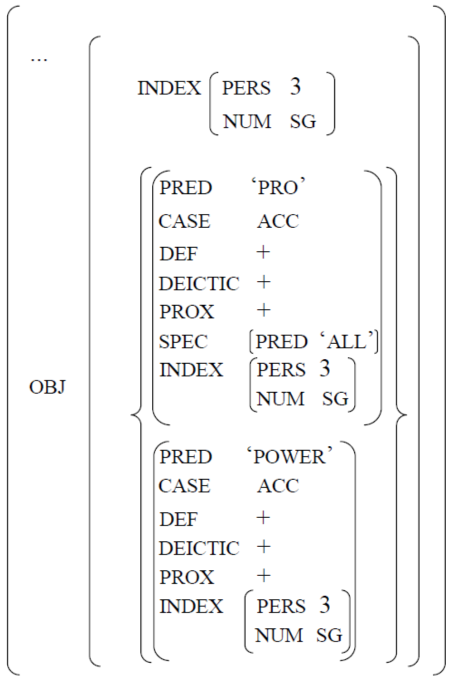
(14)
$$\left[\begin{array}{ll} \text{PRED} & \text{'GET <(SUBJ)(OBJ)>'} \\ \text{SUBJ} & \left[\begin{array}{l} \text{INDEX} \left[\begin{array}{ll} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{array}\right] \\ \left\{\begin{array}{l} \left[\begin{array}{ll} \text{PRED} & \text{'HUSBAND'} \\ \text{INDEX} & \left[\begin{array}{ll} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{array}\right] \end{array}\right] \\ \left[\begin{array}{ll} \text{PRED} & \text{'OLD MAN'} \\ \text{INDEX} & \left[\begin{array}{ll} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{array}\right] \end{array}\right] \end{array}\right\} \end{array}\right] \\ \text{OBJ} & \left[\text{PRED 'PRO'}\right] \end{array}\right]$$

The Middle Hungarian demonstrative construction in (11) is a more canonical appositive structure in the sense that it includes two constiuents with identical syntactic function and reference. Our analysis is in (15).

(15) a.



b.



As we argue here, understanding this initial diachronic stage provides us with a vantage point for the study of the synchronic adnominal demonstrative construction, which we turn to in the next subsection.

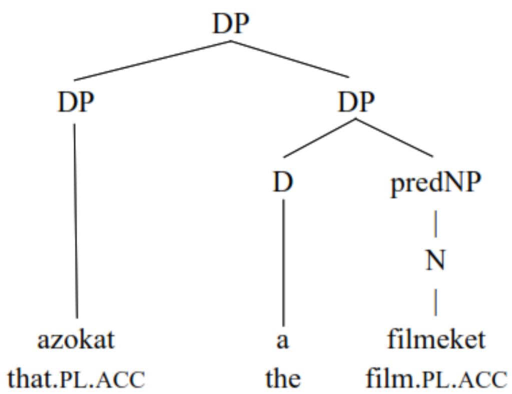
3.2 Adnominal demonstrative in the synchronic system

Consider the following sentence, our key datapoint in this section (ex. 3 repeated).

(16) *János* *látta* [*az₂-ok-at* *a* *film-ek-et*].
John saw.DEF.3SG that-PL-ACC the film-PL-ACC
'John saw those films.'

We are aware of only one (rather undeveloped) proposal in the generative literature that employs an appositional configuration even in Modern Hungarian: É. Kiss (1998: 81-82). Her analysis of the relevant construction in (16) would be as follows (17).

(17)



She assumes, agreeing with all other accounts, that the demonstrative element is a DP (because it can occur on its own as a referential pronoun). Then she points out that agreement between the demonstrative and the noun head is unattested elsewhere in Hungarian DPs; therefore, the construction can only be taken to be appositional, given that it is only the two elements in an appositional structure that exhibit this agreement behavior. É. Kiss does not address any potential problems for this approach.

By contrast, all the other generative (GB and MP) analyses we are aware of reject the appositional treatment of the present day Hungarian construction, and they postulate a matrix DP whose specifier position is occupied by the demonstrative element, see, for instance, Kenesei (1994: 294-296), Bartos (2000: 704-708), Dékány 2021: 100-113) and Egedi (2025: 14-17). The two most often used arguments against the appositional approach are the following. (i) The demonstrative and the definite article must be strictly adjacent. (ii) There can be no prosodic boundary between the demonstrative and "the rest of the configuration". We can add that notional agreement between the two parts is no longer available. That is, while (18a), a true appositive construction is grammatical, and (18b), which contains the adnominal demonstrative, is not.[5]

(18) a. *ez-ek,* *(vagyis)* *az* *új* *csapat*
this-PL.NOM that.is the new team.SG.NOM
'these, that is, the new team = these people, i.e. the new team'

b. **ez-ek* *az* *új* *csapat*
this-PL.NOM the new team.SG.NOM

It is a major challenge for the Spec,DP approach that modifiers and determiners do not agree for case, person, and number with their noun heads elsewhere in Hungarian.[6] The generative approaches mentioned above use different formal devices to capture this agreement behaviour. For example, Kenesei (1994) simply assumes Spec-head agreement, while Bartos (2000) introduces a special case-percolation operation: the case of the matrix DP percolates down onto the demonstrative pronominal DP (needing case) in Spec,DP.[7]

It appears to be a shared shortcoming of the generative analyses cited here that they do not address the status of the demonstrative element in Spec,DP. Either explicitly or implicitly they assume that it is the same demonstrative pronoun as is used on its own. However, if it is an ordinary referential pronoun (our *az*$_1$ 'that$_1$') then its automatic coreferentiality with a D' constituent within the matrix DP cannot be feasibly captured.[8]

Egedi (2025) proposes that a truly appositional construction in Middle Hungarian underwent reanalysis yielding the Modern Hungarian constituent. Consider her structural generalization in (19) (2025: 16).

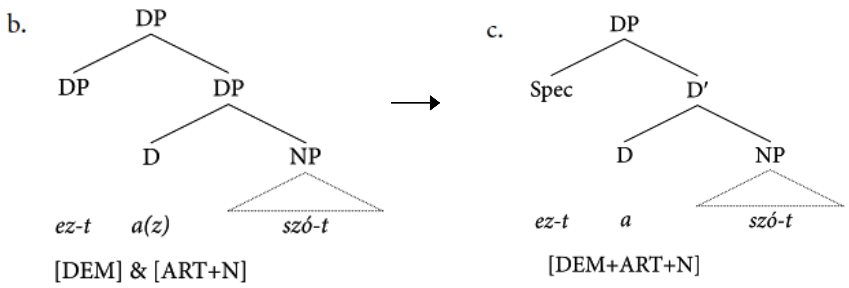
(19) a. **ez-t* *a(z)* *szó-t*
this-ACC the word-ACC
'this word'

[5] Some speakers may find (18a) somewhat marked because here the demonstrative is associated with +HUMAN entities (contrary to its typical use). This is, however, orthogonal to our point, see Farkas & Alberti (2018: 21-24) for notes on this issue. For further arguments against the appositional treatment, see Bartos (2000).

[6] Recall that this is É. Kiss' (1998) major argument for her appositional approach.

[7] For further details, see the works mentioned above.

[8] Note that É. Kiss' (1998) appositional treatment can naturally handle this, but it has serious shortcomings in several other respects that render it untenable, see above.

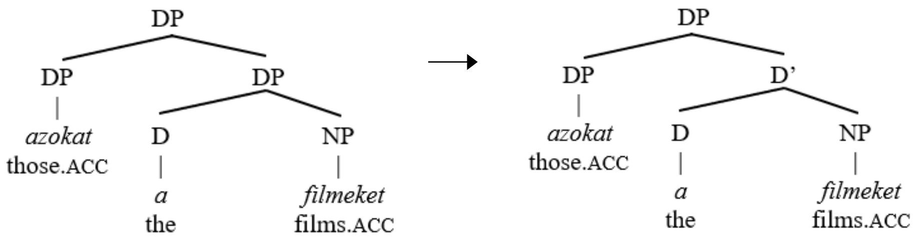


Middle Hungarian **Modern Hungarian**

In our LFG analysis to be developed here, we assume that the Modern Hungarian adnominal demonstrative construction is the result of a grammaticalization process with the following main ingredients.

We subscribe to Egedi's (2025) approach, see our reanalysis treatment of the key example from (16) in (20), and compare (19b,c) with (20).

(20)



We assume that the agreement for case and number between the demonstrative and the noun head has simply been retained in the process of grammaticalization. In the Middle Hungarian appositional configuration two DPs were in an agreement relationship, while in the Modern Hungarian counterpart the demonstrative DP in Spec,DP agrees with the noun head of the matrix DP. This is a simple and natural explanation for the exceptional agreement facts in present day Hungarian, as opposed to É. Kiss' (1998) highly problematic claim that even the Modern Hungarian version is an appositional structure.

Importantly, we also assume that in the grammaticalization process the demonstrative DP lost its PRED feature,[9] i.e. it is no longer a referential pronoun, see the two respective lexical forms for the ordinary demonstrative pronoun (*az*$_1$ 'that$_1$') and for the adnominal use of the demonstrative element (*az*$_2$).[10]

[9] This aspect of our grammaticalization analysis is comparable to the widely attested phenomenon of SUBJ and OBJ pro-drop. A SUBJ or OBJ marker suffixed to a verb stem originally functioned as an incorporated pronoun, and at a later stage it optionally dropped its PRED feature, and in the absence of the PRED feature only the agreement features remained, see Toivonen (2023), for instance.

[10] Note that a PRED-less demonstrative is also posited for the determiner use of *this/that* in Dalrymple et al. (2019: 86-87).

(21) a. *az₁*, D

$(\uparrow$ PRED) = 'PRO'
$(\uparrow$ DEF) = +
$(\uparrow$ DEICTIC) = +
$(\uparrow$ PROXIMAL) = −
$(\uparrow$ PERS) = 3
$(\uparrow$ NUM) = SG

$\longrightarrow$

b. *az₂*, D

$(\uparrow$ DEF) = +
$(\uparrow$ DEICTIC) = +
$(\uparrow$ PROXIMAL) = –
$(\uparrow$ PERS) = 3
$(\uparrow$ NUM) = SG
$(\uparrow$ CHECK _ART) $=_c$ +

In our analysis, *az*$_2$ is no longer a referential pronoun: it has become a PRED-less demonstrative element. This makes it possible for us to assume that in the process of reanalysis an important functional annotational change has also taken place: *az*$_1$ 'that$_1$', a referential pronoun with a PRED feature, requires a GF annotation, while the PRED-less *az*$_2$ is naturally associated with the functional head annotation, which makes it a functional co-head in this configuration. This change enables us to avoid, in a principled manner, the (co-)referentiality problem with the demonstrative element in analyses that assume that it is an ordinary referential pronoun in its adnominal use as well, see the foregoing discussion. We analyze our key example in (16) as shown in (22) and (23).

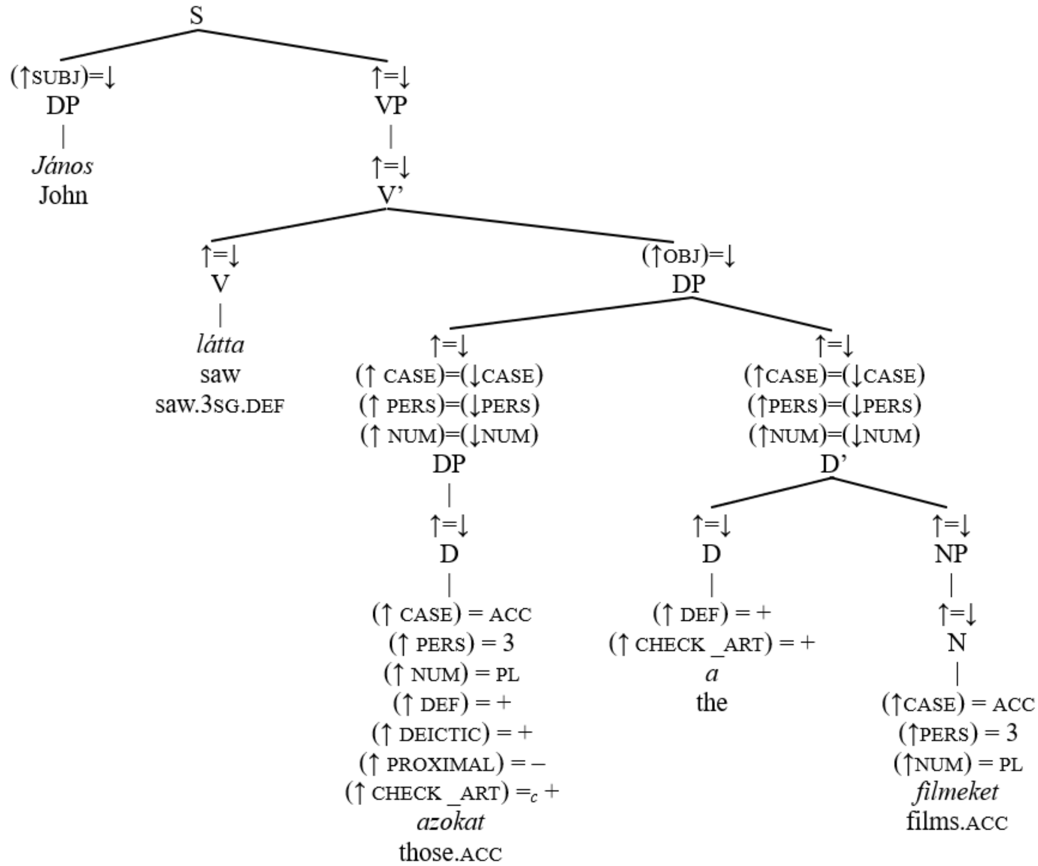
Our focus here is the representation of the object DP in (22). The demonstrative DP in Spec,DP and D' (ultimately headed by N) are functional co-heads, which is legitimate as the former has no PRED feature. The three annotations below the respective functional head annotations encode the agreement facts inherited from the appositional construction serving as input to reanalysis. The definite article and the noun head bring their usual annotations from their lexical forms. The lexical form of the demonstrative head we assume is given in (21b). The functional annotations in (22) yield the f-structure in (23).

Furthermore, it is a special property of this adnominal demonstrative construction that it must contain the definite article sitting in the D head position. We capture this fact by introducing a specific CHECK feature to encode the obligatory presence of the definite article in the construction.[11] Hence, we insert the following constraining equation in the lexical form of *az*$_2$ 'that$_2$' in (21b): $(\uparrow$ CHECK _ART) $=_c$ +. This requires the presence, in the relevant configuration, of an element associated with the defining member of this CHECK feature pair. We insert this equation in the lexical form of the definite article as an optional annotation: (($\uparrow$ CHECK _ART) = +). Thus, this optional annotation will only be activated in the presence of *az*$_2$ in a DP.[12]

[11] CHECK features come in pairs: there is a constraining equation, and it has a defining equation counterpart. These CHECK feature pairs can ensure that two elements will occur together in a particular configuration. For an example of this, see Laczkó & Rákosi's (2011) treatment of Hungarian particle verb constructions, in which the simplex verb and the particle are marked by corresponding CHECK features in their respective lexical forms.

[12] As we subscribe to Laczkó (2021) in terms of the general LFG-approach to Hungarian sentence-structure, (22) is headed by the exocentric S node.

(22)



(23)

$$\begin{bmatrix} \text{PRED} & \text{'SEE <(SUBJ)(OBJ)>'} \\ \text{TENSE} & \text{PAST} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED 'JOHN'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'FILM'} \\ \text{CASE} & \text{ACC} \\ \text{DEF} & + \\ \text{DEICTIC} & + \\ \text{PROXIMAL} & - \\ \text{INDEX} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Finally, we note that in the majority of analyses az_2 'that$_2$' and the dative-marked possessor DP are assumed to be in complementary distribution in Spec,DP. It is a well-known fact that dative possessors can be extracted from the matrix possessive DP, see (22). By contrast, the extraction of az_2 from the very same position is not allowed (23).[13]

[13] In our LFG context, *extraction* is just a descriptive term. The theory's formal treatment is functional uncertainty and not movement.

(22) *Láttam* [*Jánosnak* *a* *filmjét*]. → *Jánosnak láttam* [*a filmjét*].
saw.DEF.1SG John.DAT the film.his.ACC
'I saw John's film.'

(23) *Láttam* [*azt* *a* *filmet*]. → **Azt láttam* [*a filmet*].
saw. DEF.1SG that.ACC the film.ACC
'I saw that film.'

Our explanation for this contrast is that the possessor has a GF (POSS), while the demonstrative, being a functional co-head, has no GF, and the necessary (but not sufficient) condition on extraction is that the element involved should have a GF.

4 Clausal correlate demonstrative

Az$_1$ 'that$_1$' can be used to refer to clausal or propositional entities within standard discourse deixis, appearing both cataphorically (24a) and anaphorically (24b). In such cases, the demonstrative is co-referential with an independent clause.

(24) a. *János* *az*$_1$*-t* *mondta:* *"A* *film* *érdekes".*
John that-ACC said.DEF.3SG the film interesting
'John said: the film is interesting.'

b. *"A* *film* *érdekes."* *János* *mindig* *az*$_1$*-t* *mondja.*
the film interesting John always that-ACC says.DEF.3SG
'The film is interesting. John always says that.'

Moreover, Hungarian features a distinctive construction involving the nominal demonstrative, which functions as a proleptic correlate pronoun linked to a subordinate clause. Apart from answering a question like *What did John say?*, (25) can be used out of the blue, or as a broad-focus response to a question like *What happened?*.[14]

(25) *János* *az*$_3$*-t* *mondta,* *hogy* *a* *film* *érdekes.*
John that-ACC said.DEF.3SG COMP the film interesting
'John said that the film was interesting.'

Here we propose that (25) involves a distinct variant of *az* – here labeled as *az*$_3$ and referred to as a "clausal correlate". Our analysis is in line with Szűcs (2022), wherby this demonstrative is analyzed in LFG following the GF-unification-based approach of Berman et al. (1998). This analysis is outlined in Section 4.2, following a short diachronic overview of the development of this element.

4.1 On the diachrony of clausal correlates

According to É. Kiss (2023), finite subordination began to emerge in Old Hungarian around the 12th century. Prior to that, subordination was either nonfinite or achieved through parataxis, typically in the form of direct quotation using an independent clause. Such quoted material was often introduced by an anticipatory demonstrative pronoun in the main clause. While É. Kiss's study focuses on the adverbial demonstrative *úgy* 'so.DIST' in this role, the same holds true for *az* 'that', which appeared somewhat later (the adverbial may already be found in the 14th century, while the nominal becomes

[14] We restrict our discussion and analysis here to sentences with assertive/non-factive main verbs. Verbs of other semantic types show a different behavior. However, going into such details would take us far afield. See Szűcs (2022: 355-356) for discussion and references.

common in the 15th century). Note also the contrast in definiteness agreement on the verbs in (26) and (27). In the former sentence, *mond* 'say' is intransitive, while in (27), the demonstrative serves as its object. The historical examples in this section are from the Old Hungarian corpus of Simon et al. (2014).[15]

(26)

Úgy	*mond*	*Szent*	*Gergely*	*doktor:*	*az*	*igazaknak*
so.DIST	says.INDEF	saint	Gregory	doctor	the	thruthful.DAT

erőssége	*a*	*testnek*	*győzése.*
strength.POSS.3SG	the	body.DAT	defeat.POSS.3SG

'So says Saint Gregory: it is the strength of the truthful to defeat the body.'

(27)

Az-t	*mondják*	*vala:*	*ó*	*én*	*édes*	*Istenem*	*volnának*	*mégis*
that-ACC	say.DEF.3PL	been	oh	my	sweet	god	be.COND.3PL	still

több	*tagjaink,*	*hogy*	*teérted*	*adhatnók.*
more	limbs.POSS.1PL	COMP	for.you	give.COND.1PL

'They said (that): O my dear God, if only we had more limbs to give to you.'

By the 15th-16th centuries, the earlier paratactic construction grammaticalized into genuine subordination (illustrated in 25), involving both the adverbial and the nominal demonstrative pronouns. Both are parts of the grammatical system of contemporary Hungarian, and their distribution is governed by a range of lesser studied linguistic factors.[16]

4.2 Clausal correlate in the synchronic system

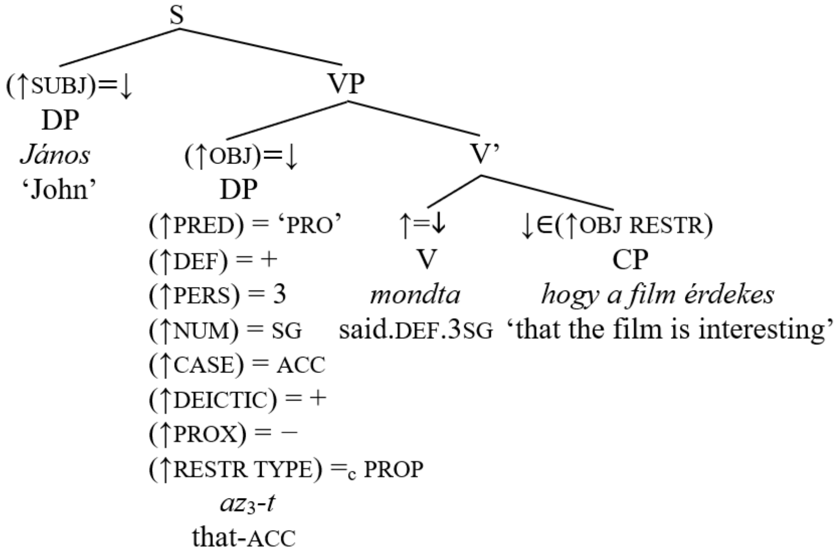
Agreeing with Szűcs's (2022) treatment, we adopt the "unification"-style analysis based on Berman et al. (1998). In particular, we propose that *az*$_3$ 'that$_3$', as a demonstrative, and the subordinate clause jointly constitute the OBJ of the main predicate. In this approach, the pronoun contributes an instantiated semantic variable, which is crucially distinct from specifying/restricting the content of such a variable. The restriction is done by the clause, in a sub-f-structure. Ultimately, the contributions of both the pronoun and the clause are unified within the OBJ function of the main predicate.[17] Consequently, for (25), we propose the c-structure and f-structure representations in (28), with the lexical entry for *az*$_3$ shown separately in (29).

[15] The diachronic primacy of the adverbial demonstrative is supported by its role in the historical development of the Hungarian complementizer *hogy*. Originally, *úgy* 'so' and *(a)hogy* 'how' formed a correlative pair, analogous to other demonstrative-relativizer pairs in the paradigm (such as Hungarian equivalents of *that…who*, *then…when*, or *there…where*). According to É. Kiss (2023), this correlative structure was repurposed for finite subordination. In this process, the relativizer was reanalyzed as a complementizer.

[16] For instance, with some verbs (e.g. *tud* 'know'), using *úgy* 'so.DIST' vs. *az* 'that' is associated with the non-factive vs. factive interpretation of the CP. These issues are beyond the scope of our paper.

[17] In the words of Berman et al. (1998), it is possible to "make a distinction between (i) the introduction of an instantiated symbol (i.e. a variable or a discourse referent): [PRED '…']; and (ii) the specification of a semantic relation restricting such a variable (the separation of the latter is technically achieved by introducing the semantic relation embedded under a set-feature RESTR resembling the adjunct feature; this makes the outer f-structure compatible with an ordinary PRED value from elsewhere: [RESTR {[PRED '…']}]".

(28) a.



b.

$$\left[\begin{array}{ll}
\text{PRED} & \text{`SAY <(SUBJ)(OBJ)>'} \\
\text{TENSE} & \text{PAST} \\
\text{SUBJ} & \left[\text{PRED `JOHN'}\right] \\
\text{OBJ} & \left[\begin{array}{ll}
\text{PRED} & \text{`PRO'} \\
\text{CASE} & \text{ACC} \\
\text{DEF} & + \\
\text{DEICTIC} & + \\
\text{PROXIMAL} & - \\
\text{INDEX} & \left[\begin{array}{ll} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{array}\right] \\
\text{RESTR} & \left\{\left[\begin{array}{ll}
\text{PRED} & \text{`INTERESTING <(SUBJ)>'} \\
\text{SUBJ} & \left[\begin{array}{ll} \text{PRED} & \text{`FILM'} \\ \text{DEF} & + \end{array}\right] \\
\text{TYPE} & \text{PROP}
\end{array}\right]\right\}
\end{array}\right]
\end{array}\right]$$

(29) *az*3, D
(↑ PRED) = 'PRO'
(↑ DEF) = +
(↑ DEICTIC) = +
(↑ PROXIMAL) = −
(↑ PERS) = 3
(↑ NUM) = SG
(↑ RESTR TYPE) $=_c$ PROP

As we consider the pronoun *az*3 'that3' to be a demonstrative pronoun – specifically, a grammaticalized version of *az*1 – we argue that it is endowed with the [DEICTIC +] and [PROXIMAL −] features. Accordingly, we maintain that, despite the less common and marked status of proximals, such forms are nonetheless compatible with the construction.

Support for this view can be drawn from both diachronic and synchronic data. Notably, the dominance of distal over proximal forms appears to be independent of the language's historical developmental stage. Rather, it seems that discourse-related deixis in Hungarian systematically favors distal forms, even when clearly contentful instances of *az*$_1$ ‘that’ are involved, as illustrated in examples (26) and (27) above. Nevertheless, relevant occurrences of proximal forms can be found in both historical (29) and contemporary (30) authentic sources.

(30) a. *hiú dicsőség ez*$_1$*-t mondja: mutassad ki a jót*
vain glory this-ACC says show.IMP.2SG out the good
‘vain glory says this: show the good’

b. *ki ez*$_3$*-t hirdeted, hogy nem kell orozni, orozást tész*
who this-ACC proclaim.2SG COMP not need rob.INF robbery.ACC do.2SG
‘whoever proclaims (this) that robbery is not needed, you do robbery’

(31) a. *Aztán ez*$_1$*-t mondja: Hát akkor legyen.*
then this-ACC says so then be.IMP.3SG
‘Then he says this: so then let it be.’ (Hungarian National Corpus, Oravecz et al. 2014)

b. *Tehát ez*$_3$*-t látjuk, hogy nem hasznosul ez a rengeteg pénz.*
so this-ACC see.1PL COMP not gets.utilized this the plenty money
‘So what we see is that this huge amount of money is not put to good use.’ (online, https://youtu.be/VKB8Ydff9zI?si=lm6Cit-dk9y1cPSn, 1:54)

The specific contextual conditions that license the use of proximal forms remain largely unexplored. Their distribution is likely influenced by factors such as the cognitive prominence of the proposition, and the speaker’s stance towards it. While these factors merit further investigation, for the purposes of the present analysis, we believe that it is justified to assume that deixis forms part of the lexical specification of *az*$_3$ ‘that$_3$’.

As for NUMBER, *az*$_3$ ‘that$_3$’ does not seem to occur in the plural. That is, sentences such as (32) are unattested in both diachronic and synchronic data.

(32) **János az*$_3$*-ok-at mondta, hogy ... és hogy…*
John that-PL-ACC said.2SG.DEF COMP and COMP
Intended: ‘John said (those) that …. and that …’

This restriction cannot be attributed to an incompatibility between the relevant verbs and plural pronominal objects. The historical corpus (Simon et al. 2014) does contain examples of such verb-object combinations. However, in those cases, the plural pronouns either introduce relative clauses or serve as anaphoric references to preceding sentences (that is, not instances of *az*$_3$).

(33) *te pedig az*$_1$*-ok-at mondjad, melyek illenek az igaz tudományhoz*
you and that-PL-ACC say.2SG.IMP which.PL suit.3PL the true science.to
‘And you should say those (things), which suit the true science.’

(34) *és* *mikor* *ez$_1$-ek-et* *mondotta* *volna…*
and when this-PL-ACC said.2SG COND
'And when he was to say these (things)…' (reference to earlier statements)

As for the general issue with plural forms in sentences like (32), the problem probably stems from the difficulty of associating plurality with clausal or propositional entities. This may be because CPs may not have a number feature, so only the default singular pronoun can refer to them. This can also be seen in English: while for the purposes of agreement, coordinated CPs might, under certain circumstances, trigger plural concord (for details see McCloskey 1991), pronominal reference is strongly preferred as singular. In other words, clauses are generally associated with a singular number feature.

(35) *That he'll resign and that he'll stay in office seem at this point equally possible.* (McCloskey 1991: 564)

(36) *Kate is the smartest student, but John is intelligent too. Everyone believes {this/?these}.*

This explains why the relative clause in (33), in which the demonstrative is a nominal head, and the clause is possibly only an adjunct, can occur with the plural form *azokat* 'those.ACC'. Nevertheless, (34) still features a plural demonstrative but it is important to note, that such constructions are relatively rare in historical corpora, with singular forms being the far more common choice. Also, the sentences with the plural (33 and 34 alike) sound distinctly marked in contemporary Hungarian. This pattern suggests that alongside the issue of whether a category bears a number feature, there is a more general difficulty in associating propositional content with plurality. This interpretation aligns with broader tendencies in grammaticalization, where reduced variability in feature expression is a common outcome (Diessel 1999: 118). For us this means that the lack of plural occurrences like (31) may be explained not directly by the lack of NUM in *az$_3$*, but by general principles.

The restriction (↑RESTR TYPE) $=_c$ PROP is necessary for *az$_3$* 'that$_3$', to prevent it from being associated with arbitrary objects in its restriction. The restricting element must be a propositional CP as in (25), but not a simple entity as in (37). Importantly, *vicc* 'joke' would be legitimate object on its own. However, in (37), rather than specifying/restricting content of the demonstrative, its presence just results in incoherence by doubling the OBJ function.[18]

(37) **János* *az$_1$-t* *mondta* *a* *vicc-et.*
John that-ACC said.2SG the joke-ACC
Intended, approx.: '*John said/told it the joke.'

In English (as in many other languages), there is no direct equivalent for *az$_3$* 'that$_3$' and even the standard demonstratives (*this* and *that*) are somewhat marked in discourse-related deixis – note that the translation of (34) is dispreferred. This is in line with the general stance of discourse-related deixis itself being a grammaticalization of the core exophoric function of demonstratives, as argued by Diessel (1999: 109-113). However, languages will differ with respect to particular consequences of grammaticalization: they could be a development of new instance of a demonstrative (*az$_3$*) or just usage restrictions (*?he said these*).

[18] Constraining the restriction to be a CP might also be an option, although the optionality of the complementizer (Kenesei 1994: 333-339) complicates the issue.

We conclude this section with a brief critical overview of the alternative accounts proposed in the previous literature. The traditional account of the clausal correlate constuction – originating with Kenesei (1994) and followed by many subsequent studies – maintains that the demonstrative functions as a semantically empty formative, i.e., an expletive. However, as opposed to expletives, the demonstrative in question: i) can assume various non-subject grammatical functions; ii) can bear discourse functions and be stressed accordingly; iii) occurs in a *pro*-drop language, and such languages are typologically not expected to host expletive elements; iv) can participate in a number of syntactic constructions which are normally unavailable for expletives (e.g. coordination, nominalization). For a more comprehensive discussion, the reader is referred to Laczkó (2022) and Szűcs (2022).

Because of such considerations, some later analyses (e.g. Szűcs 2015), interpret the demonstrative as an instance of *az*$_1$ 'that$_1$', with the clause serving as an adjunct. Nevertheless, the clause does not seem to be one: i) conceptually, the CP contains the proposition associated with the main verb; b) the main verb imposes selectional restrictions on the subordinate clause; c) the subordinate clause is not set apart from the main clause by an intonational boundary, as would be expected in appositive clauses.[19]

Laczkó (2022) is another LFG-based account. Laczkó argues that *az*$_3$ is a personal pronoun (so no deictic meaning is involved) and it alone functions as a fully-fledged argument of the main predicate, with the subordinate clause serving as an argument of the pronoun, bearing a COMP function. This shares an important insight with our analysis: in some sense, clausal correlate *az* 'that' is "incomplete" without the accompanying clause. However, a key aspect of divergence lies in how this incompleteness is interpreted. Laczkó (2022) argues that the demonstrative is "incomplete" insofar as it is an argument-taking predicate. By contrast, the unification-analysis advocated here proposes that *az*$_3$ 'that$_3$' is a demonstrative, and with the subordinate clause it jointly constitute the OBJ of the main predicate. We believe that this latter approach better captures both the diachronically and synchronically detectable deictic aspect of *az*$_3$ 'that$_3$' and it also expresses the link between the CP and the main verbal predicate in a more direct fashion.[20]

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[19] Butt (2014: 163) opts for such an adjunction-based analysis of Urdu scope-marking constructions. Thus, according to her, *kya* below is a thematic pronoun. For the reasons outlined above, we do not adopt this kind of analysis, but we acknowledge her calling our attention to this analysis at the LFG2025 conference in person. (For simplicity, the morphosyntactic details have been removed from the original example.)

(i)	*rɑvi*	*kya*	*janta*	*hɛ*	*[ke*	*sita*	*kɪsko*	*pɑsɑnd*	*kɑrti*	*hɛ]?*
	Ravi	what	know	be	COMP	Sita	who	liking	do	be

'Who does Ravi know Sita likes?' lit.: 'What does Ravi know, who does Sita like?'

[20] A reviewer asks whether an apposition-like analysis would be appropriate for clausal correlation. While we do subscribe such a treatment for the topic left dislocation construction to be detailed in section 5, we do not find it appealing for sentences like (25). In left dislocation, the pronoun is plausibly an independent referring expression in the (referential) topic field of the sentence, we take *az*$_3$ to be deficient in the sense described above (occurring in the specifier of VP). The apposition analysis is also motivated by case-sharing in left dislocation, which is not applicable to the constellation of *az*$_3$ and the associated CP.

It may also be noted that Laczkó (2022) and our current analysis are both similar in spirit to Szűcs's (2024) Minimalist-style approach (where the demonstrative, originating in Spec-CP, is a secondary predicate for the clause).

5 Topic left dislocation correlate

5.1 Descriptive overview

Left dislocation (LD) is a term commonly used to describe constructions in which a left-peripheral, topic-like host element is (usually) co-indexed with a subsequent pronominal element. It is widely accepted generalization that at least two types of LD should be distinguished (see, for example, Shaer 2009). The type found in languages such as English is often referred to as non-integrated or n-type left dislocation:

(38) *John*$_i$*, I really like him*$_i$*.*

In (38), *John* functions as a hanging topic, an element loosely connected to the sentence. This lack of syntactic integration is evidenced by the possibility of case mismatches (e.g.: *me, I like beer*) or by constructions where actually no sentence-internal pronoun is present, and the connection between the peripheral element and the clause is only pragmatic (e.g.: *Barcelona, the architecture is amazing*).

While certain Hungarian constructions may be analyzed as instances of non-integrated (n-type) left dislocation, the demonstrative *az* ('that') participates in the other subtype, the integrated (i-type) left dislocation. This is characterized by a closer, syntactic association of the topical element with the sentence. Szűcs (2019) offers a detailed account of the two LD types in Hungarian; see also Lipták (2011) for a Minimalist perspective. Here, we summarize the most relevant empirical facts.

In Hungarian (i-type) LD, an element in the topic-field of the Hungarian sentence is followed by a co-referent demonstrative pronoun. Adjacency between the two is not required, as illustrated in (39).[21]

(39)	*A*	*film-ek-et*$_i$*,*	*szerintem*	*az-ok-at*$_i$	*János*	*is*	*látta.*
	the	film-PL-ACC	in.my.opinion	that-PL-ACC	John	also	saw.DEF.3SG
	'The films, I think John also saw them.'						

However, since this is an i-type LD, case-mismatch is not permitted: if the peripheral element in (39) were *film-ek* 'film-PL.NOM' or the demonstrative were *az-ok* 'that-PL.NOM' (resulting in a mismatch), the sentence would be ungrammatical.[22]

While the demonstrative pronoun in (39) can be seen as an instance of *az*$_1$, there is a remarkable variation that manifests the focus of our analysis: it is possible for the *singular* form of *az* 'that' to appear in (40), even though such usage is unexpected under

[21] As regards topic-orientedness, note that *valaki* 'somebody' can only be a host element if it is interpreted contrastively, in relation to some previously established set, otherwise it would violate the pragmatic identifiability condition on topics. So there is no non-contrastive interpretation for (ia) below, and a newly introduced topic in a presentational sentence is infelicitous with the LD-demonstrative. See Szűcs (2019: 300-301) for more on this issue.

(i) a.	*Valaki*	*az*	*eljött.*	b.	*#Valaki*	*az*	*van*	*odakint.*
	somebody	that.ACC	came.3SG		somebody	that	is	outside
	'Somebody (as opposed to others) came.				'There is somebody outside.'			

[22] Other contrasts between the two types of LD include the form of the pronoun (it can be a personal pronoun in the i-type), the phonology of the two (n-type LDs are set apart from the host sentence by a sizable intonational break) and positional restrictions. N-type LDs, strongly prefer sentence-initial positions, e.g. they are degraded if subordinated), while i-type LDs are more freely distributed. Note that English "topicalization" behaves more like an i-type structure in this regard: *They think that John, I really like (??him).*

standard assumptions of co-reference. We argue that (40) features another grammaticalized version of *az*, which we label as *az*4 and we describe it as "topic left dislocation correlate demonstrative pronoun".

(40) *A film-ek-et*$_{i}$*, szerintem az*4*-t*$_{i}$ *János is látta.*
the film-PL-ACC in.my.opinion that-ACC John also saw.3SG.DEF
'The films, I think John also saw them (it).'

Apart from NUMBER, the PERSON feature may also exhibit mismatch with the host.

(41) *Minket,* ***az*4*-t János is látott.*
us that-ACC John too saw.3SG.INDEF
'Us, John saw (it), too.'

Finally, the formally distal *az*4 'that' can be associated with a proximal element.

(42) *[Ez*2*-t a könyv-et]*$_{i}$*, [az*4*-t]*$_{I}$ *szeretem.*
this-ACC the book-ACC that-ACC like.1SG.DEF
'This book, I like (it).'

At present, relatively little is known about the historical development of left dislocation. One of the primary challenges is that this construction is most characteristic of informal, spoken language, whereas historical corpora typically consist of official documents, literary texts, Bible translations, and other formal registers – sources that are not well suited to capturing colloquial phenomena.[23]

There has been some research on the historical development of left dislocation in English, e.g. Tizón-Couto (2015). On the basis of these findings, it is a plausible scenario that n-type left dislocations emerge first and are later reanalyzed into more syntactically integrated structures. The initial appearance of n-type LDs may be motivated by general communicative or processing principles – such as the separation of introducing a discourse referent (the topic) from making an assertion about it (Lambrecht 1994: 185). The integration results in topicalization in English (see footnote 20) or an i-type dislocation in Hungarian (and other languages which have it, e.g. German, see example in (48) in the next section).

According to Tizón-Couto (2015), the driving force behind this development may be speakers' tendency to avoid syntactically non-integrated elements within the clause. Such a diachronic trajectory would, in essence, parallel the development of the adnominal demonstrative and finite subordination from clausal juxtaposition towards functional unification. At this point, however, this remains a conjecture about Hungarian, requiring further investigation.

5.2 Topic left dislocation correlate in the synchronic system

Szűcs (2019) analyzes the demonstrative pronoun in Hungarian i-type left dislocation as an adjunct to the host element. While this is technically a workable solution, we find it lacking in conceptual plausibility. Adjuncts typically contribute additional information about the element with which they are associated, but it is not clear what it would mean for a demonstrative pronoun – whose semantic function is to refer to another element – to serve as an adjunct. Hence, the lack of similar solutions in the LFG-literature is unsurprising, which motivates exploring alternatives. In this spirit, here we propose an approach designed to supersede the analysis presented in Szűcs (2019).

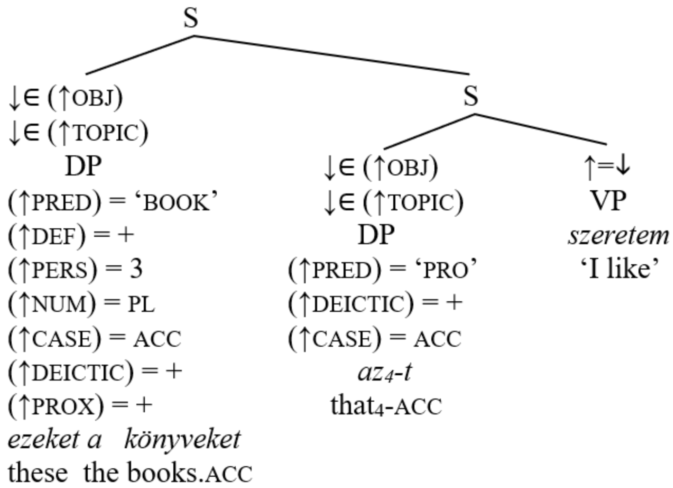
[23] We stress that in spite of the scarcity of historical data, there is no doubt about the existence of LD in contemporary Hungarian.

Invoking the approach to apposition by Sadler & Nordlinger (2009) (described in section 3.1), we propose that in Hungarian topic left dislocaction, the host element and the demonstrative pronoun co-specify the given grammatical function, as can be seen in (43)-(45) below. We assume that the case-matching requirement arises as a natural consequence of the host element and the demonstrative pronoun sharing the same grammatical function.[24] The proposed lexical entry for *az*$_4$ is also shown separately in (46).[25]

As shown in (43)–(46), the grammaticalization of *az*$_4$ 'that$_4$' appears to involve the loss of several grammatical features. Specifically, *az*$_4$ lacks person and number specifications, which allows it to co-occur with hosts bearing a variety of feature values – singular or plural number, and first, second, or third person – as seen in (40) and (41). This flexibility enables the host element to determine the agreement features of the complex grammatical function.

(43) *[Ez-ek-et a könyv-ek-et]*$_i$ *[az*$_4$*-t]*$_i$ *szeretem.*
this-PL-ACC the book-PL-ACC that$_4$-ACC like.1SG
'These books, I like (them).'

(44)



[24] The apposition analysis of Hungarian topic left dislocation is also in line with Lipták (2011: 179), according to whom the pronoun is "generated as an appositive modifier to the left-dislocated item".

[25] A reviewer asks why not simply put the topicalized constituent in a TOPIC feature and then coindex that with the OBJ. The reason is that such a treatment would erroneously suggest that at least one of the two elements is an extrasentential entity (a hanging topic), while there are ample reasons to believe that both are integrated in the core clause structure – they do not have to be sentence-initial, they can intermingle with other topics, they can be in a subordinate clause, see Szűcs (2019) for details.

(45)

$$\left[\begin{array}{ll}
\text{PRED} & \text{`LIKE } \langle\text{(SUBJ)(OBJ)}\rangle\text{'} \\
\text{SUBJ} & \left[\text{PRED `PRO'}\right] \\
\text{OBJ} & \left[\begin{array}{l}
\text{INDEX} \left[\begin{array}{ll}\text{PERS} & 3\\ \text{NUM} & \text{PL}\end{array}\right] \\
\left\{\begin{array}{l}
\left[\begin{array}{ll}
\text{PRED} & \text{`BOOKS'} \\
\text{DEF} & + \\
\text{INDEX} & \left[\begin{array}{ll}\text{PERS} & 3\\ \text{NUM} & \text{PL}\end{array}\right] \\
\text{CASE} & \text{ACC} \\
\text{DEICTIC} & + \\
\text{PROX} & +
\end{array}\right] \\
\left[\begin{array}{ll}
\text{PRED} & \text{`PRO'} \\
\text{PRONTYPE} & \text{DEM} \\
\text{CASE} & \text{ACC} \\
\text{DEICTIC} & +
\end{array}\right]
\end{array}\right\}
\end{array}\right] \\
\text{TOPIC} &
\end{array}\right]$$

(46) *az*4, D
($\uparrow$ PRED) = ‘PRO’
($\uparrow$ DEF) = +
($\uparrow$ DEICTIC) = +

We further propose that although *az*4 ‘that4’ retains its fundamental deictic character (specifically in its attention-directing function, which probably underlies its topic-oriented behavior), it no longer encodes a specific distance value. In other words, *az*4 functions as a distance-neutral demonstrative pronoun (Diessel 1999: 2), which allows it to co-occur with host elements that may bear an overtly contrasting deictic specification (see 42). In such cases, the surface distal form of the left dislocation correlate demonstrative reflects grammaticalization into a default, unmarked setting, rather than signaling true deixis.

It is worth noting that the involvement of such a demonstrative in left dislocation is not unique to Hungarian; the German counterpart similarly employs a distance-neutral demonstrative element, *den* in (47):[26]

(47) *Den* *Hans,* *den* *mag* *jeder.* (German)
the.ACC Hans DEM.ACC likes everyone
‘Hans, everyone likes him.’ (Shaer 2009: 369)

Additionally, it needs be noted that in Hungarian left dislocation, proximal forms are only permitted when the host element already carries a corresponding proximal specification:

[26] On the distance-neutral nature of the German demonstrative in question, see Buchholz & von Heusinger (2024: 2).

(48) a. *A filmet, {az-t / #ezt} szeretem.*
the film-ACC that-ACC this-ACC like.1SG
'The film, I like (it).

b. *Ez-t a filmet, {az-t / ez-t} szeretem.*
this-ACC the film-ACC that-ACC this-ACC like.1SG
'This film, I like (it).'

The deictic mismatch in (49b) clearly indicates that the demonstrative *az* used there is an instance of az_4 'that$_4$'. In contrast, the *az* in (49a) could be interpreted as either az_1 or az_4. The proximal form ez_1 'this$_1$' is not licensed in (49a) due to the general dispreference for proximal forms in discourse-related deixis, as noted earlier in Section 4.2.

Compared to clausal association, left dislocation appears to exhibit an even stronger preference for distal forms. While, under our account, general cognitive prominence can license ez_3 as a clausal correlate, as illustrated in (30b) and (31b), ez_1 'this$_1$' is only acceptable in (48) when proximity is explicitly encoded in the grammatical environment.

6 Conclusions

In this paper we developed an LFG analysis of three Hungarian constructions containing a demonstrative element that appears to be the same as the canonical demonstrative pronoun. Our key assumption is that the demonstrative elements in these constructions are special, grammaticalized versions of the canonical pronoun with partially different feature sets. We claim that this variation in the synchronic system is a result of different historical paths of grammaticalization, possibly not only involving feature loss or feature change but also the emergence of a new feature. Below in (49) we repeat the lexical forms of the ordinary pronoun and the three grammaticalized variants.

(49) a. ordinary demonstrative pronoun
az_1, D
(↑ PRED) = 'PRO'
(↑ DEF) = +
(↑ DEICTIC) = +
(↑ PROXIMAL) = −
(↑ PERS) = 3
(↑ NUM) = SG

b. adnominal demonstrative
az_2, D
~~(↑ PRED) = 'PRO'~~
(↑ DEF) = +
(↑ DEICTIC) = +
(↑ PROXIMAL) = −
(↑ PERS) = 3
(↑ NUM) = SG
(↑ CHECK _ART) $=_c$ +

c. clausal correlate
az_3, D
(↑ PRED) = 'PRO'
(↑ DEF) = +
(↑ DEICTIC) = +
(↑ PROXIMAL) = −
(↑ PERS) = 3
(↑ NUM) = SG
(↑ RESTR TYPE) $=_c$ PROP

d. topic LD correlate
az_4, D
(↑ PRED) = 'PRO'
(↑ DEF) = +
(↑ DEICTIC) = +
~~(↑ PROXIMAL) = −~~
~~(↑ PERS) = 3~~
~~(↑ NUM) = SG~~

References

Alberti, Gábor & Judit Farkas. 2018. Characterization. In Gábor Alberti & Tibor Laczkó (eds.), *Syntax of Hungarian: Nouns and noun phrases*, vol. 1, 5–151. Amsterdam: Amsterdam University Press. http://www.jstor.org/stable/j.ctv2x00w8v

Bartos, Huba. 2000. Az inflexiós jelenségek szintaktikai háttere. In Ferenc Kiefer (ed.), *Strukturális magyar nyelvtan 3. Morfológia,* 653–762. Budapest: Akadémiai Kiadó. https://doi.org/10.1556/9789634540533

Berman, Judith, Stefanie Dipper, Christian Fortmann & Jonas Kuhn. 1998. Argument clauses and correlative es in German – Deriving discourse properties in a unification analysis. In Miriam Butt & Tracy H. King (eds.), *Proceedings of the LFG'98 Conference*. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG3-1998/lfg98bermanetal.pdf

Booth, Hannah & Miriam Butt. 2023. LFG and historical linguistics. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 905–960. Berlin: Language Science Press. 10.5281/zenodo.10037797

Börjars, Kersti & Nigel Vincent. 2017. Lexical-Functional Grammar. In Adam Ledgeway & Ian Roberts (eds.), *The Cambridge handbook of historical syntax*, 642–663. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781107279070

Buchholz, Timo & Klaus von Heusinger. 2024. German demonstrative pronouns differ in their sensitivity to discourse and sentence topics. *Frontiers in communication* 9, 1–18. https://doi.org/10.1515/tlr-2022-2107

Butt, Miriam. 2014. Questions and information structure in Urdu/Hindi. In Miriam Butt & Tracy H. King (eds.), *Proceedings of the LFG'14 Conference*, 158–178. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/19/papers/lfg14butt.pdf

Dalrymple, Mary & Helge Lødrup. 2000. The grammatical functions of complement clauses. In Miriam Butt & Tracy H. King (eds.), *Proceedings of the LFG'00 Conference*, 104–121. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2000/pdfs/lfg00dalrympl-lodrup.pdf

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001

Dékány, Éva. 2021. *The Hungarian nominal functional sequence.* Cham: Springer-Verlag. https://doi.org/10.1007/978-3-030-63441-4

Diessel, Holger. 1999. *Demonstratives*. John Benjamins Publishing Company. Amsterdam/ Philadelphia. https://doi.org/10.1075/tsl.42

Egedi, Barbara. 2014. The DP-cycle in Hungarian and the functional extension of the noun phrase. In Katalin É. Kiss (eds.). *The Evolution of Functional Left Peripheries in Hungarian Syntax*, 56–82. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198709855.003.0003

Egedi, Barbara. 2025. Demonstrative modifiers in Middle Hungarian. A complex picture of renewal. *Journal of Historical Linguistics*, 1–23. https://doi.org/10.1075/jhl.24019.ege (online first)

É. Kiss, Katalin. 2023. From relative proadverb to declarative complementizer: The evolution of the Hungarian *hogy* 'that'. *The Linguistic Review* 40(1), 107–130. https://doi.org/10.1515/tlr-2022-2107

É. Kiss, Katalin. 1998. Mondattan. In Katalin É. Kiss, Ferenc Kiefer & Péter Siptár (eds.), *Új magyar nyelvtan*, 15–184. Budapest: Osiris Kiadó. https://search.worldcat.org/title/909093995

Gugán, Katalin, Enikő Bácsi, Adrienne Dömötör, László Horváth, Zsuzsanna Mohay, Mónika Varga & Bálint Sass. 2023. *Középmagyar emlékirat-és drámakorpusz*. [Corpus of Middle Hungarian Memoires and Dramas]. https://ked.nytud.hu/

Kenesei, István. 1994. Subordinate clauses. In Ferenc Kiefer & Katalin É. Kiss (eds.): *The syntactic structure of Hungarian. Syntax and semantics 27.* New York, Academic Press, 275–354. https://real.mtak.hu/136850/

Laczkó, Tibor. 2021. *Lexicalising clausal syntax: The interaction of syntax, the lexicon and information structure in Hungarian*. Amsterdam: John Benjamins Publishing Company.

Laczkó, Tibor. 2022. Arguments for argument structure for a Hungarian pronoun in clausal complementation. In Miriam Butt, Tracy H. King, & Ida Toivonen (eds.), *Proceedings of the LFG'22 Conference.* 183–202. PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/22

Laczkó, Tibor & György Rákosi. 2011. On particularly predicative particles in Hungarian. In Miriam Butt & Tracy Holloway King. (eds.), *Proceedings of the LFG'11 Conference*. Stanford, CA: CSLI Publications, 299–319. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/16/papers/lfg11laczkorakosi.pdf

Lambrecht, Knud. 1994. *Information structure and sentence form: Topic, focus, and the mental representations of discourse referents*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511620607

Lipták, Anikó. 2011. The structure of the topic field in Hungarian. In Paola Beninca & Nicola Munaro (eds.), *Mapping the left periphery*, 163-198. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199740376.003.0006

Lowe, John J. 2015. Degrees of degrammaticalization: A lexical sharing approach to the English possessive. In Miriam Butt & Tracy H. King (eds.), *Proceedings of the LFG'15 conference*, 208–228. Stanford: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/20/papers/lfg15lowe.pdf

Oravecz, Csaba, Tamás Váradi, Bálint Sass. 2014. The Hungarian Gigaword Corpus. In *Proceedings of LREC 2014*. http://mnsz.nytud.hu/index_eng.html

McCloskey, James. 1991. *There*, *it*, and agreement. *Linguistic Inquiry* 22, 563–567. https://www.jstor.org/stable/4178736

Sadler, Louisa & Rachel Nordlinger. 2009. Nominal juxtaposition in Australian languages: An LFG analysis. *Journal of Linguistics* 46 (2), 415–452. https://doi.org/10.1017/S002222670999020X

Shaer, Benjamin. 2009. German and English left-peripheral elements and the orphan analysis of non-integration. In Benjamin Shaer, Philippa Cook, Werner Frey & Claudia Maienborn (eds.), *Dislocated elements in discourse: Syntactic, semantic and pragmatic perspectives*, 366–397. New York: Routledge. https://doi.org/10.4324/9780203929247

Simon, Eszter. 2014. Corpus building from Old Hungarian codices. In Katalin É. Kiss (ed.)*, The evolution of functional left peripheries in Hungarian syntax. Oxford Studies in Diachronic and Historical Linguistics*, 224–236. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198709855.001.0001

Szűcs, Péter. 2015. On pronouns in Hungarian complex sentences. *Argumentum* 11, 292–313. https://argumentum.unideb.hu/2015-anyagok/szucsp.pdf

Szűcs, Péter. 2019. Left dislocation in Hungarian. In Miriam Butt, Tracy H. King, & Ida Toivonen (eds.), *Proceedings of the LFG'19 Conference*, 293–313. Stanford, CA: CSLI Publications. web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG-2019/lfg2019-szucs.pdf

Szűcs, Péter. 2022. Constructions with propositional proforms. In Miriam Butt, Tracy H. King, & Ida Toivonen (eds.), *Proceedings of the LFG'22 Conference,* 345–364. PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/8/14

Szűcs, Péter. 2024. In defense of a COMP-less approach to Hungarian finite clauses. In Miriam Butt, Jamie Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 244–263. PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/50/48

Szűcs, Péter. 2024. Predicative and argumental demonstratives as clausal proforms in Hungarian. In Markéta Janebová et al. (eds.), *Language use and linguistic structure: Proceedings of the Olomouc Linguistics Colloquium 2023*, 138–150. Olomouc: Palacký University Olomouc. https://doi.org/10.5507/ff.24.24465081

Tizón-Couto, David. 2015. A corpus-based account of left-detached items in the recent history of English: Left dislocation vs. left detached-sequences. *English Text Construction* 8(1), 21–64. https://doi.org/10.1075/etc.8.1.02tiz?locatt=mode:legacy

Toivonen, Ida. 2023. Pronoun incorporation. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 563–601. Berlin: Language Science Press.

Vincent, Nigel. 2001. LFG as a model of syntactic change. In Miriam Butt & Tracy H. King (eds.), *Time over matter: Diachronic perspectives on morphosytax*, 1–42. Stanford: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/site/1575862824.shtml

The prosody of Hungarian complex noun phrases in focus

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Abstract

This paper analyses Hungarian complex noun phrases with varying focus patterns. The results of a production study on different focus conditions show that the assumption of a main focus accent on the first syllable of the comment with following deaccentuation might be too simplistic to capture the prosodic patterns of focus in Hungarian complex NPs. The paper provides a new analysis of the different accents, their shapes, and their possible combinations at the prosody-syntax interface in LFG.

1 Introduction

Hungarian is a discourse-configurational language with designated syntactic positions for topic and focus: Topics occur sentence-initially, while focused elements are typically placed in the preverbal position (see, e.g., É. Kiss 1995, 2002). If a verbal modifier (VM, cf. Laczkó 2023) is present, the VM is placed in the immediately preverbal position, unless a focused element occurs, in which case the VM follows the verb. The inverted order of the verb and the VM is thus a clear indicator of a filled focus position. In example (1), *János* 'John' occupies the topic position, and in (2) the focus position where the particle *el* 'away' occurs after the verb *ment* 'went'.

(1)	János el-ment. John away.VM-went. 'John went away.'	(2)	János ment el. John went away.VM 'It was John who went away.'

(É. Kiss 1995: 213, glossing adapted)

Previous research showed that in a non-neutral Hungarian sentence, that is, a sentence with a filled focus position as in (2), the main accent of the sentence falls on the first element of the comment (or 'essential section') of the sentence (see, e.g., Kálmán et al. 1986, Varga 2002)[1]. This focus accent, which is expressed by a high tone on the first syllable followed by a sharp fall in pitch, is typically described as an 'eradicating stress', deaccenting any postfocal elements (unless another focused element occurs, see, e.g., Kálmán et al. 1986, Varga 2002). The first element in the comment receiving the accent often coincides with the syntactic focus position, but can also be, for example, a quantifier occupying the quantifier position between the topic and the focus position (see, e.g. Kálmán et al. 1986). However, in her work on (multiple) question words, quantifiers, and negation, Mycock (2010) shows that it is not necessarily the leftmost scope operator that receives main stress, but the one with the widest scope (c.f. Hunyadi 2002).

There are multiple syntax-prosody mapping approaches proposed for Hungarian that are concerned with the sentence level, among them Mycock (2010) for LFG (for non-LFG approaches see Vogel & Kenesei 1987; É. Kiss 2002, 2009; Hamlaoui & Szendrői 2015, 2017). However, there is hardly any work on the phrase level which requires an analysis of prosodic patterns beyond the discourse-configurational expectations: For a complex NP occupying the syntactic focus position, the main accent should still fall on this position, but the exact prosodic pattern inside the NP might differ depending on whether the whole NP or only subparts (e.g. only the noun) are focused.

[1]Following, for example, É. Kiss 2002, we will use the division of sentences into (sentence initial) topic(s) and the comment (all elements behind the topic).

In this paper, we look at complex noun phrases with varying focus patterns. We show that Hungarian focus prosody on the phrase level cannot be (fully) explained by the assumption of a main focus accent on the first syllable of the comment with following deaccentuation but that a pure description in terms of scope operators is also not sufficient. We present the characteristic pitch patterns within the complex NP in different focus conditions that were identified by Langer & Kügler (2021) and Langer (in prep.) and provide a new analysis at the interface proposed in Bögel (2015), which takes the different accents, their shape, and their combinations into account.

2 Production study

Even though the syntactic focus marking is a crucial feature of Hungarian, there are cases where it does not suffice to disambiguate between multiple possible interpretations of a sentence. One of these cases occurs when the focus position is filled with a complex modified noun phrase (NP). In a sentence like (3), where the complex NP *a híres zenészt* 'the famous musician-ACC' occupies the syntactic focus position, the focus can be on the whole NP (NPF) or a narrowly focused subpart of the NP, such as the adjective (AF) or the noun (NF). Thus, the sentence in (3) can be the answer to each of the questions under discussion (QUD; Roberts 1996) given in (3a)-(3c).[2]

(3) **A híres zenész-t** tüntette ki a polgármester.
the famous musician-ACC honored VPRT the mayor
'The mayor honored [the famous musician]$^{\text{Syntactic Focus}}$'

a. Which musician did the mayor honor? [AF: narrow adjective focus]

b. Which famous person did the mayor honor? [NF: narrow noun focus]

c. Who did the mayor honor? [NPF: broad focus on the whole NP]

This ambiguity of focus cannot be disambiguated by syntactic means, because a definite NP cannot be split to only place a focused subpart into the syntactic focus position (Jánosi 2014). Instead, prosody is said to disambiguate (at least some of) the possible focus conditions. According to Dékány & Csirmaz (2018), the default main accent falls on the left edge of the NP (excluding determiners) and, thus, both AF and NPF would have a single falling accent on the adjective. If there are later foci in a syntactically focused NP, as in the NF condition, 'the stress is shifted [to the focused element], but the word order does not change' (Dékány & Csirmaz 2018: 1065).

[2]Following Krifka (2008) (see Langer in prep. for the discussion), we assume that the focused constituent is a choice from a set of alternatives, in this case two. In line with Krifka, we use the terms 'narrow' and 'broad' focus as relational terms: the smallest relevant focus domain in our analysis, that is, focus on a single word, will be called 'narrow' focus, and focus on the whole NP will be called 'broad(er)' focus. This definition is roughly the same as the one discussed in Mycock & Lowe (2013) in that narrow focus assumes an approximate identity between focus extent and focus exponent, while the focus extent is larger than the exponent in broad focus. All three foci in example (3) would commonly be called 'contrastive', that is, +new and +prominent in Choi (1996)'s system, but since this paper does not discuss information structure or the difference between types of foci per se, we only indicate the focused predicate and the focus-type (narrow or broad) in our analyses (see Figure 10). See, e.g., Mycock (2006) or O'Connor (2004) for more detailed proposals discussing prosody and information structure.

In order to empirically test Dékány & Csirmaz's (2018) claims, and, thereby, investigate whether prosodic means can be used to disambiguate these syntactic ambiguities, Langer & Kügler (2021) conducted a production study (expanded in Langer in prep.), analyzing the prosodic patterns of Hungarian sentences such as the one in (3). In the following sections, we will briefly summarize their methods and results.

2.1 Methods

The production experiment tested sentences with complex NPs occupying the syntactic focus position. Each sentence consisted of the target NP (a noun modified by a single adjective), a particle verb to unambiguously mark the NP as syntactically focused, and at least one postverbal NP. The sentences were embedded into contexts eliciting the different possible focus domains (narrow adjective focus (AF), narrow noun focus (NF), or broad NP focus (NPF)) in the target sentence, which was syntactically identical between focus conditions. Each context ended in a question that the target sentence was the answer to. Example contexts for the sentence in (3) are given in (4), eliciting narrow adjective focus, (5), eliciting narrow noun focus, and (6), eliciting broad NP focus:

(4) AF: *A Balaton melletti kisvárosban minden évben megrendendezésre kerül a díjkiosztó gála, ahol a polgármester ünnepélyes keretek között adja át egy tehetséges polgárnak a kitüntetést. Ebben az évben* ***egy híres zenészt*** *és* ***egy fiatal zenészt*** *jelöltek a dírja. Melyik zenészt tüntette ki a polgármester?*
'In a small town next to Lake Balaton, every year, a prize-winning gala is organized, where the mayor ceremoniously presents the award to a talented citizen. This year, **a famous musician** and **a young musician** were nominated for the prize. Which musician did the mayor honor?'

(5) NF: *... Ebben az évben* ***egy híres zenészt*** *és* ***egy híres festőt*** *jelöltek a díjra. Melyik híres művészt tüntette ki a polgármester?*
'... This year, **a famous musician** and **a famous painter** were nominated for the price. Which famous artist did the mayor honor?'

(6) NPF: *... Ebben az évben* ***egy híres zenészt*** *és* ***egy szorgalmas diákot*** *jelöltek a díjra. Kit tüntette ki a polgármester?*
'... This year, **a famous musician** and **a hardworking student** were nominated for the price. Who did the mayor honor?' (Langer in prep.)

During the experiment, the contexts were presented in randomized order in both written form on a screen and as pre-recorded audio files to twenty native speakers of (standard) Hungarian (18-72 years, ∅ 35,8; 4 males/16 females). Their task was to answer the question at the end of the context with the visually presented target sentence 'as naturally as possible'. The participants were recorded in a quiet environment at home using a handheld Zoom H4n Pro recorder and a Rode Lavalier condenser microphone.

2.2 Analysis

After annotating words, syllables and vowels in Praat (Boersma & Weenink 2025), Langer & Kügler (Langer & Kügler 2021, Langer in prep.) measured f0 maxima and minima inside the vowels for (i) a categorical analysis of contour types (falling, rising, plateau) per word and (ii) gradual analyses of height and position of maxima/minima as well as slopes of falling and rising contours. Additionally, they extracted pitch at ten points per syllable in the target NP used for contour comparisons in generalized additive mixed models, and marked non-modal voiced syllables. For all pitch related analyses, f0 was converted into semitones with speaker dependent baselines to reduce the influence of inter-speaker variation. Langer & Kügler also investigated intensity contours and the duration of syllables. However, these analyses showed no significant results and will thus not be discussed in the present paper. Figure 1 shows a schematic representation of the pitch-related measurement points.

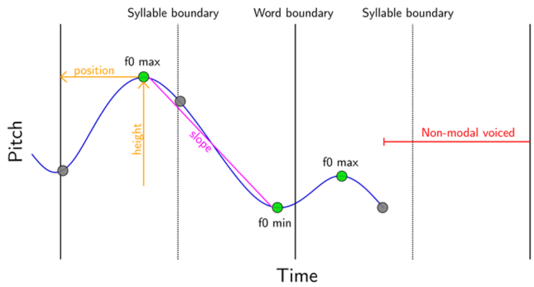

Figure 1: Schematic representation of the pitch-related measurement points inside the target NP (excluding the determiner) (Langer in prep.)

2.3 Results

Figure 2 shows the waveform of one of the utterances produced in the experiment. This sentence was uttered in AF, that is in the condition eliciting focus on the adjective *híres* ('famous'), by a female speaker. The speaker produced falling contours on both parts of the NP and deaccentuation (on the verb) or creaky voice on every word following the syntactic focus position. This pattern of deaccentuation/non-modal voice starting at the verb until the end of the sentence was found in every target sentence irrespective of speaker or focus condition. Consequently, differences between focus conditions are only investigated inside the target NP that occupies the syntactic focus position.

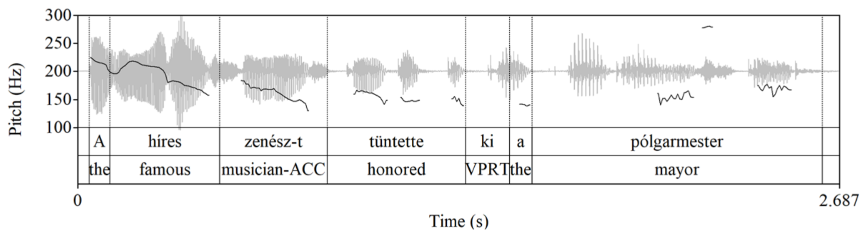

Figure 2: Waveform, pitch track and associated annotation layer of sentence (3) produced in the AF condition; VPRT = VM (Langer in prep.)

For an initial investigation, Langer & Kügler (Langer & Kügler 2021, Langer in prep.) used generalized additive mixed models (GAMMs) that assume non-linear relations between predictor variable(s) (time) and a response variable (pitch). The GAMMs were used to visualize the mean-pitch trajectories of the three focus conditions (Figure 3) and to calculate windows of significant differences between these trajectories.

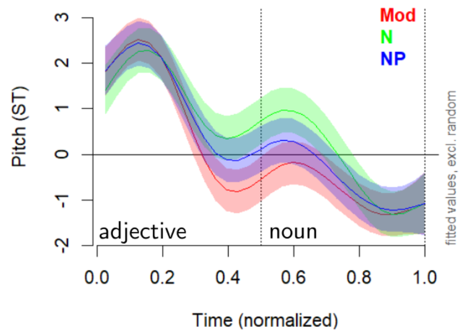

Figure 3: Generalized additive mixed model for the three mean-f0 trajectories (in semitones) per focus condition based on ten equidistant measurement points per syllable (Mod = AF; N = NF; NP = NPF) (Langer in prep.)

The results showed that the highest prosodic prominence was always at the beginning of the adjective.[3] Significant differences were found for the second part of the adjective and the first part of the noun: The adjective ends lower in the AF condition compared to the NF condition, and the noun starts higher in the NF condition compared to the two other focus conditions. The GAMM found no significant differences between the narrow AF and the broad NPF.

Since the GAMM compares the means of all data points, differences between conditions can be influenced by both categorical and gradual differences. For example, the mean-f0 trajectory on the adjective might end lower when it is narrowly focused (AF) because of a higher number of falling contours in this condition as opposed to more prefocal rising contours in NF. However, it could also be the case that the adjective is always produced with a falling contour, but this contour falls steeper in narrow AF compared to the other focus conditions. To disentangle these categorical and gradual effects, both were investigated further.

For the categorical analysis, Langer & Kügler (see Langer in prep. for the detailed analysis) calculated contour types per word based on the f0 minima and maxima. They took one semitone as the threshold for a 'just noticeable difference' between minima and maxima, classifying everything below as a plateau contour. If the difference was at least one semitone, the contour was classified as rising or falling depending on the direction of the difference. Table 1 shows the distribution of contour types per focus condition on the adjective and the noun.

Contours on the adjective				Contours on the noun			
Focus	Fall	Plateau	Rise	Focus	Fall	Plateau	Rise
A	92	3	5	A	58	31	11
N	72	9	19	N	82	9	9
NP	79	7	14	NP	75	14	11
Total	81%	6.3%	12.7%	Total	71.7%	18%	10.3%

Table 1: Distribution (counts = percentages) of contour types on the adjective (left) and the noun (right) per focus condition (Langer in prep.)

[3]The determiners were excluded as they were always unaccented and often very short or even omitted (see, also, Dékány & Csirmaz 2018).

A chi-square test found significant correlations between focus and contours type on both words (adjective: X-squared = 13.438, df = 4, p-value < 0.05; noun: X-squared = 19.287, df = 4, p-value < 0.05). As the correlation plots in Figure 4 show, there is a strong correlation between rising contours in narrow NF and a strong anticorrelation between rising contours and narrow AF.

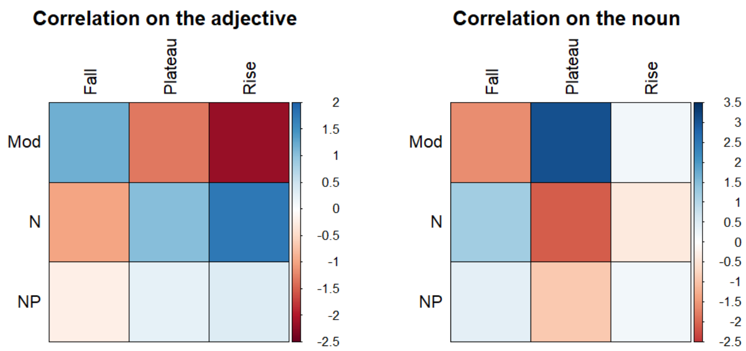

Figure 4: Correlation plots for the correlations (blue) and anticorrelations (red) between focus condition and contour type on the adjective (left) and the noun (right); darker color indicates a stronger (anti)correlation; Mod = A (Langer in prep.)

On the noun, AF correlates with plateau contours. This means that there are (i) more rising contours and less falling contours on the adjective if it is prefocal (narrow focus on the noun) than if it is narrow focused, and (ii) more plateau contours on the noun if it is postfocal (narrow focus on the adjective). Still, both the adjective and the noun are most often produced with falling contours. Thus, for the gradual anlysis, Langer & Kügler investigated the slope of falling contours (visualized in Figure 5).

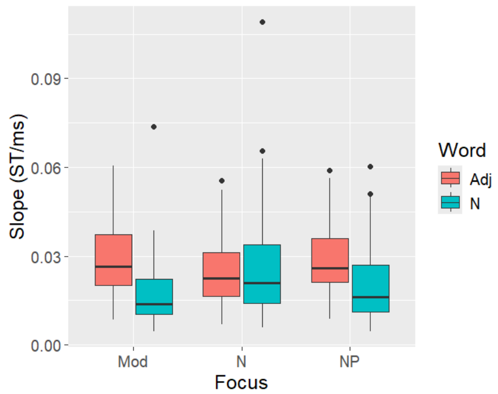

Figure 5: Slope of falling contours per word per focus condition (Langer in prep.)

The ANOVA found a significant effect of word (df = 1, f = 26.18, p < 0.05), and the interaction of word and focus (df = 2, f = 10.08, p < 0.05). Focus alone was not significant (df = 2, f = 0.22, p = 0.8). The post-hoc Tukey-HSD test found a syntagmatic effect in both AF and broad NPF: the slope on the adjective was significantly steeper than on the noun (p < 0.05 for both comparisons). In the paradigmatic comparison, the only significant difference was on the noun: It was significantly steeper in narrow NF compared to narrow AF (p < 0.05). This means that falling contours on the adjective were equally strong in each focus condition, while the strength on the noun differed: it was significantly stronger if the noun was narrowly focused than if it was postfocal (narrow focus on the adjective), with the broad focus realisation not differing from either and thus being produced ‘in between’ the other two.

Of course all these analyses show the overall results across all 20 speakers that might obscure relevant inter- and intra-speaker variation. For example, it might be the case that some speakers use other prosodic cues such as intensity or voice quality for focus marking. Therefore, an in-depth analysis of the variation is planned. Still, the data show strong evidence for pitch-related cues to be relevant in the marking of focus in Hungarian. In the next section, we will thus present the phonological abstractions that Langer & Kügler conclude based on the statistically significant phonetic differences described here.

2.4 Discussion

The categorical analysis presented above found (i) more rising contours on the adjective in NF and (ii) more plateau contours on the noun in AF. Langer & Kügler (2021) and Langer (in prep.) analyze these findings as a reduction of the prefocal prominence in NF and reduction or deletion of accents on the noun in AF. Still, falling contours are the most common contour type on both word categories in all focus conditions. Especially the adjective shows a strong preference for falling contours irrespective of focus condition (81% of the data). A closer investigation found that only half of the speakers use rising contours on the adjective in NF and NPF, and that even those speakers do not do so consistently (at most 50% of the NF/NPF data points). Langer & Kügler (2021) and Langer (in prep.) therefore conclude that the ‘default’ pattern of NP accentuation includes a falling contour on the adjective irrespective of focus condition, while the cases with rising (or plateau) contours on the adjective are an alternative pattern, in which the adjective gets reduced to enhance the prominence on the noun. This alternative pattern needs to be investigated further (see, e.g., the discussion in Langer in prep.).

The slope analysis found no significant differences between falling contours on the adjective (paradigmatic comparison) and between contours on the adjective and a following narrow focused noun (syntagmatic comparison). Langer & Kügler thus conclude that accents on the left edge and accents on narrowly focused elements are equally strong.[4] On the noun, the slope analysis found a significant paradigmatic difference between narrow NF and narrow AF: The falling contours were steeper in NF than in AF. Together with the higher number of plateau contours on the noun in AF, Langer & Kügler take this as an argument for a reduced (or deleted) accent on post-focal words (similar to post-focal accentuation on the sentence level, see, for example, Kálmán et al. (1986), Varga (2002)). Since there is no significant difference on the noun between NPF and the other two focus conditions, Langer & Kügler (2021) conclude that it is produced with neither a strong (as in NF) nor a reduced accent (as in AF).

[4]This might be counter-intuitive as narrow foci are often made more prominent than other parts of the utterance, which is true for the alternative pattern mentioned above in which the prominence on the adjective is reduced.

Following these considerations, Langer & Kügler (2021) and Langer (in prep.) suggest a three-way distinction of accent types in complex NPs occupying the syntactic focus position:

- a *neutral accent* on words that are part of a broad(er) focus domain (O)
- an *enhanced accent* on the left edge of the phrase containing the focus & on narrowly focused words (+)
- a *reduced/deleted accent* on post-focal words (–)

Figure 6 summarizes the 'default' prosodic patterns found by Langer & Kügler for accentuation in complex NPs. In all three conditions, the highest prosodic prominence was found at the left edge of the syntactic focus position, that is, the first syllable of the adjective. Significant differences between the three focus conditions are found on the noun: The accent (second black line) is boosted in relation to broad focus if the noun is narrowly focused, and reduced if it is postfocal, that is, in the adjective focus condition.

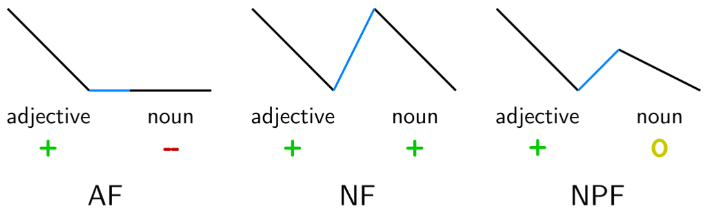

Figure 6: Schematic representation of the prosodic patterns of narrow adjective (AF), narrow noun (NF) and broad (NPF) focus in the NP (Langer in prep., added symbols for accent type)

Similar to the claims made in the literature (see, e.g., Dékány & Csirmaz 2018), the narrowly focused element always bears a strong (falling) accent, and all elements after the syntactic focus position are deaccented. The found patterns digress, however, in two ways: First, AF and NPF are not identical. Instead, the expected deaccentuation on the noun was only found in AF. Second, contrary to the claims, there is an accent on the adjective irrespective of the focus condition, that is, even if the noun is narrowly focused. Langer & Kügler conclude that, in the default pattern, there is an obligatory left-edge accentuation in the NP occupying the syntactic focus position, post-focal deaccentuation (on the noun in AF) and focal 'boosting' of later narrowly focused elements (the noun in NF, see Féry & Ishihara 2010 for the notion of 'boosting by focus'). This pattern can neither be fully explained by assuming only an eradicating stress on the first syllable of the focus, nor by the scope-stress correspondence proposed by, for example, Mycock (2010) for focus on the sentence level.

3 LFG analysis

We adopt the syntactic structure proposed by Laczkó (2014), who assumes that VMs and focused constituents (here: the complex NP) both occur in Spec, VP, the former in neutral, and the latter in non-neutral sentences (see Börjars et al. 1999, Gazdik 2012 for other approaches; Laczkó 2023 for an overview). Figure 7 shows the c-structure for the VP of example (3), where the focused constituent is in the preverbal (VP-Spec) position.

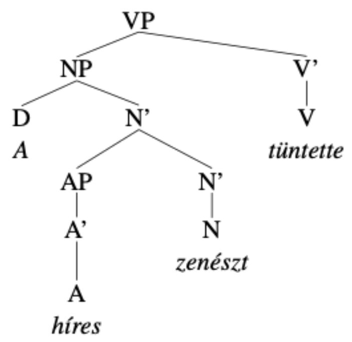

Figure 7: C-structure for the VP of example (3).

The results of the production experiment described in Section 2 and illustrated in Figure 6 show that the left edge of the comment always seems to receive a main accent (possibly a phrase accent), which often coincides with the focus accent. However, as the pattern for the narrow noun focus shows, this is not always the case. In order to identify the correct focus position, reference to p-structure is thus crucial.

In this paper, we follow the approach to the prosody-syntax interface proposed in Bögel (2015) and illustrated in Figure 8.

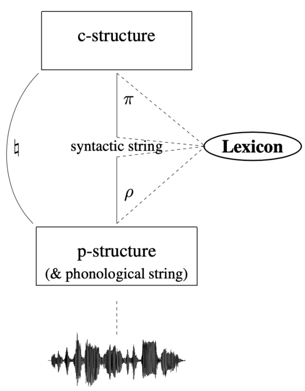

Figure 8: The syntax–prosody interface (Bögel 2015)

Two transfer processes regulate the exchange of information at the interface. The *transfer of structure* (♮) exchanges information on syntactic and prosodic grouping and on intonation, while the *transfer of vocabulary* (ρ) associates morphosyntactic and phonological information of lexical elements and projects them to their respective structures. P-structure is represented by the p-diagram (see below in Figure 9), the underlying representation of the speech signal itself.

The approach distinguishes two views on the interface: Production, which describes the transfer of information from syntax/c-structure to prosody/p-structure, and comprehension, which takes the speech signal as a starting point and exchanges information from prosody to syntax (see Bögel (2023) for a detailed discussion). With regard to the question how focus interpretation is associated to the distribution of prosodic events in a complex NP in Hungarian, the paper will assume comprehension, that is, going from the speech signal to p-structure to c-structure.

In our analysis of the prosodic structure of complex NPs, we rely on the combination of accent and accent shape proposed in Bögel & Zhao (2025), where both accent and shape can be recorded in one representation. Table 2 illustrates how each level of L or H is characterized by a particular height and shape of the slope leading to it (*lead*) and following it (*tail*).

Cat.	Max/Min	lead	tail
H4/L4	Max/Min	steep	steep
H3/L3	Max/Min	steep	flat
H2/L2	Max/Min	flat	steep
H1/L1	Max/Min	normal	flat

Table 2: Tone and slope system from Bögel & Zhao (2025: 19)

H4 and L4 thus represent accents where the lead and the tail show a strong rise and fall respectively, while H1 and L1 are relatively flat. L2/L3 and H2/H3 are the accents between these two extremes, with each having a different combination of slopes. In contrast to the less fine-grained traditional ToBI annotations (Silverman et al. 1992), these accents include both the scale and the shape of the pitch accent in question, which allows for a distinction between the two accents on the noun in the NPF and NF condition (see Figure 6). H4 can thus be used to represent the boosted (main) accent generally found on the left edge of the comment or the narrow focused element in the AF and NF condition, and H1 would represent the 'neutral' accent on the noun in the broad NPF condition. Postfocal deaccentuation is signalled by retaining a low pitch L.[5] The following Table 2 illustrates the three possible combinations.[6]

Comment		
Adjective	*Noun*	*Condition*
H4	L	AF
H4	H4	NF
H4	H1	NPF

Table 3: Constraining accent combinations for narrow (AF/NF) and broad focus (NPF)

P-structure is represented by the p-diagram, a linear representation of the speech signal

[5]These accent combinations are based on the default patterns established in Section 2.

[6]The description of gradient pitch movement in a speech signal as categorical accents in p-structure points to one of the main problems at the interface between phonetics and phonology: How can one determine a threshold and is setting a threshold justified? We will not be able to resolve this issue here. The threshold values used in this paper are based on the statistical levels; any signal with pitch accents values below this level cannot be uniquely identified. To indicate probabilities (here, for example, NPF is the most probable version if there are no prosodic indicators) Optimality Theory style constraints (Frank et al. 1998; Bögel 2020) could be used.

in syllables over time. Figure 9 shows the p-diagram of a sentence in the NF-condition during comprehension, that is, the answer to the question in (3b), eliciting narrow focus on the noun *zenész-t* [zɛne:st] ‘musician’.

TONE	...	H4	...	H4	...	...	...	
FUND. FREQ.	176	199	179	198	144	145	143	149
SEGMENTS	[ɒ]	[hi:]	[rɛʃ]	[zɛ]	[ne:st]	[tʏn]	[tɛ]	[tɛ]
VECTORINDEX	$\mathbf{S_1}$	$\mathbf{S_2}$	$\mathbf{S_3}$	$\mathbf{S_4}$	$\mathbf{S_5}$	$\mathbf{S_6}$	$\mathbf{S_7}$	$\mathbf{S_8}$

Figure 9: p-diagram of a speech signal in the NF-condition (example 3b)

In the p-diagram, each syllable vector is associated with a number of values related to attributes like SEGMENTS or FUNDAMENTAL FREQUENCY. During comprehension, these values are directly taken over from the speech signal. However, in order to establish the focus structure of the complex NP, the analysis is dependent on the exact determination of categorical tone distributions in the p-diagram. The calculation of tones can be accomplished by means of the fundamental frequency values associated with each syllable vector. In Figure 9, for example, the strong rises and falls in fundamental frequency on vectors S_2 and S_4 are interpreted as H4 accents on the first syllables of the adjective and the noun, respectively.[7] As illustrated in Table 3, this is the combination indicating that there is a narrow focus accent on the noun. However, before this information can be processed in a meaningful way, the signal has to be syntactically parsed.

3.1 The transfer of vocabulary

As part of the information exchange at the interface, the transfer of vocabulary matches the incoming segments against the p-forms of the lexicon, that is, against abstract phonological representations of possible Hungarian words. Table 4 shows the lexical entries for the words *híres* ‘famous’ and *zenészt* ‘musician’.

concept	s-form				p-form	
FAMOUS	*híres*	A	(↑ PRED)	= ‘híres’	SEGMENTS	/h i: r ɛ ʃ/
			...		METR. FRAME	$('\sigma\sigma)_\omega$
MUSICIAN	*zenészt*	N	(↑ PRED)	= ‘zenészt’	SEGMENTS	/z ɛ n e: s t/
			(↑ PERS)	= 3	METR. FRAME	$('\sigma\sigma)_\omega$

Table 4: Lexical entries for *híres* ‘famous’ and *zenészt* ‘musician’

Following Levelt et al. (1999), the lexicon distinguishes between different dimensions for each lexical item: An abstract concept, which contains semantic information, a s(yntactic)-form, which includes the morpho-syntactic information associated with each item, and the p(honological)-form which contains information on the segments and the metrical frame for each lexical item. For example, for *zenészt*, the lexicon includes the

[7]Note that while the p-diagram only shows the mean fundamental frequency as a way to represent coarse-grained pitch movement, tones are calculated based on a more fine-grained analysis and by using semitones to account for speaker differences (see Bögel & Zhao (2025) for a detailed description).

abstract notion of MUSICIAN, the morphosyntactic information of *zenészt* being a noun and third person (with further attributes not shown here), and the phonological information on segments and that *zenészt* is a prosodic word consisting of two syllables, with stress on the first syllable.

During comprehension p-structure matches the information against the p-form section of the lexicon. Once a match has been made, the associated morphosyntactic information becomes available as well and a syntactic string can be formed. This s-string then serves as the input to c- and f-structure.

3.2 The transfer of structure

During the transfer of structure, information on prosodic phrasing and on intonation is exchanged at the interface between c-structure and p-structure. For the case at hand, access to the exact tone distribution within the range of the NP is crucial. In order to assign narrow focus to the noun, two conditions have to be met: There must be a H4 tone associated with the first syllable of the N-node, and a H4 accent with the first syllable of the adjective. The c-structure annotation given in (7) for the N-node provides the detailed constraints and mapping functions to p- and i-structure.

(7) c-structure annotation on N:

a. $(\natural(T(*))\ S_{min}\ \text{TONE}) =_{\mathbf{c}} \text{H4}$

b. $(\natural(T(<*))\ S_{min}\ \text{TONE}) =_{\mathbf{c}} \text{H4}$

c. $(\downarrow \text{PRED-FN}) \in (\uparrow_i \text{FOC})$

d. $(\uparrow_i \text{FOCUS-TYPE}) = \text{narrow}$

The annotation in (5a) states that for all the terminal nodes of the current node (T(*), which in this case is the predicate of N, *zenészt* ‘musician’), take the syllable with the smallest index (S_{min}; corresponds to the first syllable of the noun) in p-structure ($\natural$). For the attribute TONE, this syllable must have ($=_c$) the value H4. The annotation in (5b) is identical to (5a), except for (T($<$*)). $<$* refers to the left sister of the current node[8], in this case the adjective *híres* ‘famous’, which is required to have a H4 accent on its first syllable as well. If both constraints are met, then the noun is in focus. This information is projected to i-structure by means of the annotation in (5c) (following the proposal made in King (1997)), together with the information that this is a narrow focus (5d). Figure 10 illustrates the relevant part of the resulting i-structure representation.

$$\begin{bmatrix} \ldots & \\ \text{FOC} & \left\{ \begin{bmatrix} \text{PRED-FN} & \text{‘zenészt’} \\ \text{FOCUS-TYPE} & \text{narrow} \end{bmatrix} \right\} \\ \ldots & \end{bmatrix}$$

Figure 10: I-structure representation of a narrow noun focus on *zenészt* ‘musician’.

[8]For $<$* see (Dalrymple et al. 2019: 223), who follow Nordlinger (1998). XLE has similar notations: LS* and RS* are short for left and right sister, respectively (Crouch et al. 2022).

In contrast, for the H4 accent on the adjective to be interpreted as a narrow focus, the following noun (the right sister *>) must have an L as tone value.

(8) c-structure annotation on A:

a. $(\natural(T(*))\ S_{min}\ \text{TONE}) =_c \text{H4}$

b. $(\natural(T(*>))\ S_{min}\ \text{TONE}) =_c \text{L}$

c. $(\downarrow \text{PRED-FN}) \in (\uparrow_i \text{FOC})$

d. $(\uparrow_i \text{FOCUS-TYPE}) = \text{narrow}$

Figure 11 shows the complete analysis of a narrow noun focus during comprehension from p-structure to c-structure to i-structure.

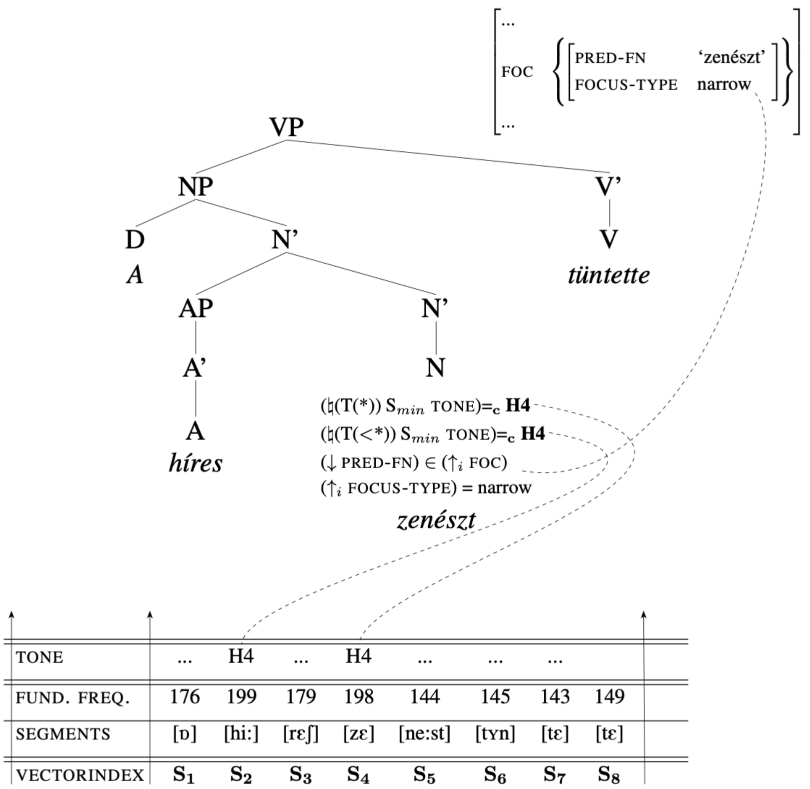

Figure 11: A narrow noun focus in the preverbal position at the prosody-syntax interface

4 Conclusion

This paper presented an analysis of different focus structures in complex NPs in the Hungarian preverbal position, namely narrow adjective focus, narrow noun focus, and broad NP focus. A production study established different accent shapes and accent combinations across the NP and provided a more detailed analysis of the eradicating stress patterns found in varying focus conditions (independently of syntactic focus position), thus adding to and extending previous analyses of Hungarian focus prosody.

The paper furthermore showed how an inclusion of these different tones and their combinations in p-structure allows for a more fine-grained analysis of focus in complex Hungarian NPs at the prosody-syntax-information structure interface in LFG.

5 References

Boersma, Paul & David Weenink. 2025. Praat: doing phonetics by computer. http://www.praat.org/.

Bögel, Tina. 2015. *The Syntax-Prosody Interface in Lexical Functional Grammar*. Konstanz. Ph.D. thesis, University of Konstanz. http://nbn-resolving.de/urn:nbn:de:bsz:352-0-403020.

Bögel, Tina. 2020. German case ambiguities at the interface: production and comprehension. In Gerrit Kentner & Joost Kremers (eds.), *Prosody in Syntactic Encoding* (Linguistische Arbeiten 573), 51–84. Berlin: De Gruyter. https://www.degruyterbrill.com/document/doi/10.1515/9783110650532/.

Bögel, Tina. 2023. Prosody and its interfaces. In Mary Dalrymple (ed.), *The Handbook of Lexical Functional Grammar*, Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10037797.

Bögel, Tina & Tianyi Zhao. 2025. From speech signal to syntactic structure: A computational implementation. *Journal of Language Modelling* 13(1). 1–42. https://doi.org/10.15398/jlm.v13i1.397.

Börjars, Kersti, Erika Chisarik & John Payne. 1999. On the justificaton for functional categories in LFG. In Miriam Butt & Tracy H. King (eds.), *Proceedings of LFG'99*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG1999/index.html.

Choi, Hye-Won. 1996. *Optimising structure in context: scrambling and information structure*. Ph.D. thesis, Stanford University. https://doi.org/10.7282/T3WH2NX2.

Crouch, Richard, Mary Dalrymple, Ronald M. Kaplan, Tracy H. King, John T. Maxwell III & Paula Newman. 2022. *XLE online documentation*. Palo Alto, CA: Palo Alto Research Center. https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/xle_toc.html.

Dalrymple, Mary, John Lowe & Louise Mycock. 2019. *The Oxford Reference Guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Dékány, Éva & Anikó Csirmaz. 2018. Numerals and quantifiers. In Gábor Alberti & Tibor Láczko (eds.), *Syntax of Hungarian: Nouns and Noun Phrases*, vol. 2, 1044–1150. Amsterdam: Amsterdam University Press. https://doi.org/10.1515/9789048532759-008.

É. Kiss, Katalin. 1995. NP movement, operator movement, and scrambling in Hungarian. In Katalin É Kiss (ed.), *Discourse Configurational Languages*, 207–243. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780195088335.003.0008.

É. Kiss, Katalin. 2002. *The Syntax of Hungarian*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511755088.

É. Kiss, Katalin. 2009. Syntactic, semantic, and prosodic factors determining the position of adverbial adjuncts. In Katalin É. Kiss (ed.), *Adverbs and Adverbial Adjuncts at the Interfaces*, 21–38. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110214802.

Féry, Caroline & Shinichiro Ishihara. 2010. How focus and givenness shape prosody. In Malte Zimmermann & Caroline Féry (eds.), *Information Structure. Theoretical, Typological, and Experimental Perspectives*, 36–65. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199570959.001.0001.

Frank, Anette, Tracy Holloway King, Jonas Kuhn & John T. Maxwell III. 1998. Optimality Theory style constraint ranking in large-scale LFG grammars. In *Proceedings of LFG'98*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG1998/index.html.

Gazdik, Anna. 2012. Towards an LFG analysis of discourse functions in Hungarian. In Ferec Kiefer & Zoltán Bánréti (eds.), *Twenty Years of Theoretical Linguistics in Budapest*, 59–92. Hungarian Academy of Sciences, Research Institute for Linguistics & Tinta Publishing House. https://archive.nytud.hu/szakcsoport/huszeves/kotet.html.

Hamlaoui, Fatima & Kriszta Szendrői. 2015. A flexible approach to the mapping of intonational phrases. *Phonology* 32(1). 79–110. https://doi.org/10.1017/S0952675715000056.

Hamlaoui, Fatima & Kriszta Szendrői. 2017. The syntax-phonology mapping of intonational phrases in complex sentences: a flexible approach. *Glossa: a journal of general linguistics* 2(1). https://doi.org/10.5334/gjgl.215.

Hunyadi, László. 2002. *Hungarian Sentence Prosody and Universal Grammar: On the Prosody-Syntax Interface*. New York: Lang. https://www.peterlang.com/document/1093218.

Jánosi, Adrienn. 2014. *Long Split Focus Constructions in Hungarian with a View on Speaker Variaton*. Ph.D. thesis, KU Leuven.

Kálmán, László, Gabor Prószéky, Ádam Nádasky & C. György Kálmán. 1986. Hocus, focus, and verb types in Hungarian infinitive constructions. In Werner Abraham & Sjaak de Meij (eds.), *Topic, Focus and Configurationality: Papers from the 6th Groningen Grammar Talks 1984* Linguistik Aktuell/Linguistics Today 4, 129–142. Amsterdam: John Benjamins. https://doi.org/10.1075/la.4.07kal.

King, Tracy H. 1997. Focus domains and information structure. In *Proceedings of LFG'97*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG1997/index.html.

Krifka, Manfred. 2008. Basic notions of information structure. *Acta Linguistica Hungarica* 55.3-4. 243–276. https://doi.org/10.1556/aling.55.2008.3-4.2.

Laczkó, Tibor. 2014. Essentials of an LFG analysis of Hungarian finite sentences. In Miriam Butt & Tracy H. King (eds.), *Proceedings of LFG'14*, Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/19/lfg14.html.

Laczkó, Tibor. 2023. LFG and Finno-Ugric languages. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, chap. 31, 1469–1532. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10037797.

Langer, Corinna. In prep. *Focus and Prosody in Hungarian*. Ph.D. thesis, Goethe University, Frankfurt.

Langer, Corinna & Frank Kügler. 2021. Focus and prosodic cues in Hungarian noun phrases. In *Proceedings of the 1st International Conference on Tone and Intonation (TAI)*, 219–223. https://doi.org/10.21437/TAI.2021-45.

Levelt, Willem J.M., Ardi Roelofs & Antje S. Meyer. 1999. A theory of lexical access in speech production. *Behavioral and Brain Sciences* 22. 1–75. https://doi.org/10.1017/S0140525X99001776.

Mycock, Louise. 2006. *The Typology of Constituent Questions: A Lexical-Functional Grammar Analysis of 'WH'-Questions*. Ph.D. thesis, University of Manchester.

Mycock, Louise. 2010. Prominence in Hungarian: the prosody-syntax connection. *Transactions of the Philological Society* 108(9). 265–297. https://doi.org/10.1111/j.1467-968x.2010.01241.x.

Mycock, Louise & John Lowe. 2013. The prosodic marking of discourse functions. In *Proceedings of LFG'13*, Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/18/lfg13.html.

Nordlinger, Rachel. 1998. *Constructive Case: Evidence from Australian Languages*. Dissertations in Linguistics. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/site/1575861348.shtml.

O'Connor, Rob. 2004. *Information Structure in Lexical-Functional Grammar: The Discourse-Prosody Correspondence in English and Serbo-Croation*. Ph.D. thesis, University of Manchester.

Roberts, Craige. 1996. Information structure in discourse: Toward a unified theory of formal pragmatics. *Ohio State University Working Papers in Linguistics* 49. 91–136.

Silverman, Kim, Mary Beckman, John Pitrelli, Mari Ostendorf, Colin Wightman, Patti Price, Janet Pierrehumbert & Julia Hirschberg. 1992. ToBI: a standard for labeling English prosody. In *Proceedings of the 1992 International Conference on Spoken Language Processing*, Banff. https://doi.org/10.21437/ICSLP.1992-260.

Varga, László. 2002. *Intonation and Stress: Evidence from Hungarian*. New York: Palgrave Macmillan. https://link.springer.com/book/10.1057/9780230505827.

Vogel, Irene & István Kenesei. 1987. The interface between phonology and other components of grammar: the case of Hungarian. *Phonology Yearbook* 4. 243–263. https://www.jstor.org/stable/4615419.

Pāṇinian Lexical Functional Grammar

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Abstract

In this paper I present an implementation in LFG of *kāraka* theory, the model of argument structure developed by the ancient Indian linguist Pāṇini in his grammar of Sanskrit, the *Aṣṭādhyāyī*. This implementation contributes to the goal of modelling and analysing Pāṇinian grammar in modern theoretical terms; from the perspective of LFG, it contributes an exploration of the capacity of LFG as a model of grammar, and more specifically speaks to the question of grammatical functions as primitives of the theory.

1 Introduction

The Indo-Aryan culture of first millennium BC northern India was the scene of the development of a highly advanced tradition of linguistic analysis, which remained the most sophisticated tradition of linguistics – far eclipsing the Western tradition – at least until the early 20th century.[†] The most important figure in that tradition is Pāṇini (c. 500–300 BC), whose grammar of Sanskrit, the *Aṣṭādhyāyī*, has been described as "one of the greatest monuments of human intelligence. . . an indispensable model for the description of languages" (Bloomfield 1929: 268); Pāṇini's influence can be traced in the development of modern Western linguistics in the 19th and 20th centuries, from Franz Bopp through figures like Leonard Bloomfield to the work of Paul Kiparsky (see Lowe 2024).

Pāṇini's model of argument structure, referred to here as *kāraka* theory, is a particularly advanced and widely lauded part of his grammar; it is notably similar to Fillmore's (1968) theory of Case Grammar, perhaps the earliest modern Western model of argument structure, and it influenced the early development of Lexical-Mapping Theory through the work of Ostler (1979). The goal of this paper is to present an implementation in LFG of the core of Pāṇini's argument structure system. The implementation has been tested in XLE and shown to work for one-, two-, and three-place predicates.

An average reader of the LFG proceedings might at this point ask the question: why? What value is there in modelling an ancient – and while no doubt sophisticated for its time, nonetheless necessarily limited – theory of argument structure in LFG when LFG already has well-developed models of argument structure?

There are two perspectives to consider. From the side of Pāṇinian studies, there is evident value in formalizing aspects of Pāṇinian grammar in modern theoretical terms, in order for example to test its robustness and investigate its similarities to and compatibility (or otherwise) with modern linguistic theory. This goal aligns also with the growing body of work seeking to adapt Pāṇinian notions and insights into computational linguistic work applied to Sanskrit and modern South Asian languages (see e.g. Kulkarni & Sharma 2019 and Kulkarni et al. 2020, with references).

But what about the LFG perspective? The goal of this paper is certainly not to argue that Pāṇini's theory of argument structure is in any meaningful sense 'better' than

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existing LFG approaches, whether for modelling Sanskrit specifically, or for modelling argument structure cross-linguistically. Nor does this paper seek to propose a Pāṇinian approach to argument structure in LFG as replacement of or improvement on existing LFG theories of argument structure. But as argued in Lowe (2024: 215), it is crucial for linguistic theory to keep questioning itself, for individual theories to keep learning from each other and to stretch and test themselves. Thus simply the act of implementing a distinctly non-LFG theory of argument structure in LFG has value in telling us something about the capacity of LFG as a theory, and about the benefits (or otherwise) of existing LFG approaches. In this particular case, moreover, there is one particular point of theoretical interest for LFG in implementing a Pāṇinian model of argument structure: the question of grammatical functions.

2 Grammatical functions

One key difference between Pāṇini's *kāraka* theory and existing LFG approaches to argument structure is that the former makes no reference whatsoever to a set of relations equivalent to LFG's grammatical functions (GFs). LFG differs from most contemporary syntactic frameworks in treating an inventory of GFs as one of the sets of primitives of the theory. The precise membership of the GF inventory may be debated: most questionable is the status of the clausal function COMP (Dalrymple & Lødrup 2000, Alsina et al. 2005, and more recently Belyaev et al. 2017, Laczkó 2021, Szűcs 2018, 2024); somewhat differently, SUBJ may be best understood as a conflation of two separate GFs, $\widehat{\text{GF}}$ and PIVOT (Falk 2006). But the assumption of an inventory itself remains almost unquestioned.

The only exception to this uniform acceptance of GFs within LFG is the proposal, by Patejuk & Przepiórkowski (2016) and Przepiórkowski (2016), to replace the inventory of GFs with an ordered list of dependents (DEPS). Patejuk & Przepiórkowski argue that at most SUBJ, OBJ and perhaps OBL need to be distinguished (echoing Alsina 1996); clausal functions, the θ index used to distinguish varieties of OBJ and OBL, and the distinction between arguments and adjuncts (Przepiórkowski 2016), are all unnecessary. While Patejuk & Przepiórkowski (2016) present a formalization which retains SUBJ and OBJ alongside the DEPS list, the formalizations offered by Przepiórkowski (2016: 571–572) go further in eliminating GFs entirely from the f-structure. The only author to engage substantively with Patejuk & Przepiórkowski's proposal is Kaplan (2017), who finds their arguments not "yet" convincing, and argues in favour of retaining an inventory of GFs, while recognizing the value of questioning such basics of the theory.

The assumption, or otherwise, of an inventory of GFs will naturally play an important role in any model of argument structure. While theories of argument structure in LFG necessarily focus on the mapping between underlying argument relations and GFs, the argument structure model of Kiparsky (1987; 1988; 1997; 2001; also presented in detail by Butt 2006: 100–111) is more flexible, capable of modelling the mapping between underlying argument relations and e.g. case marking, without reference to GFs, working on the assumption that GFs are not linguistic primitives.

Pāṇini's *kāraka* theory makes no reference to GFs: the mapping is between underlying argument relations and surface case relations. In fact, Pāṇini's grammar as a whole lacks any notion of GFs. The absence of the notion of 'subject' in the *Aṣṭādhyāyī* has been widely discussed (e.g. Cardona 1974: 244–245, Kiparsky 2009, Keidan 2017); Keidan (2017) argues that one of Pāṇini's core argument structure notions, the *kartṛ*, is on some level akin to the notion of subject, but Lowe (2024: 130–135) shows that Pāṇini's *kartṛ* is in fact more abstract, being more similar to $\hat{\theta}$ or (as assumed in the present paper) the arg_1 of Kibort's (e.g. 2007) mapping theory.[1] Kiparsky (2009) goes as far as to argue that Pāṇini's grammar deals with some aspects of Sanskrit syntax all the better for entirely lacking the notion of subject. This reflects the observation (e.g. Hock 1986, 1987, 1990, 1991) that the standard tests for subjecthood, when applied to Sanskrit, tend to pick out the highest underlying argument of a predicate (i.e. $\hat{\theta}$ or arg_1) rather than anything that could be equated with the notion of subject.

A Pāṇinian LFG, then, must reckon without GFs. In implementing a Pāṇinian argument structure in an LFG framework, I am not necessarily seeking to argue that Patejuk & Przepiórkowski (2016) were right to argue against an inventory of GFs as primitives of the theory. Rather I am exploring, in a particular respect, the consequences of such an assumption; I show that it is at least possible to model argument structure alternations in LFG without the traditional reliance on GFs. This further shows that LFG's argument structure has, or at least could have, the same sort of flexibility that Kiparsky claims for his own argument structure model. Whether this is the right way to approach argument structure is a different question – an interesting one certainly, but not one I seek to take a position on in this paper.

3 Pāṇini's system: *kārakas*

In this section I provide a brief introduction to Pāṇini's *kāraka* theory; for more detailed expositions, see e.g. Cardona (1974), Kiparsky (2009: 48–56), Lowe (2024: 108–117).

Pāṇini's grammar is fundamentally generative: one begins with a meaning to be expressed, or at least with a set of lexical stems representing the lexical meaning to be expressed, and the grammar then proceeds through syntactic relations, morphology, and phonology to a detailed phonetic output. The *kāraka* relations play a key role in this system, representing the primary syntactic relations between a predicate and its arguments, relations that drive much of the morphology.

The *kārakas* are underlying grammatical argument relations defined on the basis of semantic roles. They are sometimes equated with the modern notion of semantic roles; in particular, the two most important *kāraka* roles, the *kartṛ* and *karman*, are often translated as 'agent' and 'patient' respectively. But such equations, and translations, are incorrect; there is no one-to-one relation between *kārakas* and semantic roles. For example, an argument with the semantic role of 'instrument' might take the *kāraka* role of *karaṇa* or *kartṛ*, depending on the construction. The *kārakas*, then, are fundamentally grammatical relations.

Key to Pāṇini's system is the requirement that each *kāraka* role must be 'grammatically marked' (Sanskrit *abhihita*) exactly once. The active finite verb suffix grammatically marks what is in some sense the highest *kāraka* relation, the *kartṛ*: not 'agent', but

[1] It is also similar to the notion of 'logical subject' (Jespersen 1924), for which see Mohanan (1990: 49–51) and Manning & Sag (1998: 113ff.).

often in practice resolving to the agent. The mediopassive finite verb suffix marks either the role of *karman* (not 'patient/theme', but often resolving to the patient or theme) or is understood to mark the verbal event (a way of avoiding it marking any *kāraka*). Non-nominative case suffixes grammatically mark particular *kāraka* roles; the nominative does not mark any *kāraka* role, and hence is the case suffix used when the role in question is marked by the verbal suffix. Very simply, this is how Pāṇini models the active-passive alternation: in the active the verbal suffix marks the *kartṛ*, so the *kartṛ* argument appears in the nominative; in the passive, the verbal suffix marks the *karman*, which then appears in the nominative, while the *kartṛ* receives different (instrumental) case marking. For example, let us suppose we want to derive the following sentence:

(1) caitro dātreṇa yavaṃ lunāti
C.NOM scythe.INS.SG barley.ACC.SG harvest.PRES.3SG
'Caitra harvests the barley with a scythe.'

Given the meaning to be expressed, 'Caitra harvests the barley with a scythe', we begin our derivation with the four lexical stems representing 'Caitra', 'harvest', 'barley' and 'scythe'. Various semantic features are also at play here, including e.g. the temporal reference of the verb (present time) and, importantly for our purposes, the semantic roles of the verb's arguments. This is represented in (2), with equivalent Sanskrit terminology in (3).

(2) *caitra*$_{\text{[agent]}}$ *dātra*$_{\text{[instrument]}}$ *yava*$_{\text{[patient]}}$ *lū*$_{\text{[present]}}$

(3) *caitra*$_{\text{[svatantra]}}$ *dātra*$_{\text{[sādhakatama]}}$ *yava*$_{\text{[īpsitatama]}}$ *lū*$_{\text{[vartamāna]}}$

Kāraka role labels are assigned to arguments based on their semantic roles, by rules such as the following:

(4) a. Aṣṭ. 1.4.54: *svatantraḥ kartā* 'The independent actor is labelled *kartṛ*.'
b. Aṣṭ. 1.4.49: *kartur īpsitatamaṃ karma* 'The participant most desired by the *kartṛ* is labelled *karman*.'
c. Aṣṭ. 1.4.42: *sādhakatamaṃ karaṇam* 'That which is the most effective means is labelled *karaṇa*.'

There are six *kāraka* roles, and thirty-three rules governing their assignment, but only these three concern us here.[2] On the basis of these rules (and a further rule attaching the verbal suffix *laṭ* to mark the present tense), we reach the following step in the derivation:

(5) *caitra*$_{\text{[kartṛ]}}$ *dātra*$_{\text{[karaṇa]}}$ *yava*$_{\text{[karman]}}$ *lū-laṭ*

Since we want to derive the active voice sentence in (1), the following rule applies; this will serve to replace *-laṭ* with an active voice person/number suffix.

(6) Aṣṭ. 1.3.78: *śeṣāt kartari parasmaipadam* 'Parasmaipada (active) affixes occur after the remaining roots [i.e. roots not treated in preceding rules] to mark the *kartṛ* role.'

[2] The kāraka labels are assigned in rules Aṣṭ. 1.4.23–1.4.55. The three not treated here are: *apādāna*, primarily representing the semantic roles of point of departure and source of fear; *sampradāna*, primarily representing the goal (beneficiary or recipient); and *adhikaraṇa*, primarily representing location.

The relevant rules for case assignment are given in (7). The accusative suffix is added to grammatically mark the *karman* role (7b), and the instrumental suffix is added to grammatically mark the *kartṛ* or *karaṇa* (7c), when they are not otherwise grammatically marked (7a). The nominative suffix does not grammatically mark any *kāraka* relation (7d).

(7) a. Aṣṭ. 2.3.1: *anabhihite* 'When not otherwise grammatically marked:'
b. Aṣṭ. 2.3.2: *karmaṇi dvitīyā* 'The accusative marks *karman*.'
c. Aṣṭ. 2.3.18: *kartṛkaraṇayos tṛtīyā* 'The instrumental marks *kartṛ* and *karaṇa*.'
d. Aṣṭ. 2.3.46: *prātipadikārthaliṅgaparimāṇavacanamātre prathamā* 'The nominative is used when only the meaning, gender, and number of a nominal stem are to be marked.'

Each *kāraka* role associated with an argument in the clause must be grammatically marked exactly once by some element in the clause. In the sentence under consideration, the finite verb marks the *kartṛ*, here the most agentive argument, so that argument receives nominative case. The *karman* and *karaṇa* receive accusative and instrumental respectively, since these case endings grammatically mark those roles. All *kāraka* roles in the sentence are therefore marked.

(8) *caitra*$_{\text{[kartṛ]}}$-*s*U *dātra*$_{\text{[karaṇa]}}$-Ṭ*ā*$_{[\checkmark\text{karaṇa}]}$ *yava*$_{\text{[karman]}}$-*am*$_{[\checkmark\text{karman}]}$ *lū*-Ś*nā*-*ti*P$_{[\checkmark\text{kartṛ}]}$

If we eliminate the *kāraka* roles, and the code letters (Skt. *anubandhas*, given in small caps) from this representation, it now looks very close to the desired output:

(9) *caitra-s dātra-ā yava-m lū-nā-ti*

Rules dealing with allomorphy and sandhi will then produce the final (for our purposes) sentence form (cf. 1):

(10) *caitro dātreṇa yavaṃ lunāti*

But the same underlying sentence form can equally derive the passive. If we return to (5), instead of applying the rule in (6), which adds active verbal suffixes to grammatically mark the *kartṛ*, we could alternatively apply the following rule, which specifies mediopassive verbal suffixes to grammatically mark either the *karman* or the *bhāva* 'verbal event'.

(11) Aṣṭ. 1.3.13: *bhāvakarmaṇoḥ* '(Ātmanepada (mediopassive) affixes occur) to mark the verbal event or the *karman* role.'

The same case assignment rules (7) apply, but if the finite verb suffix marks the *karman*, then this argument will be assigned nominative case, and the *kartṛ*, since it is not marked by the finite verb suffix, will be assigned instrumental case:

(12) *caitra*$_{\text{[kartṛ]}}$-Ṭ*ā*$_{[\checkmark\text{kartṛ}]}$ *dātra*$_{\text{[karaṇa]}}$-Ṭ*ā*$_{[\checkmark\text{karaṇa}]}$ *yava*$_{\text{[karman]}}$-*s*U *lū*-*ya*K-*ta*$_{[\checkmark\text{karman}]}$

Simplifying to

(13) *caitra-ā dātra-ā yava-s lū-ya-ta*

And with appropriate allomorphy and sandhi, the passive sentence:

(14) caitreṇa dātreṇa yavo lūyate
C.INS scythe.INS barley.NOM harvest.PASS.3SG
'The barley is harvested by Caitra with a scythe.'

The option for the mediopassive finite verb suffix to mark the 'verbal event' is Pāṇini's mechanism to license the passives of intransitives. In Sanskrit the passive is highly productive, and almost any verb can form a passive. So beside the active sentence in (15), it is equally possible to form the sentence in (16), which is semantically equivalent.

(15) caitraḥ svapiti
C.NOM sleep.ACT.3SG
'Caitra sleeps.'

(16) caitreṇa supyate
C.INS sleep.PASS.3SG
'(Lit.) it is slept by Caitra.' (I.e. 'Caitra sleeps.')

In the active sentence, there is only one argument, and so only one *kāraka* role, the *kartṛ*, marked by the active finite verb ending. In the passive sentence, there is no *karman* for the mediopassive ending to mark, so it is understood to mark the *bhāva* 'verbal event'. The *kartṛ* is then assigned instrumental case, just as in the derivation above.

Pāṇini's *kāraka* theory is also able to derive sentences with more complicated argument structures, including two types of causative, and the passives of those causatives. I give examples here, but do not include these in the grammar fragment developed below.[3]

(17) maitraś caitreṇa yavaṃ lāvayati
M.NOM C.INS barley.ACC harvest.CS.3SG
'Maitra makes Caitra harvest the barley.'

(18) maitraś caitraṃ vyākaraṇaṃ bodhayati
M.NOM C.ACC grammar.ACC understand.CS.3SG
'Maitra makes Caitra understand (i.e. teaches C.) grammar.'

(19) maitreṇa caitreṇa yavo lāvyate
M.INS C.INS barley.NOM harvest.PASS.CS.3SG
'The barley was made by Maitra to be harvested by Caitra.'

(20) maitreṇa caitro vyākaraṇaṃ bodhyate
M.INS C.NOM grammar.ACC understand.PASS.CS.3SG
'Caitra was made to understand (i.e. was taught) grammar by Maitra.'

4 Three models of argument structure

In this section I first introduce the LFG argument structure model of Kibort (e.g. 2007), mentioned above, and the Kibort-Findlay Mapping Theory (KFMT), the fully formal-

[3]For more on causatives and passives of causatives in Sanskrit, see Lowe et al. (2019, 2024) with earlier references.

ized and architecturally integrated implementation of that model; the implementation of Pāṇinian LFG is partly modelled on this. Then, I briefly introduce Kiparsky's linking theory, also introduced above, and then compare and contrast these models with Pāṇini's *kāraka* theory, revealing the main challenges and potential benefits of modelling Pāṇini's *kāraka* theory within LFG.[4]

4.1 LFG

Linking rules were first formulated within LFG (as "Association Principles") by Zaenen & Maling (1983), building on earlier work including that of Ostler (1979). The first comprehensive theory of linking within LFG, *Lexical Mapping Theory* (LMT), was advanced by Bresnan & Kanerva (1989), and further developed by Bresnan & Zaenen (1990), Zaenen (1993), and Kibort (2001, 2004, 2007) among others. The model of Kibort (2007) was adopted by Dalrymple et al. (2019), and formalized within a connected s-structure model of LFG by Findlay (2016), a formalization known as the Kibort-Findlay Mapping Theory (KFMT)

Kibort (2007) proposes a universal "valency template" for all non-derived predicates:

(21) $\langle$ arg_1 arg_2 arg_3 arg_4 $\ldots$ arg_n $\rangle$

$[-\text{O}/-\text{R}]$ $[-\text{R}]$ $[+\text{O}]$ $[-\text{O}]$ $[-\text{O}]$

Verbs select one or more argument slots together with default feature specification. Argument slots link to grammatical functions according to the hierarchy of grammatical functions:[5] arg_1 (if selected) links to the highest available grammatical function, then arg_2 (if selected) links to the highest remaining grammatical function, and so on.

What crucially distinguishes Kibort's model from earlier LFG mapping theories is the separation of semantic roles from the argument structure. Whereas in earlier work predicates are represented as selecting for agents, patients, etc., which then map via the $\pm$O/R features to grammatical functions, Kibort explicitly keeps semantic roles separate from the grammatical system of argument structure, by positing the level of 'arg' relations between semantic roles and grammatical functions. So, predicates select for zero or more argument slots from the universal valency template; these slots are related on the one hand to semantic roles, and on the other hand (via the linking principles) to grammatical functions:

(22)

			(agent)	(patient)	
	harvest	$\langle$	arg_1	arg_2	$\rangle$
intrinsic:			$[-\text{O}]$	$[-\text{R}]$	
			SUBJ	OBJ	

This intermediate level of arg_x relations can be directly compared with Pāṇini's *kāraka* roles. Both are the base roles in the grammatical argument structure system, associated with but distinct from the semantic roles/relations between a predicate and its arguments. In the Pāṇinian argument structure model developed below, the *kārakas* are

[4]For a more extensive comparison of these three approaches, see Lowe (2024: 108–128).

[5]Standardly SUBJ > OBJ , OBL_θ > OBJ_θ (Bresnan & Moshi 1990); but according to Her (2013): SUBJ > OBJ > OBL_θ > OBJ_θ.

treated as directly equivalent to the s-structure ARGx roles which are the KFMT implementation of Kibort's arg$_x$ relations.

4.2 Kiparsky's linking theory

The linking theory developed by Kiparsky (1987, 1988, 1997, 2001), which again builds on the proposals of Ostler (1979), explicitly avoids the notion of a set of distinct semantic roles, depending rather on the idea that the semantic arguments of a predicate are best understood in terms of a spectrum between Dowty's (1991) 'Proto-Roles' of Proto-Agent and Proto-Patient. In Kiparsky's theory, the arguments of a predicate are ordered according to such a spectrum, and based on this ordering two syntactic features are assigned: ±H(ighest)R(ole) and ±L(owest)R(ole). For example, given a preliminary version of the Sanskrit sentence 'Devadatta gives the cow to Yajñadatta', with case-marking yet to be determined, we would have the following assignment:

(23) devadatta yajñadatta go dadāti
D. Y. cow gives
[+HR] [ ] [+LR]
'Devadatta gives the cow to Yajñadatta.'

(23)	devadatta	yajñadatta	go	dadāti
	D.	Y.	cow	gives
	[+HR]	[ ]	[+LR]	
	'Devadatta gives the cow to Yajñadatta.'			

Devadatta, as the giver or 'agent', is the most Proto-Agentive argument, so receives the feature [+HR]. The cow, as the theme, is the most Proto-Patientive, so receives [+LR]. Yajñadatta as the beneficiary is intermediate between the two in terms of Proto-Agent and Proto-Patient properties, so receives no specification.

In contrast with the LFG model presented above, but in agreement with Pāṇini's *kāraka* theory, Kiparsky's model does not depend on grammatical functions like subject and object: it is possible to state relations directly between the underlying syntactic features [+HR] and [+LR] and case marking, if that is the most relevant surface marking of argument relations in the language in question. So, Kiparsky assumes default relations between case and HR/LR features such as:

(24) a. nominative = [ ]
b. accusative = [−HR]
c. dative = [−HR, −LR]

Nominative is the least marked case, and is in principle compatible with any argument. Case assignment proceeds according to a principle of 'Specificity', a form of the Elsewhere / Pāṇini's Principle: more specific assignments override less specific assignments. So for (23), granted the defaults in (24), there is only one option for Devadatta, the nominative, and likewise for Yajñadatta, only the dative is possible.[6] The cow could be assigned either nominative or accusative, since both are compatible with its [+LR] specification; it is assigned accusative because this is the more specific assignment. We therefore obtain the correct case marking:

[6]Of course there are other cases, and the presentation is simplified here.

(25) devadatto yajñadattāya gām dadāti
D.NOM Y.DAT cow.ACC gives
[+HR] [ ] [+LR]
'Devadatta gives the cow to Yajñadatta.'

As we have already noted, subject and object play no role here. They could, but they need not: Kiparsky's model is intentionally underspecified in this respect, so that the generalizations in (24) could be reformulated e.g. in terms of structural position, or grammatical function, depending either on the theory assumed or on the most relevant properties of the language concerned.

4.3 Comparisons

The major difference between Pāṇini's, Kibort's and Kiparsky's models has already been discussed: While the LFG model necessarily treats the mapping between underlying argument relations and GFs, Pāṇini's model focuses on the mapping between underlying relations and case assignment, while Kiparsky's system has the flexibility to cover either mapping.

The three models also differ in their approach to the passive. Kibort (2007) assumes a demotional approach to the passive: the passive operation 'demotes' the highest argument of a predicate, so that it is not realized as the highest GF, but can only be realized as an oblique argument. Specifically, she proposes that the passive operation adds the feature [+R] to the arg_1:

(26)

			(agent)	(patient)	
	harvest	⟨	arg_1	arg_2	⟩
intrinsic:			[−O]	[−R]	
passive			[+R]		
			OBL_θ	SUBJ	

Kiparsky understands passivization rather in suppressional terms: the passive operation effectively removes the highest argument from the argument frame of the predicate, at least for linking purposes. Under a suppressional approach to the passive, the passive agent, if expressed, must be treated as an adjunct. In Kiparsky's model, in the passive the [+HR] argument is prevented from linking. Kiparsky then assumes a structural requirement for a [+HR] role, introduced when necessary by a process of 'agreement'. For example, for the sentence 'The cow is given by Devadatta':

(27)

	devadatta	*go*	*dīyate*
	[+HR]	[+LR]	
passive:	∅	|	
'agreement':		[+HR]	

With the original [+HR] argument prevented from linking, the remaining argument, though originally [+LR] must be reassigned to [+HR]. Thus the only possible case assignment in this passive sentence will see the cow surfacing as nominative:

(28) devadattena gaur dīyate
D.INS cow.NOM give.PASS
∅ [+HR]
'The cow is given by Devadatta.'

devadattena	gaur	dīyate
D.INS	cow.NOM	give.PASS
∅	[+HR]	

'The cow is given by Devadatta.'

Suppressional approaches to the passive are also found in LFG, and could be adopted even within Kibort's model. For Pāṇini's approach to the passive, it is not clear that either of the terms 'demotional' or 'suppressional' are appropriate, but the demotional view of the passive is certainly closer to Pāṇini's: there is no suppression or elimination of the *kartṛ* argument in the passive.

In fact, in Pāṇini's approach to the passive, there is no change whatsoever to the underlying relations between a predicate and its arguments, relative to the active. This represents a more significant difference which sets Pāṇini's model apart from all (to my knowledge) modern approaches to the passive. So, in all modern models of argument structure, whether demotional or suppressional, the passive argument structure is in some way derived from that of the active. Or, more precisely, the base argument structure assumed for any predicate corresponds directly to what surfaces in the active voice, while some change – the elimination of an argument, or an augmented specification for one argument – is required for the passive. In argument structure terms, then, the active is always more basic, and the passive derived.

While, then, lexical non-derivational theories tend to refer to the passive 'alternation', rather than to a passive 'operation' or 'derivation', this is never a true alternation in the sense of an alternation of equals. In contrast, Pāṇini's approach to the passive does treat active and passive as true, equal, alternants of each other. The underlying argument relations remain exactly the same between active and passive; the difference between active and passive comes down solely to the free choice between active and mediopassive verb endings, and everything else follows automatically from this, with no additional processes required for the passive.

Cross-linguistically, it is not unreasonable to model argument structure in such a way that the active is derived more directly, while the passive involves additional mechanisms; this reflects, for example, the fact that the passive voice is more restricted than the active, both in terms of its occurrence and productivity across and within languages, and the fact that the passive is usually associated with more extensive morphological marking. Such arguments can in fact be applied to Sanskrit. However, for Pāṇini there were advantages to modelling the active-passive alternation with real equality: in particular, it gave him a simple way of dealing with the ergative.[7] Such considerations go beyond the scope of the present paper, but once again by implementing a Pāṇinian model of argument structure in LFG, we can at least explore the value of a treatment of the passive which is uniquely distinct from all modern approaches to the passive.

5 Pāṇinian LFG

In this section I present the toy grammar developed and implemented in XLE as a proof-of-concept, as it were, for a 'Pāṇinian' LFG. The aim is merely to demonstrate

[7] On the ergative in Sanskrit, see Lowe et al. (2024: 34–38).

the viability of the approach; its coverage and completeness remain to be expanded in future work.

5.1 The *kārakas*

In modelling Pāṇini's *kāraka* theory in LFG, I start from the identification, argued for above, that Pāṇini's *kārakas* correspond directly to the arg_x roles of Kibortian argument structure. For the purposes of the present implementation, I identify the three *kārakas* in question with three of Kibort's arg_x roles as shown in (29).[8]

(29) a. *kartṛ* = arg_1
b. *karman* = arg_2
c. *karaṇa* = arg_4

In KFMT (Findlay 2016), arg_x roles are features at s-structure: ARG1, ARG2, etc. For Pāṇinian LFG, then, the *kārakas* are modelled as s-structure features.

In standard KFMT, constraints are stated on the relation between the s-structure features ARG1, ARG2, etc., and corresponding f-structure features; for example, the value of ARG1 at s-structure can be projected from either the f-structure SUBJ or OBL_θ.[9] But as discussed above, Pāṇini's system makes no reference to grammatical functions: rather than modelling the mapping between underlying argument positions and GFs, it models the mapping between underlying argument positions and case.

For a more faithful implementation of Pāṇini's grammar within LFG, then, we must avoid grammatical functions. In the spirit of Patejuk & Przepiórkowski (2016), all arguments of a predicate are treated as members of a single set, DEPS, at f-structure. Patejuk & Przepiórkowski (2016) propose that DEPS takes as its value an ordered set, but for the present purposes it is sufficient to treat the Pāṇinian DEPS as taking a standard unordered set as its value.

5.2 C-structure

Sanskrit is a discourse-configurational language with considerable freedom for discontinuous constituents. The default, or at least most common, word order is SOV, and the left periphery is associated with topicalization. The evidence suggests a relatively flat phrasal structure for Sanskrit, with the exocentric clausal cateogry S playing a significant role. Lowe (2015a: 37–46) discusses the evidence for phrasal categories and other hierarchical relations in Sanskrit phrase structure, and concludes that while there is evidence for phrases (XPs), including VP, there is no clear evidence for intermediate (X′) categories or for a hierarchical left periphery.

In any case, for the present implementation the c-structure is relatively unimportant, and for simplicity I follow Lowe (2015a) in modelling Sanskrit c-structure as entirely flat.[10] I therefore assume the following simple phrase structure rules:

[8] Kibort's arg_3 is not relevant for our purposes and may not be required for Sanskrit.

[9] This corresponds to the inherent [−O] feature of Kibort's arg_1; cf. Findlay (2016: 318, ex. 50a).

[10] As in Lowe (2015a), I accept the existence of VPs in Sanskrit containing the verb and optionally one or more arguments, but for the purposes of this toy grammar I treat all arguments as VP-external, to avoid proliferating multiple parses.

(30) a. $\text{S} \rightarrow \underset{@\text{ARG}}{\text{NP*}}\ \text{VP}$

b. $\text{VP} \rightarrow \underset{\uparrow=\downarrow}{\text{V}^0}$

c. $\text{NP} \rightarrow \underset{\uparrow=\downarrow}{\text{N}^0}$

d. $\text{V}^0 \rightarrow \underset{\uparrow=\downarrow}{\widehat{\text{V}}}\ \underset{\uparrow=\downarrow}{\widehat{\text{Vsuff}}}$

e. $\text{N}^0 \rightarrow \underset{\uparrow=\downarrow}{\widehat{\text{N}}}\ \underset{\uparrow=\downarrow}{\widehat{\text{Nsuff}}}$

Since the contribution of suffixes is crucially distinguished from that of their stems in the Pāṇinian system, I include what are to be understood as sub-lexical nodes, $\widehat{\text{V}}$, $\widehat{\text{N}}$, $\widehat{\text{Vsuff}}$ and $\widehat{\text{Nsuff}}$ as non-projecting categories.[11]

The template ARG, called by NP arguments in (30a), is defined in (31). It specifies the corresponding f-structure as a member of the clause's DEPS set; it further specifies the corresponding s-structure as the value of a KĀRAKA feature in the clausal s-structure. The metavariable KĀRAKA is a disjunction over possible s-structure roles (32): KARTṚ, KARMAN, KARAṆA, etc.[12] Thus, every argument of a clausal predicate will appear in the DEPS set at f-structure, and will appear as the value of some KĀRAKA feature at s-structure.

(31) $\text{ARG} \equiv \quad \downarrow \in (\uparrow \text{DEPS})$
$(\uparrow_\sigma \text{KĀRAKA}) = \downarrow_\sigma$

(32) $\text{KĀRAKA} \equiv \{\ \text{KARTṚ} \mid \text{KARMAN} \mid \text{KARAṆA} \dots \}$

5.3 Lexicon

Verbal stems contribute merely their PRED value and a corresponding feature for the s-structure. The s-structure feature BHĀVA roughly corresponds to the EV or EVENT feature in standard s-structures. Note that there is no subcategorization in the PRED value, since there are no distinct GFs in the f-structure; as shown by Asudeh & Giorgolo (2012), subcategorization can be constrained in the s-structure.

(33) a. *lū* $\widehat{\text{V}}$
$(\uparrow \text{PRED}) = \text{'harvest'}$
$(\uparrow_\sigma \text{BHĀVA SEM}) = \text{HARVEST}$

b. *svap* $\widehat{\text{V}}$
$(\uparrow \text{PRED}) = \text{'sleep'}$
$(\uparrow_\sigma \text{BHĀVA SEM}) = \text{SLEEP}$

Likewise nominal stems contribute nothing significant beyond their PRED value and corresponding s-structure feature:

[11] Cf. the similar but distinct use of non-projecting categories for stem forms of nouns in Sanskrit compounds by Lowe (2015b). Note further that the use of non-projecting categories would be a somewhat more LFG-faithful way of representing sublexical nodes in L_RFG.

[12] This is equivalent, in standard KFMT, to a metavariable over s-structure ARGx roles, e.g. ARGX $\equiv$ { ARG1 | ARG2 | ARG3 … }.

(34) *caitra* = $\widehat{\text{N}}$
$(\uparrow \text{PRED}) = \text{'Caitra'}$
$(\uparrow_\sigma \text{SEM}) = \text{CAITRA}$

In Pāṇini's system, the contributions of nominal and verbal suffixes are crucial. I define the lexical entry in (35) for the 3sg. active finite verb suffix. The second f-description in the lexical entry specifies the feature-value pair MRK VSUFF as appearing within the KARTṚ s-structure. This models the Pāṇinian constraint that the active finite verb suffix grammatically marks the *kartṛ* role. The next three lines in (35) state constraints on an f-structure labelled %KR: the s-structure projected from %KR is identified with the value of the KARTṚ feature in the clausal s-structure; and appropriate person/number features are specified. The somewhat roundabout use of a local name is required by the fact that all arguments appear in the unordered DEPS set at f-structure. The following two lines provide alternative definitions of %KR. The first of these applies if there is an explicit *kartṛ* in the clause: %KR is defined as some member of the DEPS set. But since constraints involving local names cannot themselves construct an f-structure for the name to apply to, we require a different formulation when there is no explicit *kartṛ*, that is in the context of 'pro-drop'. For that case, I make use of ↓ inside the lexical entry to effectively construct an f-structure inside the DEPS set which can serve for the pro-dropped *kartṛ*.

(35) *-ti* $\widehat{\text{Vsuff}}$
$(\uparrow \text{VOICE}) = \text{ACTIVE}$
$(\uparrow_\sigma \text{KARTṚ MRK}) = \text{VSUFF}$
$\%\text{KR}_\sigma = (\uparrow_\sigma \text{KARTṚ})$
$(\%\text{KR NUM}) = \text{SG}$
$(\%\text{KR PERS}) = 3$
$\{ (\uparrow \text{DEPS} \in) = \%\text{KR} \quad |$
$\%\text{KR} = \downarrow$
$\downarrow \in (\uparrow \text{DEPS})$
$(\%\text{KR}_\sigma \text{SEM}) = \text{PRO}$
$(\%\text{KR PRED} = \text{'pro'}) \}$

The passive use of the 3sg. mediopassive finite verb suffix (36) is mostly equivalent, with the change of KARMAN for KARTṚ, modelling the Pāṇinian constraint that the mediopassive finite verb suffix grammatically marks the *karman* role.[13] With the passive there is an additional possibility, however: in the absence of a *karman* (i.e. with an intransitive verb, or with a transitive verb used intransitively), the mediopassive suffix may grammatically mark the BHĀVA; as noted above, this is Pāṇini's method for licensing the impersonal passive. This possibility is defined in the final two lines of (36).

[13] For simplicity I ignore the middle voice uses of the mediopassive; they would simply require additional disjunctions in (36).

(36) *-ta* $\widehat{\text{Vsuff}}$

$(\uparrow \text{ VOICE}) = \text{PASSIVE}$
$\{ (\uparrow_\sigma \text{ KARMAN MRK}) = \text{VSUFF}$
$\%\text{KR}_\sigma = (\uparrow_\sigma \text{ KARMAN})$
$(\%\text{KR NUM}) = \text{SG}$
$(\%\text{KR PERS}) = 3$
$\{ (\uparrow \text{DEPS} \in) = \%\text{KR} \quad |$
$\%\text{KR} = \downarrow$
$\downarrow \in (\uparrow \text{ DEPS})$
$(\%\text{KR}_\sigma \text{ SEM}) = \text{PRO}$
$(\%\text{KR PRED} = \text{'pro'}) \} \quad |$
$(\uparrow_\sigma \text{ BHĀVA MRK}) = \text{VSUFF}$
$\neg(\uparrow_\sigma \text{ KARMAN}) \}$

On the other side of the coin are the case suffixes. Recall that in Pāṇini's system the nominative case ending does not grammatically mark any *kāraka*, while the other cases do. Therefore, the argument suffixed with the nominative case must be the argument whose *kāraka* role is grammatically marked by the verbal suffix. This constraint is formulated in the fourth line of (37a). The other cases are, of course, not compatible with an argument which is grammatically marked by the verbal suffix; this is ensured by the distinct value NSUFF for the feature MRK specified in (37b–c). The final lines of (37b–c) specify the KĀRAKA roles that the suffixed nouns must or may correspond to at s-structure. Note that in this system the case suffixes are constructive (Nordlinger 1998, 2000), but at the level of s-structure rather than f-structure.

(37) a. *-s*U $\widehat{\text{Nsuff}}$

$(\uparrow \text{CASE}) = \text{NOM}$
$(\uparrow \text{NUM}) = \text{SG}$
$(\uparrow_\sigma \text{ MRK}) =_c \text{VSUFF}$

b. *-am* $\widehat{\text{Nsuff}}$

$(\uparrow \text{CASE}) = \text{ACC}$
$(\uparrow \text{NUM}) = \text{SG}$
$(\uparrow_\sigma \text{ MRK}) = \text{NSUFF}$
$(\text{KARMAN} \uparrow_\sigma)$

c. -Ṭ*ā* $\widehat{\text{Nsuff}}$

$(\uparrow \text{CASE}) = \text{INS}$
$(\uparrow \text{NUM}) = \text{SG}$
$(\uparrow_\sigma \text{ MRK}) = \text{NSUFF}$
$\{(\text{KARTṚ} \uparrow_\sigma) \mid (\text{KARAṆA} \uparrow_\sigma) \}$

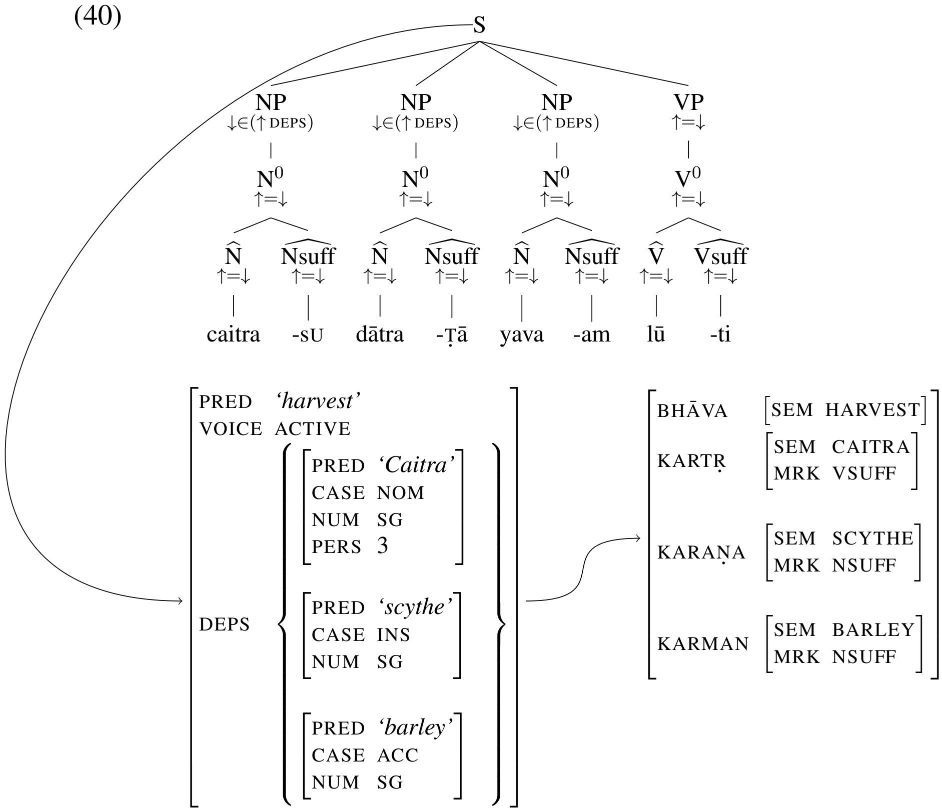
6 Examples

In (40) I give the c-structure, f-structure and s-structure for the sentence in (38)=(1). For the corresponding passive sentence in (39)=(14), the c-structure, f-structure and s-structure are given in (41). Note that due to the need to distinguish the contributions of suffixes from stems (and since I have not implemented a morphological parser), the grammar effectively models an underlying version of the sentence (so 38 is closer to 8 than to 1).

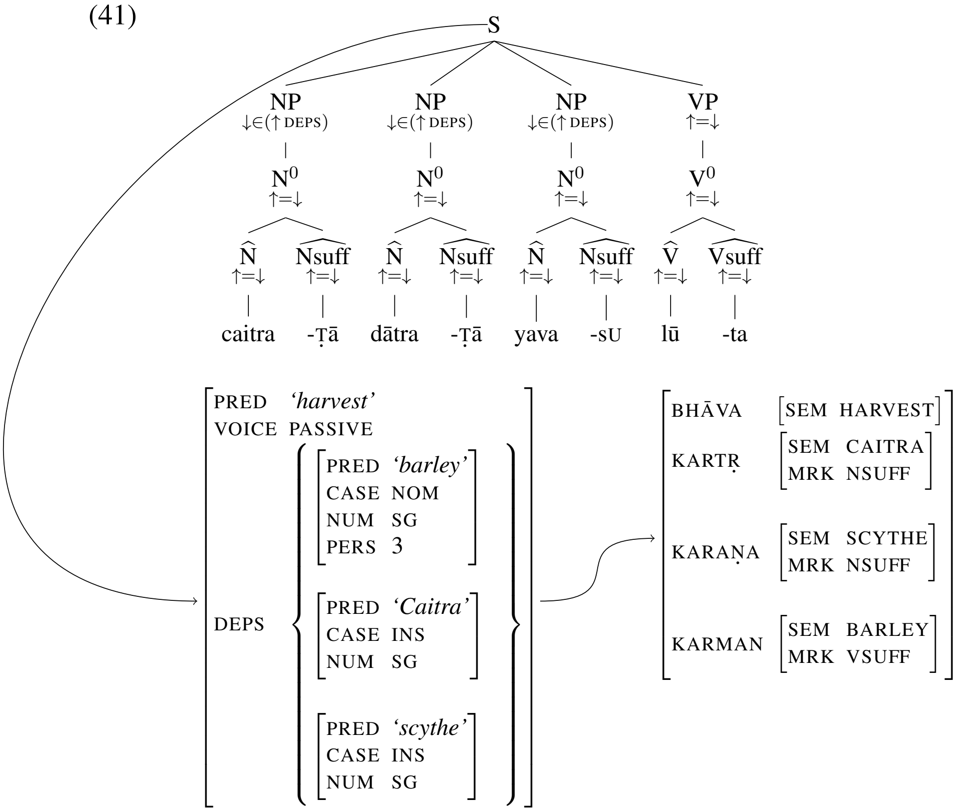
(38) caitro dātreṇa yavaṃ lunāti
C.NOM scythe.INS.SG barley.ACC.SG harvest.PRES.3SG
'Caitra harvests the barley with a scythe.'

(39) caitreṇa dātreṇa yavo lūyate
C.INS scythe.INS.SG barley.NOM.SG harvest.PASS.PRES.3SG
'The barley is harvested by Caitra with a scythe.'

(40)



(41)



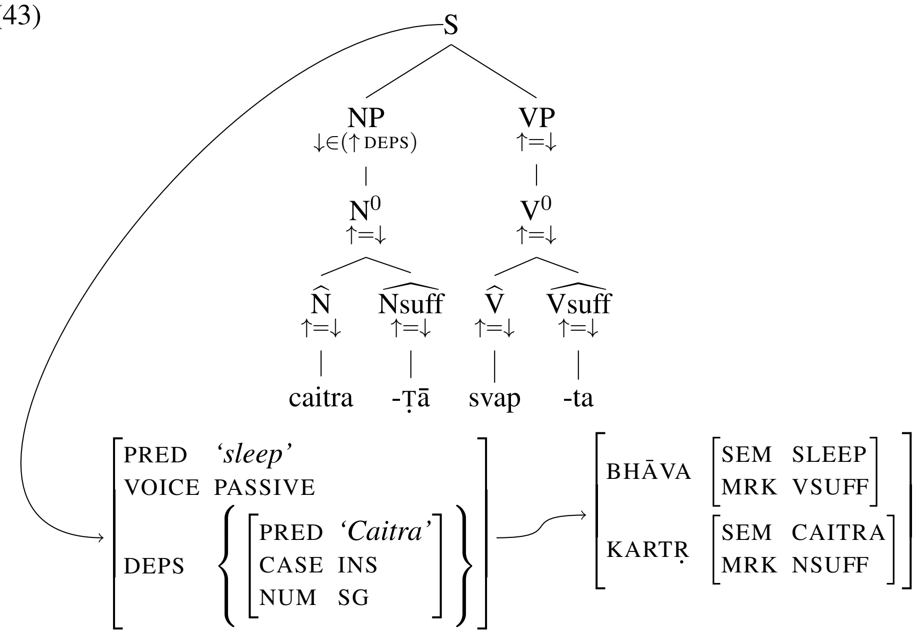
In (40), the three arguments of the verb all appear in the DEPS set in the f-structure, but their *kāraka* roles are distinguished in the s-structure; since the active finite verb ending grammatically marks the *kartṛ* role, the *kartṛ* argument (Caitra) necessarily takes nominative case and has the feature-value pair MRK VSUFF in the s-structure.

In (41) the only difference is that the finite verbal suffix is mediopassive; used as a passive here, it grammatically marks the *karman*, resulting in the MRK VSUFF feature in the corresponding s-structure. The *karman*, the barley, therefore receives nominative case, while the *kartṛ* and *karaṇa* both receive instrumental case, which supplies the MRK NSUFF feature in the corresponding s-structures.

For the passive of an intransitive verb, as in (42)=(16), the c-, f-, and s-structure are illustrated in (43).

(42) caitreṇa supyate
C.INS sleep.PASS.3SG
'(Lit.) it is slept by Caitra.' (I.e. 'Caitra sleeps.')

(43)



As there is no *karman*, the mediopassive finite verb suffix grammatically marks the *bhāva*, the verbal event; the sole argument, the *kartṛ*, is grammatically marked by the instrumental case suffix.

7 A PCASE-style alternative

An anonymous reviewer of the abstract suggested an apparently simpler alternative to the model developed above, involving a formulation similar to that used for PCASE in Kaplan & Bresnan (1982). Rather than the constraints in (31), the annotation on NP arguments would be:

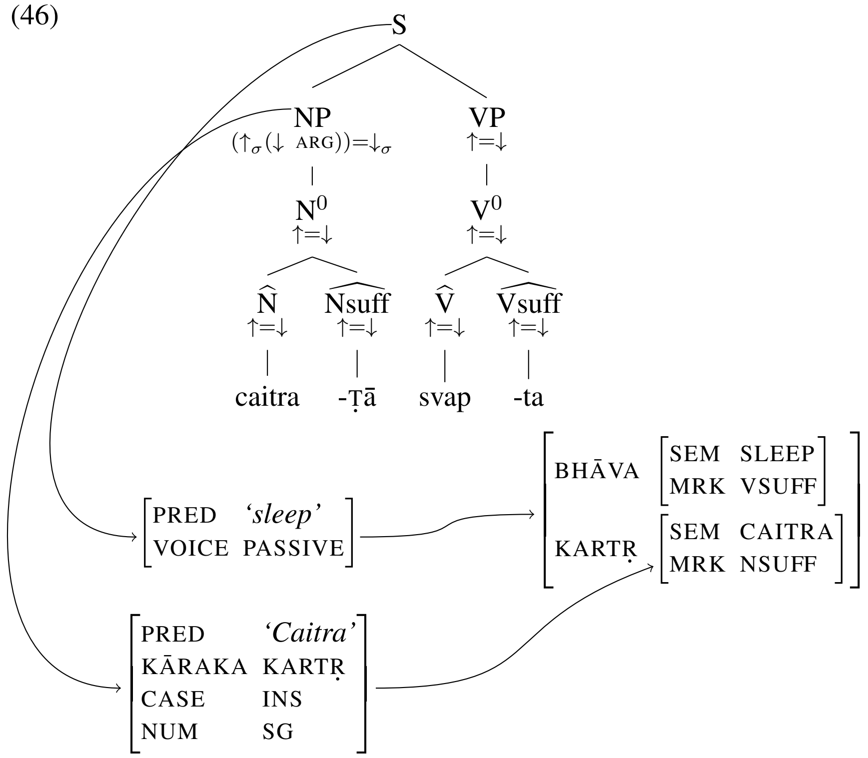
(44) $(\uparrow_\sigma(\downarrow \text{KĀRAKA})) = \downarrow_\sigma$

The value of $(\downarrow \text{KĀRAKA})$ would need to be specified for the f-structure of each argument. For example, instead of the constructive case style constraints in the last line of (37), the nominal suffix -*Ṭā* would instead have the following constraint:

(45) $\{ (\uparrow \text{KĀRAKA}) = \text{KARTṚ} \mid (\uparrow \text{KĀRAKA}) = \text{KARAṆA} \}$

The effect of this would be to construct the same s-structure relations as in the model above using an f-structure feature KĀRAKA whose value is the name of the corresponding s-structure feature for that f-structure. The major difference is that this approach would produce disconnected f-structures: the f-structures of the verb’s arguments are not embedded within the f-structure projected by the verb. This would eliminate the need for the DEPS set in the f-structure of the verb, an alternative and perhaps purer way to represent the absence of grammatical functions. So, instead of (43), this approach would produce the following:

(46)



However, there is a implementational difficulty with this approach. It is necessary for the verbal suffix to state constraints on the f-structure of its *kartṛ*, as in (35) and (36). We could in theory do this by defining %KR via the inverse projection from s-structure, for example (for the active verb suffix):

(47) $\%\text{KR} \in (\uparrow_\sigma\ \text{KARTṚ})_{\sigma^{-1}}$

But this can only work if the f-structure for the *kartṛ* contains the feature-value pair KĀRAKA KARTṚ, since otherwise that f-structure cannot project (via 44) to the relevant s-structure. And it does not appear to be possible to specify that on the verb suffix; at least, it cannot be implemented in XLE.[14]

In cases of pro-drop, the problem can be overcome by using ↓ in the lexical entry to create an f-structure for the *kartṛ* without going via s-structure. However, when there is an explicit *kartṛ* argument, ↓ in the lexical entry does not help, because there is no way to unify the f-structure projected by the *kartṛ* and the f-structure ↓ (since the function σ is not injective, both might in theory independently project to $(\uparrow_\sigma\ \text{KARTṚ})$).

The problem arises due to the absence of a *kāraka* specification in the lexical entry for the nominative suffix (cf. 37a), and can be resolved by adding such a specification, since then the f-structure for the *kartṛ* is directly defined as projecting to $(\uparrow_\sigma\ \text{KARTṚ})$. However, this goes directly against Pāṇini's approach, where the nominative is explicitly not associated with any *kāraka*. Such an approach would therefore be distinctly less Pāṇinian than the approach developed in §5, despite the apparent advantage of avoiding

[14]Specifically, the constraint $\%\text{KR}_\sigma = (\uparrow_\sigma\ \text{KARTṚ})$, theoretically equivalent to (47), does not license the identification of %KR with an f-structure that could project to $(\uparrow_\sigma\ \text{KARTṚ})$ if the identification were accepted.

the need for DEPS.

8 Conclusion

In this paper I have presented an implementation of the core, at least, of Pāṇini's *kāraka* theory in LFG. I hope to have shown that this 'Pāṇinian LFG' quite faithfully represents the key aspects of Pāṇini's system, despite the fundamental differences between the two theories. Perhaps the most significant difference is the lack of anything corresponding to GFs in Pāṇini's system. In implementing a Pāṇinian LFG, I have demonstrated that it is possible to model argument structure in LFG without reference to GFs. As discussed in §§1–2, my goal here has not been to argue that such an approach to argument structure is necessarily better than existing LFG approaches, nor necessarily to advocate the reduction or elimination of GFs from LFG as proposed by Patejuk & Przepiórkowski (2016). But I hope to have shown, at least, that if one were to accept the arguments of Patejuk & Przepiórkowski (2016), it would still be perfectly possible to model argument structure alternations. This also gives LFG the sort of flexibility in modelling argument structure that we observed above in Kiparsky's mapping theory. While it is undeniably the case that GFs play a key role in the argument structure alternations of some languages, e.g. English, it may be that in some languages, perhaps including Sanskrit, GFs are not implicated in argument structure, which concerns rather the mapping between underlying arguments and e.g. case marking. It is to the advantage of LFG that it has the flexibility to deal with such cross-linguistic variation.

References

Alsina, Alex. 1996. *The role of argument structure in grammar*. Stanford, CA: CSLI Publications.

Alsina, Alex, K. P. Mohanan & Tara Mohanan. 2005. How to get rid of the COMP. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'05 Conference*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2005/pdfs/lfg05amm.pdf.

Asudeh, Ash & Gianluca Giorgolo. 2012. Flexible composition for optional and derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'12 Conference*, 64–84. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2012/papers/lfg12asudehgiorgolo.pdf.

Belyaev, Oleg, Anastasia Kozhemyakina & Natalia Serdobolskaya. 2017. In defense of COMP: Complementation in Moksha Mordvin. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'17 Conference*, 83–103. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2017/lfg2017-bks.pdf.

Bloomfield, Leonard. 1929. Review of *Konkordanz Pāṇini-Candra* by Bruno Liebich. *Language* 5. 267–276. https://doi.org/10.2307/409597.

Bresnan, Joan & Jonni M. Kanerva. 1989. Locative inversion in Chicheŵa: A case study of factorization in grammar. *Linguistic Inquiry* 20. 1–50. https://www.jstor.org/stable/4178612.

Bresnan, Joan & Lioba Moshi. 1990. Object asymmetries in comparative Bantu syntax. *Linguistic Inquiry* 21(2). 147–185. https://www.jstor.org/stable/4178668.

Bresnan, Joan & Annie Zaenen. 1990. Deep unaccusativity in LFG. In Katarzyna Dziwirek, Patrick Farrell & Errapel Mejías-Bikandi (eds.), *Grammatical relations: A cross-theoretical perspective*, 45–57. Stanford, CA: CSLI Publications.

Butt, Miriam. 2006. *Theories of case*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139164696.

Cardona, George. 1974. Pāṇini's *kārakas*: agency, animation and identity. *Journal of Indian Philosophy* 2. 231–306. https://www.jstor.org/stable/23438766.

Dalrymple, Mary & Helge Lødrup. 2000. The grammatical functions of complement clauses. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'00 Conference*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2000/pdfs/lfg00dalrympl-lodrup.pdf.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Dowty, David R. 1991. Thematic proto-roles and argument selection. *Language* 67(3). 547–619. https://doi.org/10.1353/lan.1991.0021.

Falk, Yehuda N. 2006. *Subjects and universal grammar: An explanatory theory*. Cambridge: Cambridge University Press.

Fillmore, Charles J. 1968. The case for case. In Emmon Bach & R. T. Harms (eds.), *Universals in linguistic theory*, 1–88. New York: Holt, Rinehart and Winston. https://files.eric.ed.gov/fulltext/ED019631.pdf.

Findlay, Jamie Y. 2016. Mapping theory without argument structure. *Journal of Language Modelling* 4(2). 293–338. https://doi.org/10.15398/jlm.v4i2.171.

Her, One-Soon. 2013. Lexical Mapping Theory revisited. In Tracy Holloway King & Valeria de Paiva (eds.), *From quirky case to representing space: Papers in honor of Annie Zaenen*, 47–59. Stanford, CA: CSLI Publications.

Hock, Hans Henrich. 1986. "*P*-oriented" constructions in Sanskrit. In Bhadriraju Krishnamurti (ed.), *South Asian languages: Structure, convergence and diglossia*, 15–26. Delhi: Motilal Banarsidass.

Hock, Hans Henrich. 1987. Reduced-clause and clause-union absolutives and participles in Vedic prose. In Elena Bashir, Madhav M. Deshpande & Peter Edwin Hook (eds.), *Select papers from SALA-7*, 182–197. Bloomington, Indiana: Indiana University Linguistics Club.

Hock, Hans Henrich. 1990. Oblique subjects in Sanskrit? In Manindra K. Verma & K. P. Mohanan (eds.), *Experiencer subjects in South Asian languages*, 119–139. Stanford, CA: CSLI Publications.

Hock, Hans Henrich. 1991. Causees, passive agents, or instruments? Instrumental NPs with causatives in early and later Vedic Prose. In Hans Henrich Hock (ed.), *Studies in Sanskrit syntax: A volume in honor of the centennial of Speijer's Sanskrit Syntax, 1886–1986*, 71–94. Delhi: Motilal Banarsidass.

Jespersen, Otto. 1924. *Philosophy of grammar*. London: George Allen & Unwin.

Kaplan, Ronald M. 2017. Preserving grammatical functions in LFG. In Victoria Rosén & Koenraad De Smedt (eds.), *The very model of a modern linguist: In honor of Helge Dyvik* (Bergen Language and Linguistics Studies (BeLLS), volume 8), 127–142. Bergen: University of Bergen.

Kaplan, Ronald M. & Joan Bresnan. 1982. Lexical-Functional Grammar: A formal system for grammatical representation. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 173–281. Cambridge, MA: MIT Press.

Keidan, Artemij. 2017. Subjecthood in Pāṇini's grammatical tradition. In A. Crisanti, C. Pieruccini, C. Policardi & P. M. Rossi (eds.), *Anantaratnaprabhava. Studi in onore di Giuliano Boccali* (vol. 1), 107–125. Milano: Ledizioni.

Kibort, Anna. 2001. The Polish passive and impersonal in Lexical Mapping Theory. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'01 Conference*, 163–183. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2001/pdfs/lfg01kibort.pdf.

Kibort, Anna. 2004. *Passive and passive-like constructions in English and Polish*. Ph.D. thesis, University of Cambridge.

Kibort, Anna. 2007. Extending the applicability of Lexical Mapping Theory. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'07 Conference*, 250–270. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2007/papers/lfg07kibort.pdf.

Kiparsky, Paul. 1987. Morphology and grammatical relations. MS, Stanford University.

Kiparsky, Paul. 1988. Agreement and linking theory. MS, Stanford University.

Kiparsky, Paul. 1997. The rise of positional licensing. In Ans van Kemenade & Nigel Vincent (eds.), *Parameters of morphosyntactic change*, 460–494. Cambridge: Cambridge University Press.

Kiparsky, Paul. 2001. Structural case in Finnish. *Lingua* 111. 315–376. https://doi.org/10.1016/S0024-3841(00)00035-8.

Kiparsky, Paul. 2009. On the architecture of Pāṇini's grammar. In Gérard Huet, Amba Kulkarni & Peter Scharf (eds.), *Sanskrit computational linguistics: First and second international symposia, Rocquencourt, France, October 29–31, 2007; Providence,* *RI, USA, May 15–17, 2008, revised selected papers*, 33–94. Berlin: Springer. https://doi.org/10.1007/978-3-642-00155-0_2.

Kulkarni, Amba, Pavankumar Satuluri, Sanjeev Panchal, Malay Maity & Amruta Malvade. 2020. Dependency relations for Sanskrit parsing and treebank. In *Proceedings of the 19th international workshop on treebanks and linguistic theories*, 135–150. Düsseldorf: Association for Computational Linguistics. https://aclanthology.org/2020.tlt-1.12.pdf.

Kulkarni, Amba & Dipti Misra Sharma. 2019. Pāṇinian syntactico-semantic relation labels. *Proceedings of the fifth international conference on dependency linguistics (Depling, SyntaxFest 2019)* 198–208. https://aclanthology.org/W19-7724.pdf.

Laczkó, Tibor. 2021. On the inventory of grammatical functions in LFG from a Hungarian perspective. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'21 Conference*, 181–201. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2021/lfg2021-laczko.pdf.

Lowe, John J. 2015a. *Participles in Rigvedic Sanskrit: The syntax and semantics of adjectival verb forms*. Oxford: Oxford University Press.

Lowe, John J. 2015b. The syntax of Sanskrit compounds. *Language* 91(3). e71–e115.

Lowe, John J. 2024. *Modern linguistics in ancient India*. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781009364522.

Lowe, John J., Adriana Molina-Muñoz & Antonia Ruppel. 2019. Causatives and their passives in Sanskrit. In Miriam Butt, Tracy Holloway King & Ida Toivonen (eds.), *Proceedings of the LFG'19 conference*, 212–232. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2019/lfg2019-lmr.pdf.

Lowe, John J., Adriana Molina-Muñoz & Antonia Ruppel. 2024. Passive and causative Sanskrit. *Bhāṣā (Journal of South Asian Linguistics, Philology and Grammatical Traditions)* 3(1). 1–48. https://doi.org/10.30687/bhasha/2785-5953/2024/01/001.

Manning, Christopher D. & Ivan A. Sag. 1998. Argument structure, valence, and binding. *Nordic Journal of Linguistics* 21. 107–144. https://doi.org/10.1017/S0332586500004236.

Mohanan, Tara. 1990. *Arguments in Hindi*. Ph.D. thesis, Stanford University.

Nordlinger, Rachel. 1998. *Constructive case: Evidence from Australian languages*. Stanford, CA: CSLI Publications.

Nordlinger, Rachel. 2000. Australian case systems: Towards a constructive solution. In Miriam Butt & Tracy Holloway King (eds.), *Argument realization*, 41–72. Stanford, CA: CSLI Publications.

Ostler, Nicholas. 1979. *Case-linking: a theory of case and verb diathesis applied to Classical Sanskrit*. Ph.D. thesis, MIT.

Patejuk, Agnieszka & Adam Przepiórkowski. 2016. Reducing grammatical functions in LFG. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, 541–559. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2016.28.

Przepiórkowski, Adam. 2016. How *not* to distinguish arguments from adjuncts in LFG. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, 560–580. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2016.29.

Szűcs, Péter. 2018. A COMP-less approach to Hungarian complement clauses. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'18 conference*, 325–342. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2018/lfg2018-szucs.pdf.

Szűcs, Péter. 2024. In defense of a COMP-less approach to Hungarian finite clauses. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 conference*, 244–263. Konstanz: Publikon. https://lfg-proceedings.org/lfg/index.php/main/article/view/50.

Zaenen, Annie. 1993. Unaccusativity in Dutch: Integrating syntax and lexical semantics. In James Pustejovsky (ed.), *Semantics and the lexicon*, 129–161. Dordrecht: Kluwer.

Zaenen, Annie & Joan Maling. 1983. Passive and oblique case. In Lori S. Levin, Malka Rappaport & Annie Zaenen (eds.), *Papers in Lexical-Functional Grammar*, 159–191. Bloomington, IN: Indiana University Linguistics Club.

TAG + metagrammar, LFG, HPSG and lexicalism

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Abstract

This paper deals with lexicalism and recent proposals that suggest that argument structure constructions can be or should be handled on a phrasal level. I first provide some general background, then discuss a particular proposal made in Tree Adjoining Grammar and provide a lexical alternative within the framework of HPSG. The paper ends with a comparison of Distributional Morphology and recent DM-based LFG approaches and lexical rule-based HPSG proposals.

1 Introduction

This paper deals with lexicalism and recent proposals that suggest that argument structure constructions can be or should be handled on a phrasal level.[†] I first provide some general background, then discuss a particular proposal made in Tree Adjoining Grammar and provide a lexical alternative within the framework of HPSG. The paper ends with a comparison of Distributional Morphology and recent DM-based LFG approaches and lexical rule-based HPSG proposals.

Phrasal approaches to argument structure constructions became popular with the work of Goldberg (1995). Goldberg works in the framework of Construction Grammar (CxG; Lakoff 1987, Fillmore, Kay & O'Connor 1988). (1a) shows a key example from Goldberg (1995: 29, 55):

(1) a. Sam sneezed the napkin off the table.
  b. * Sam sneezed the napkin.
  c. Sam sneezed.

The verb *sneeze* is an intransitive, mono-valenced verb, as the examples (1b,c) show. (1a) has a causative meaning. Goldberg argues that this meaning component is not contributed by any of the lexical items but by the complete configuration. By inserting *sneeze* into a certain configuration, we get an argument extension (additional object *the napkin* and the oblique *off the table*) and additional meaning components (the causation).

Goldberg's approach was and is very successful, since it is so "obviously right". There is a direct connection between form and meaning and this is compatible with pattern-based approaches to language acquisition.

The alternatives are lexical frameworks like Lexical Functional Grammar (LFG; Dalrymple 2023), Head-Driven Phrase Structure Grammar (HPSG; Müller, Abeillé, Borsley & Koenig 2024), and Categorial Grammar (CG; Steedman & Baldridge 2006). These frameworks assume that valence information is associated with lexical heads and in the case of HPSG and CG there are very general syntactic rules that combine heads with arguments. So, what about these proposals? Should they be given up? Well, if one reads up on the history of syntactic theory, one will notice that there were phrasal

[†]I thank Alex Alsina for inviting me to the LFG 2025 conference and all participants for discussion. I also thank three anonymous reviewers of CSSP 2025 for comments on a six page abstract on TAG and Construction Grammar and the LFG reviewers for the post-conference reviewing. Special thanks go to Ash Asudeh for discussion during the conference and for reviewing the post-conference submission. All mistakes in the final paper were newly introduced by me.

approaches in the seventies and eighties. The framework of Generalized Phrase Structure Grammar (GPSG; Gazdar, Klein, Pullum & Sag 1985) is rather similar to phrasal Construction Grammar. Heads are not associated with valence information but have numbers instead, which are used to assign lexical elements to slots in phrase structure rules. Within such a setting, *sneezed* can be inserted into a rule for Caused Motion Constructions as in (1a) or into the rule for intransitives like (1c).

In her review of the GPSG book by Gazdar et al. (1985), Jacobson (1987) pointed out many problems of this phrasal approach and showed that they have simple lexical solutions within Categorial Grammar. Nerbonne (1986) and Johnson (1986) found out that German partial fronting poses an inherent problem for GPSG, since the fronted verbs can be fronted together with all subsets of the arguments they would usually take. The solution they came up with is basically a Categorial Grammar solution remodeled in GPSG. As I pointed out in Müller (2016: Section 5.5.1), there is an additional problem: morphology needs to have access to valence information. Consider the following examples of *-bar* '-able' derivation:

(2) a. Ich unterstütze den Mann.
I support the.ACC man

b. Der Mann ist unterstützbar.
the.NOM man is supportable

c. Ich helfe dem Mann.
I help the.DAT man

d. * Der Mann ist helfbar.
the.NOM man is helpable

There is no obvious difference in semantics between the verbs *helfen* 'to help' and *unterstützen* 'to support' from which a difference in case could be derived.[1] *-bar* '-able' derivation productively applies only to verbs taking both a nominative and an accusative (Riehemann 1998: 55). If morphology cannot see this information, since it is hidden in numbers, as in GPSG, or since valence information is added on the phrasal level only, there is a problem.[2,3]

[1]Thanks to Ash Asudeh, who pointed out to me that *help* and *support* can be coordinated. This is also possible for *helfen* 'to help' und *unterstützen* 'to support':

(i) Wir helfen und unterstützen.
we help and support
(https://www.hilfelotse-berlin.de/detail/wir-helfen-und-unterstuetzen, 2025-12-04)

Such a coordination would be pointless, if the meaning were identical.

[2]A reviewer remarks that the numbers are visible to the morphology component. This is true, but the information about valence is hidden in the numbers. For example, in Uszkoreit's (1987: 165–166) GPSG grammar of German the rule numbers 6 and 8 are the numbers for rules into which strictly transitive and ditransitive verbs can be inserted. There is nothing in the symbols 6 and 8 that gives the information away that these verbs govern an accusative. The *-bar* would have to specify that it only combines with verbs of class 6 and 8. This would not capture the fact that the *-bar* '-able' derivation is something like passivization – something that has to do with accusative objects. So GPSG is better off than phrasal approaches which add information about valence at the phrasal level, but still I do not consider the number selection approach satisfying.

[3]Morphology also interacts with resultative constructions. Due to space limitations, I could not include

The insights from this discussion have been ignored and phrasal approaches were suggested in the framework of CxG and later also in other frameworks. Since Mainstream Generative Grammar and Construction Grammar seem to be the two big currents in theoretical linguistics nowadays, many researchers from smaller alternative non-mainstream generative theories teamed up with Construction Grammar. Most variants of CxG are not or insufficiently formalized and proponents of other frameworks try to show that their framework can be seen as a formalization of CxG ideas. The following list cites some of the attempts or comparisons:

- Constructional HPSG (Sag 1997, Müller et al. 2024, Müller 2024)
- Simpler Syntax (Culicover & Jackendoff 2005, Culicover & Varaschin 2025)
- Sign-Based Construction Grammar (SBCG, an HPSG variant; Sag 2012, 2010: 486)
- Lexical Functional Grammar (Asudeh, Dalrymple & Toivonen 2013, Findlay 2023)
- Dependency Grammar (DG; Osborne & Groß 2012)
- Tree Adjoining Grammar (TAG; Lichte & Kallmeyer 2017, Kallmeyer & Osswald 2013, Seyffarth 2019, 2023)

Of course the question is what defines a Construction Grammar (Müller 2024). If the idea of form-meaning pairs is considered crucial, then all frameworks listed above in all variants can be considered Construction Grammars. This includes lexicalized models of HPSG, LFG, DG, and TAG (Joshi, Levy & Takahashi 1975, Joshi & Schabes 1997, Abeillé & Rambow 2000) and Sag, Boas & Kay (2012: Section 2.3) explicitly follow my arguments for lexical approaches in their introductory chapter on Sign-Based Construction Grammar. But some authors working in the frameworks mentioned try to provide formalizations of Goldbergian ideas and as I showed in several publications they fail. I believe that the reasons for failure are inherent in the nature of language. For a selection of papers discussing the issues see Müller (2006, 2010, 2013b, 2018a) and Müller & Wechsler (2014). The conclusion of this work is: all phenomena having to do with valence should be treated lexically.

the discussion of morphology in this paper. The interested reader is referred to Müller (2025). For example, the resultative construction *leer fischen* 'to fish something empty' can be used in *-bar* '-able' derivation and in *Ge- -e*-nominalization: *leerfischbar* 'possible to be fished empty', *Leergefische* 'repeated annoying fishing empty of something'. Note that the nominalization is discontinuous. The word internal structure is completely different from what was suggested for phrasal TAG approaches on the sentential level and a complex raising mechanism for the linking of semantic arguments to syntactic arguments of the nominalized resultative construction would be needed. The parts of the construction in Figure 4 cannot be found in the structures of adjectives or nouns derived from the resultative construction. So these morphological derivations pose a problem for metagrammar TAGs and also for all other versions of TAG unless they assume lexical rules/metarules mapping trees to other trees or lexical items to other lexical items. For a description of the morphology of particle verbs and resultative constructions see Müller (2003b).

2 Tree Adjoining Grammar $\stackrel{?}{=}$ the perfect phrasal CxG

A body of recent work in Tree Adjoining Grammar suggests that phrasal ideas can be implemented in TAG rather directly (Lichte & Kallmeyer 2017, Kallmeyer & Oswald 2013, Seyffarth 2019, 2023) by relying on inheritance in a metagrammar-based approach. I want to look at these approaches and check whether some new technique was found that falsifies my earlier claims.

2.1 TAG and constructions

A first look at TAG suggests that this framework is ideal for capturing the phenomena that are important to CxG researchers. TAG works with so called elementary trees that are combined into larger trees. A tree usually contains all arguments of a head. This is also true for long distance dependencies: TAG has an extended domain of locality (Joshi & Schabes 1997: 95–96, 99–100, Lichte & Kallmeyer 2017: 208). TAG has two modes of combination: substitution and adjunction. They are demonstrated in Figure 1 and Figure 2.

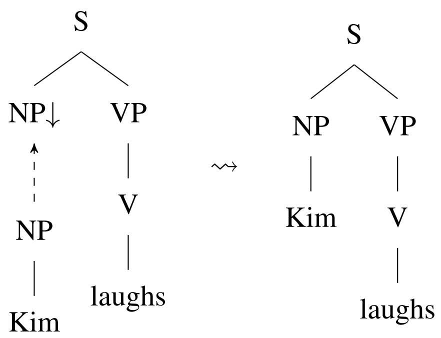

Figure 1: Substitution in TAG

TAG trees come with open slots into which other trees can be inserted. The elementary tree for *laughs* has such a slot for a subject NP. The NP tree of *Kim* is inserted there and a complete tree for *Kim laughs* results.

Trees can be taken apart again by the adjunction operation. This is shown in Figure 2. The tree for the adjunct *always* has two nodes with the same label (VP) and one of them is the top-most node and the other is marked with a '*'. The adjunction tree can be inserted at the appropriate place into another tree. The original tree is split up at a node that matches the one with the '*'.

TAG also has a convincing analysis of idioms with fixed material in discontinuous parts of idioms (Abeillé & Schabes 1989). Figure 3 shows the elementary tree for the analysis of the idiom *take sth into account*. TAG allows trees to have arbitrary amounts of fixed material, so *take* and *into account* are specified. In addition, there are open slots for NP arguments at appropriate places. The noun *account* is used without a determiner. Adjectives are impossible. Therefore the nodes in the tree of *into account* are marked as non-adjunction nodes (NA). This blocks adjunction of further material.

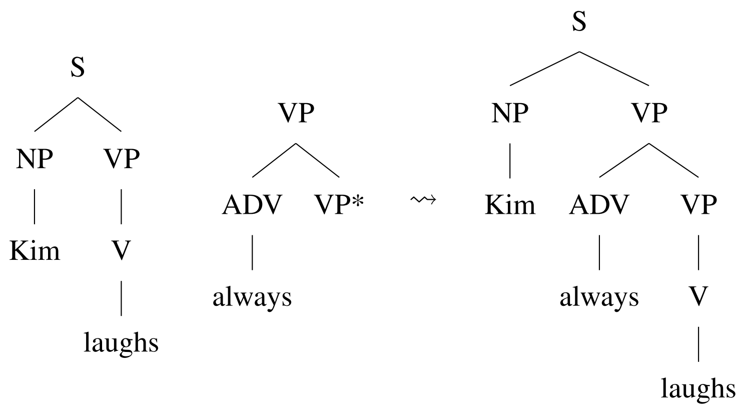

Figure 2: Adjunction in TAG

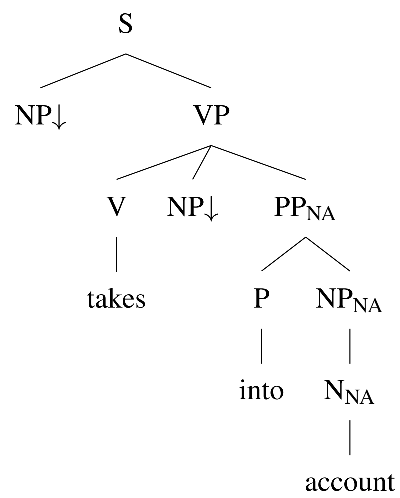

Figure 3: TAG elementary tree of the idiom *take into account*

Standard Lexicalized TAG (LTAG; Schabes, Abeillé & Joshi 1988) assumes that all trees are anchored; that is, there is at least one lexical element in a tree. Lexical items can be used with several trees, so-called tree families (Crabbé, Duchier, Gardent, Roux & Parmentier 2013: 594–595). For example, there can be active and passive trees for a certain verb. The trees in a tree family were assumed to be related to each other by lexical rules or metarules (Vijay-Shanker & Schabes 1992, Becker 1994). For example, a tree for a verb in the passive was assumed to be derived from a tree of the verb as it appears in active sentences (Vijay-Shanker & Schabes 1992: 210). Starting with the work of Candito (1998), metagrammars were used to describe trees and inheritance systems were used to capture generalizations. In some systems, trees are automatically computed from partial trees (Kallmeyer & Osswald 2013: 316, Lichte & Petitjean 2015: 199, Seyffarth 2023: 137).

I showed in earlier work that inheritance has mathematical limits and cannot be used to handle argument structure constructions and their alternations (Müller 2010, 2013a: Section 7.5.2, 2017). The question is now: Do metagrammars help? Are they different from inheritance-based systems? I will have a look at some of the phrasal approaches in the following subsection. For a more detailed discussion see Müller (2025).

2.2 Metagrammars and Frame Semantics

Lichte & Kallmeyer (2017) argued that the Caused-Motion Construction is a phrasal construction and provide the tree with a linked Frame Semantics AVM in Figure 4 that can be used in an analysis of (1a) repeated here as (3) for convenience.[4]

(3) Sam sneezed the napkin off the table.

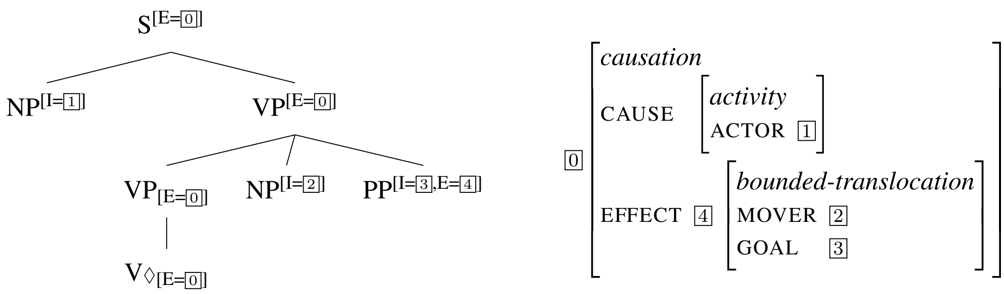

Figure 4: The Caused Motion Construction as phrasal construction according to Lichte & Kallmeyer (2017: 208)

'I' stands for internal content and 'E' for external content. The 'I' values are linked to contributions of NP arguments in the frame semantics and the 'E' values to values that are relevant for further composition. For example $\boxed{4}$ is the complete contribution of the PP.

The figure shows a tree that is not lexically anchored. Instead there is a node marked with ◇. This node is the node into which a lexical anchor has to be inserted. This is basically the Goldbergian idea that a verb enters a certain construction and the construction takes care of the realization of the appropriate arguments. In the case at hand the object and the PP of the Caused Motion Construction are realized together with the usual subject of the intransitive verb.

The figure corresponds to the general assumption in phrasal approaches that the linking to the arguments comes about only when all parts of the construction are realized together.

Lichte & Kallmeyer assume a metagrammar approach. All trees in a grammar are split into parts and parts can then be used to assemble various trees (p. 209). Figure 5 shows the metagrammar fragment that is relevant for the Caused Motion Construction.

There is a general tree for verbs taking an object and forming a VP with it (DirObj). There is a tree for verbs combining with a subject (Subj). The verb is dominated by a VP (dashed line). Arbitrary material may intervene. There is a tree for verbs forming a VP (the VSpine) and a VP tree including a directional PP (DirPrepObj). These

[4]Contrary to what Lichte & Kallmeyer (2017: 208) state, the E of the lexical anchor V◇ should contribute the value of CAUSE and be different from $\boxed{0}$.

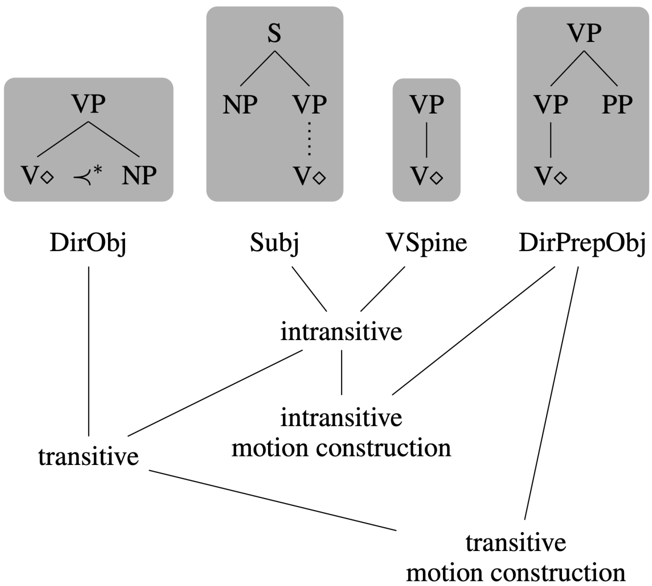

Figure 5: Metagrammar approach to Caused Motion Construction by Lichte & Kallmeyer (2017: 209)

tree fragments are combined in an inheritance hierarchy. The hierarchy is linguistically somewhat unintuitive with *transitive* being a subnode of *intransitive*.

In this view of the world active and passive are just alternative combinations of tree fragments. For example, Crabbé et al. (2013: 597) argue against lexical rules and suggest the following statements for active and passive trees instead:

(4) a. ActiveTransitiveVerb → Subject ∧ ActiveVerb ∧ CanonicalObject
   b. PassiveTransitiveVerb → Subject ∧ PassiveVerb ∧ CanonicalByObject
   c. TransitiveVerb → ActiveTransitiveVerb ∨ PassiveTransitiveVerb

Burkhardt, Lichte & Kallmeyer (2020) assume active and passive variants for resultative constructions (the Caused Motion Construction is a special case of resultatives, Goldberg & Jackendoff 2004: 540):

(5) Subject ∧ Resultative ∧
((ActiveVerb ∧ Direct-object) ∨ (active)
(PassiveVerb ∧ By-object) ∨ (passive, by-PP)
PassiveVerb) (passive, no by-PP)

The Resultative class is defined as shown in Figure 6. Note that this is basically a VP without a subject and an object. So this part of a tree is not what Goldberg sees as a resultative construction. It is a VP tree that basically looks like an adjunction structure rather than a VP including the result predicate and an object. This structure with the unary branching from V to VP is necessary to get the embedding of the semantics of the lexical anchor verb $\boxed{00}$ under the *causation* frame. (This is another instance of a class of examples that show that semantics needs embedding; see Müller 2006: 871, 2010: Section 4.2, 2017.)

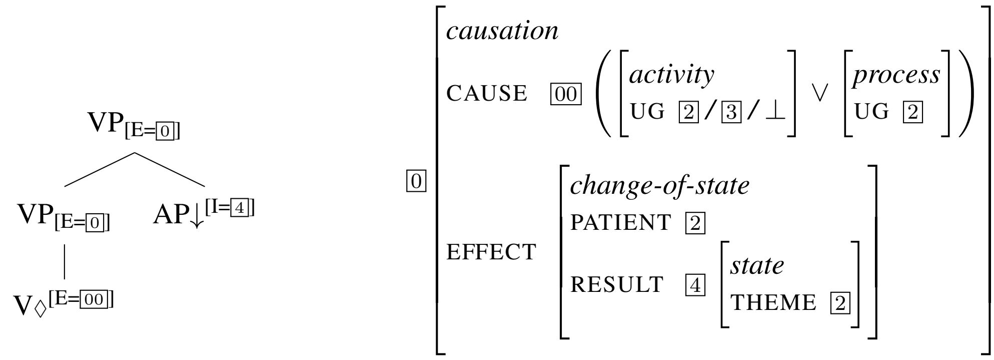

Figure 6: Resultative class in the metagrammar according to Burkhardt, Lichte & Kallmeyer (2020: 14)

In order to get the linking to subjects and objects, the following assumptions are made:

(6) a. Being a subject requires being an actor of an activity or an undergoer of a process.
  b. Being an object requires being an undergoer of an activity.
  c. The causation frame has actor and undergoer roles.
  d. There is a propagation mechanism of actor and undergoer roles.

Based on these assumptions, the tree parts for sentences with subject and object are formulated as in Figure 7.[5] They link subjects and objects to actor and undergoer roles (see Van Valin & LaPolla 1997 on these macroroles).

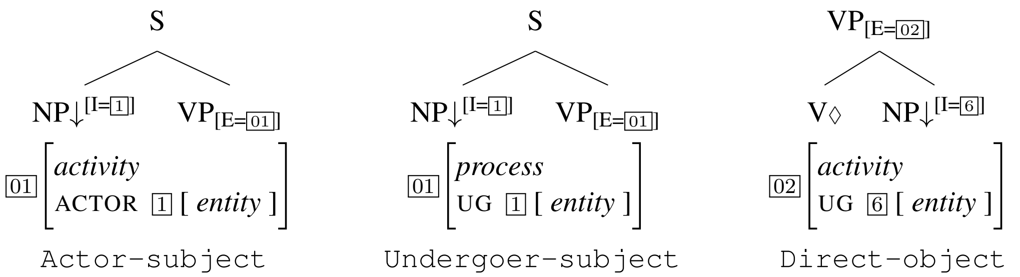

Figure 7: Subject and object classes according to Burkhardt, Lichte & Kallmeyer (2020: 15)

Without the assumptions in (6) and the subject and object construction parts in Figure 7, there would not be a link between the verb and the subject and object in phrasal constructions.

Figure 8 shows the result of the combination of Actor-subject, Direct-object, and Resultative class. The different classes are color-coded. The external semantics of the Resultative class ($\boxed{0}$) is identified with ($\widehat{=}$) the external semantics of the Subject class VP ($\boxed{01}$). This way the *causation* frame is the frame of the complete utterance. The

[5]This is refined later. Undergoers of activities can be subjects as well, if the VP is a passive VP. So the authors suggest two classes for activities, one for active sentences and one for passive sentences.

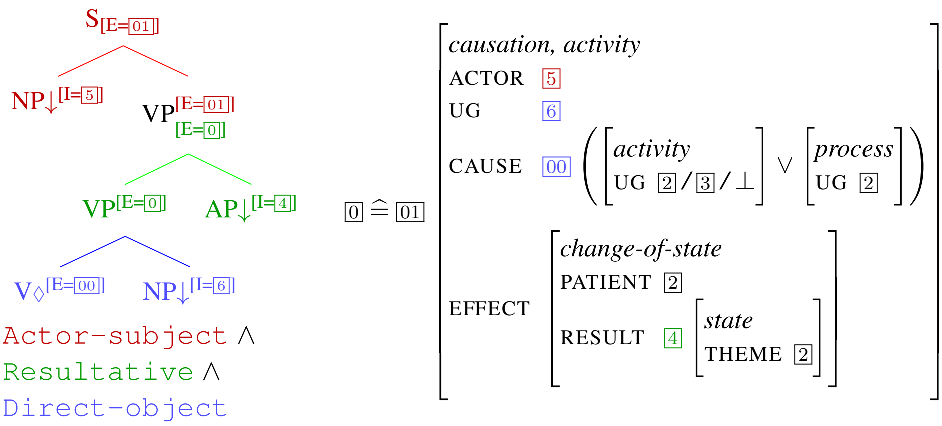

Figure 8: Combination of Actor-subject, Direct-object, and Resultative class

activity of the anchor verb ($\boxed{00}$) is identified with the CAUSE and hence embedded under the *causation* frame.

The assumptions in (6) have to be talked about, since subjects may be expletives as in (7a,b) and direct objects may be raised from the result predicate as in (7b):

(7) a. It rained.

b. Kim fishes the pond empty.

The NP in (7b) is not an undergoer of *fish*. It is fish that is fished not the pond. The undergoer of the verb *fish* is not expressed.

In addition, German has examples like (8):[6]

(8) Es regnet die Stühle nass.
it rained the chairs wet
'The chairs got wet because of the rain.'

This example and the example in (7b) suggests that the representation of the causative semantics should be as given in Figure 6; that is: there is a cause and an effect but no further semantic roles in the causation frame. See also Dowty (1979: 93) and Müller (2002: 226–227, 241) for such representations. Jackendoff (1990: 232) and Pustejovsky (1991: 65) suggest different representations but all without an actor and undergoer of the cause relation.

However, Kallmeyer, Lichte, Osswald & Petitjean (2016: 54) assume the following rules for the assignment and percolation of macroroles:

(9) a. if an effector exists, then it is the actor

b. a patient is always an undergoer

[6](8) is taken from Wunderlich (1995: 455). See also Wunderlich (1997: 118) for a similar example. Felfe (2020: 256) discusses the attested German example in (i):

(i) [...] und am Ende hagelt es die Ernte kaputt.
and at.the end hails it the crop to.pieces
'and in the end it hails and destroys the crop'

The linking problems would have to be solved for German as well.

c. a mover is always an effector
d. an emoter is always an experiencer
e. if the cause of a causation has an effector, then this is also the effector of the entire causation
f. if the effect of a causation has a patient, this is also the patient of the causation event
g. the patient of a change-of-state is the patient of the embedded result state

Figure 9 shows the analysis of (7b) without added macroroles. The internal con-

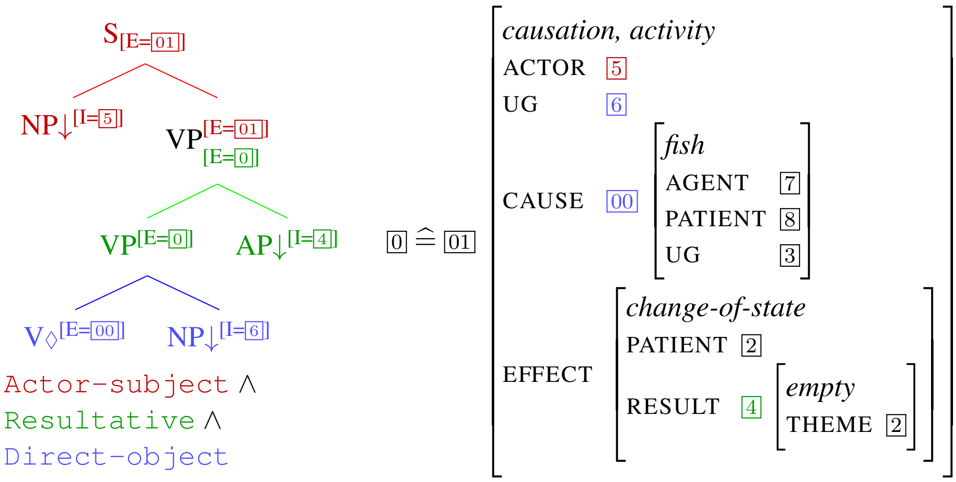

Figure 9: Combination of Actor-subject, Direct-object and Resultative class for *Kim fishes the pond empty* without inferred macroroles

tent of the subject ($\boxed{5}$) and the object ($\boxed{6}$) are linked to the actor and undergoer of the outermost frame, the *causation* frame. They are not linked to anything else in the complete frame representation. But the metagrammar decomposition analysis requires such a linking. In the concrete case of (7b), the theme of the *empty* relation has to be linked to the object in the clause. This is done by linking the undergoer role of the *causation* relation to the undergoer of *empty* via some intermediate undergoers in the chain of embedded relations (*causation*(*change-of-state*(*empty*))).

Figure 10 shows the added actor and undergoer macroroles. The rules in (9) add macroroles to the predicates that are provided by the involved words in the analysis and by the metagrammar classes. Because of this system of percolating macroroles (e.g., (9f) and (9g)), the undergoer macrorole of the *causation* is identified with the undergoer macrorole of *empty*, via the undergoer role of *change-of-state*.[7] A rule of the kind in (9e) identifies the actor of the whole *causation* with the actor of the *cause*. It is only because of this percolation that the assumption can be upheld that actor and undergoer are available at the outer-most level of sentential predication.

Based on the existence of expletive predicates as the cause and raised objects or fake reflexives, I would not assume an actor or an undergoer role for the *causation* frame. But

[7] Burkhardt et al. (2020) do not provide their system for the identification of macroroles. (9) is an approximation of what is needed for the current examples.

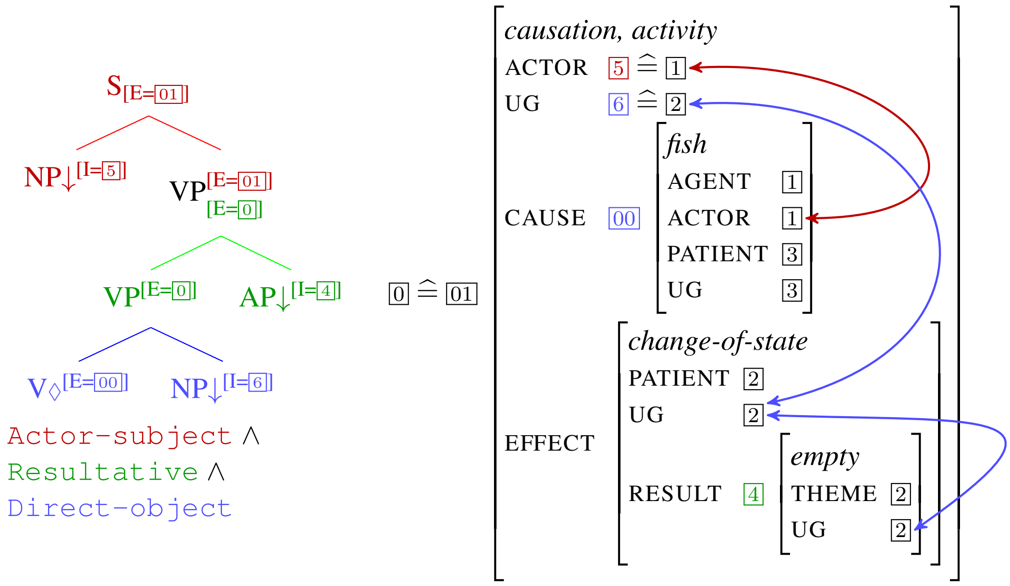

Figure 10: Object raising using propagation of undergoer information in frame semantic structures for *Kim fishes the pond empty*

this is required for the metagrammar decomposition analysis to work. If one looks at Figure 10 it becomes clear what is going on. The frame semantic structures are misused to establish a raising analysis within TAG: *causation* should be a two-place predicate rather than a relation between four arguments (actor, undergoer, cause, and effect).[8]

Compare the analysis in Figure 10 with the analysis of raising (functional control) in LFG (Bresnan 1982) in Figure 11. The similarities are obvious. The difference is that the LFG analysis uses the functional structure for an account of raising, while the frame-based TAG analysis uses semantic frames for this – a *semantic* structure that should not be used to encode *syntactic* relations.

The conclusion is that there are only two alternatives for the linking in the TAG analysis of the resultative construction under discussion: one option is to do it at the fully specified phrasal configuration as in Figure 4, which means that it could only be done at the lowest type *transitive motion construction* in Figure 5. This would mean that all the problems pointed out for phrasal approaches with fixed configurations would apply to this approach as well. The alternative is that semantic information that is deeply embedded and ultimately belongs to other predicates is made available in structures of embedding predicates as in Figure 10. This seems to be a hack.

[8]This also applies to the analysis of *leerfischbar* ‘empty fishable’ in (i).

(i) *modal-op*(*cause*(*fish*(x),*become*(*empty*(y))))

The modal operator does not have an undergoer, but an undergoer can be realized as an argument of the adjective.

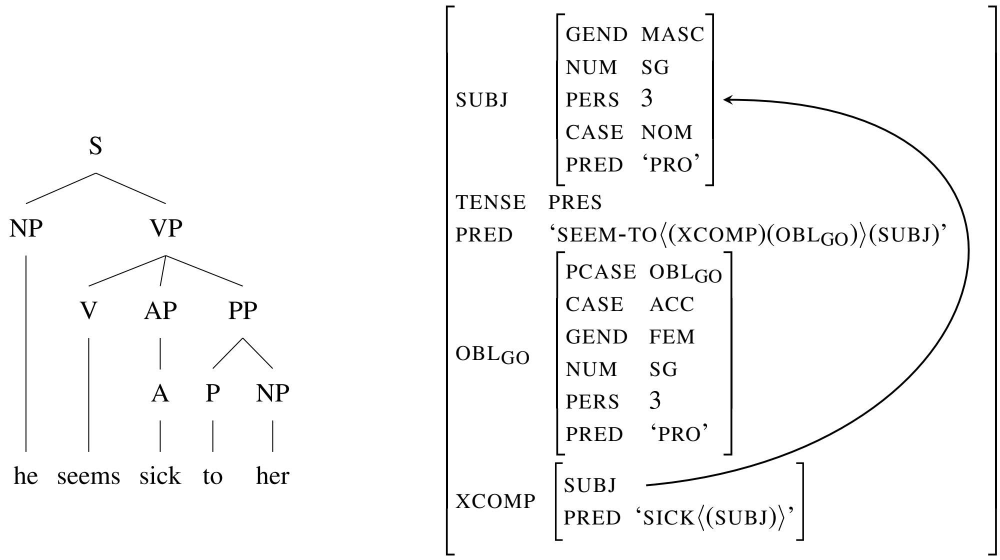

Figure 11: Raising in LFG at f-structure according to Bresnan (1982: 362)

2.3 Interation of valence changing processes

This section deals with valence changing processes. There are several "processes" that feed each other. This means that one rule creates the conditions for another rule to apply. Inheritance-based approaches cannot model such situations. Of course it will always be possible to come up with some tree for a certain syntactic configuration. The tree can be split into parts as it is in metagrammar approaches and the parts can be reassembled. But this basically amounts to writing down the language without any deeper insights about possible structures.

For example, benefactive and resultative constructions add arguments and the various variants of the passive suppress arguments. Languages like Lithuanian (Timberlake 1982), Irish (Noonan 1994), and Turkish (Özkaragöz 1986) show that several kinds of suppression can apply to one verb. The following Turkish examples are from Özkaragöz (1986: 77):[9]

(10) a. Bu ato-da bo-ul-un-ur. (Turkish)
this château-LOC strangle-PASS-PASS-AOR
'One is strangled (by one) in this château.'

b. Bu oda-da döv-ül-ün-ür.
this room-LOC hit-PASS-PASS-AOR
'One is beaten (by one) in this room.'

c. Harp-te vur-ul-un-ur.
war-LOC shoot-PASS-PASS-AOR
'One is shot (by one) in war.'

[9]The glosses are taken over from the original, but as will be discussed below these examples are not instances of double passivization but of a combination of passivization and the impersonal construction (Blevins 2003).

They are instances of the passive and the impersonal construction and are in a feeding relation (Blevins 2003) and I will argue that such phenomena are difficult to capture.

In metagrammar approaches, which often reject lexical rules (Crabbé et al. 2013: 597), possible configurations are just stated as conjunctions and disjunctions. For example, Crabbé et al. (2013: 597) assume the following conjunctions for active and passive transitive verbs:

(11) a. ActiveTransitiveVerb → Subject ∧ ActiveVerb ∧ CanonicalObject
b. PassiveTransitiveVerb → Subject ∧ PassiveVerb ∧ CanonicalByObject

ActiveVerb and PassiveVerb are just inflected verbs. In order to analyze the Turkish examples above, one would need ImpersonalPassiveVerb for verbs with correct inflection (passive suffix and impersonal suffix, glossed as PASS above). But in addition one would also need ImpersonalVerb and one would need further types for just impersonal constructions and impersonal constructions of passives. One could argue that these conjunctive types are somehow derived by computing an automatic closure of types in a metagrammar (Kallmeyer & Osswald 2013: 316, Lichte & Petitjean 2015: 199, Seyffarth 2023: 137). In such a system, one would have to specify which of the types are incompatible (in cases in which this does not follow from feature specifications). For example, Subject and ImpersonalPassiveVerb and CannonicalObject are incompatible. So one would not be better off.

Blevins (2003) suggested handling passivization and the impersonal construction via lexical rules. Both the passive and the impersonal construction suppress the subject. The object is promoted to subject in the passive, but nothing is promoted in the impersonal construction. It is important to note that the impersonal construction is not to be confused with the impersonal passive. The impersonal construction suppresses the subject and potential accusative objects can remain in the accusative (Blevins 2003: 495–496). By using a system of lexical rules to account for valence changing phenomena, one can have a passive rule mapping the object in the active to the subject in a passive and a further rule for impersonals that suppresses the new passive subject, which would have been the object in the active (Blevins 2003: 515). The interaction cannot be covered in an inheritance hierarchy containing descriptions of linguistic objects in terms of feature and value pairs, since if we inherit from the passive construction, we commit to a certain structure (Müller 2013b: 926–927).[10] If we would inherit from the impersonal construction as well, we would get conflicting information since we need embedding: the impersonal construction has to apply to the element that has been passivized before. So the passivized structure has to be the input for the impersonal construction. Note that the order of rule application is important. Passive creates the condition for the impersonal to apply. If one applies the impersonal first, a subjectless construction results, which cannot be the input to passivization, which is the suppression of the subject. This means that inheritance (without conditional constraints) cannot be used to model

[10]Timm Lichte (p. c. 2025) pointed out to me that it is possible to have conditional statements. These could be used to "check" whether the impersonal construction is combined with the passive and if it is not, a certain structure is enforced. The result is again that one creates a set of tree fragments that can be put together to give exactly the trees that are observable without capturing a connection between different realizations like active, passive and impersonal.

Ash Asudeh (p. c. 2025) suggested that Glue semantics as used in Asudeh et al. (2013) is another way of dealing with these phenomena, since the respective statements also involve implications.

the interaction of the two phenomena, since inheritance is just cumulation of constraints and it does not matter in which order one adds constraints conjunctively: A + B = B + A; independent of the order, we get the same constraints. This is different with embedding constructions (lexical rules or metarules). If we have two rules A and B, they can be constructed such that B can apply to the output of A but not vice versa. This results in a natural rule ordering, something that was argued against by proponents of metagrammar approaches (Crabbé et al. 2013: 597) and by some Construction Grammarians (Goldberg 1995: 107).

To get some idea about possible interactions between argument structure constructions, consider the data in (12):

(12) a. dass er fischt
that he.NOM fishes

b. dass gefischt wird
that fished is

c. * dass er den Teich fischt
that he.NOM the.ACC pond fishes

d. * dass der Teich gefischt wird
that the.NOM pond fished is

e. dass er den Teich leer fischt (resultative construction)
that he.NOM the.ACC pond empty fishes

f. dass der Teich leer gefischt wird (resultative construction + passive)
that the.NOM pond empty fished is

g. * dass er ihr fischt
that he.NOM her.DAT fishes

h. * dass er ihr den Teich fischt
that he.NOM her.DAT the.ACC pond fishes

i. dass er ihr den Teich leer fischt (rc + benefactive)
that he.NOM her.DAT the.ACC pond empty fishes
'that he fishes the pond empty for her'

j. * dass ihr der Teich gefischt wird
that her the.NOM pond fished is

k. dass ihr der Teich leer gefischt wird (rc + benefactive + passive)
that her.DAT the.NOM pond empty fished is
'that somebody fishes the pond empty for her'

l. dass sie den Teich leer gefischt bekommt (rc + benefactive + dative passive)
that she.NOM the.ACC pond empty fished becomes
'that somebody fishes the pond empty for her'

Some constructions extend the valence (benefactive adds a dative argument, resultative adds an accusative object and a result predicate), others reduce it (passive and dative passive). Some require the presence/absence of material. For example, the resultative construction requires a strictly intransitive verb as input. The object is licensed only if there is a result predicate. The benefactive dative is possible only if there is an accusative object as well. It seems to be impossible to compute all variants automatically by adding up partial trees without overgeneration.[11] For example, (12g) is ungrammatical, but the parts *er* 'he' *ihr* 'her' and *fischt* 'fishes' must be compatible, since these components appear together in (12i). That certain constituents have to appear together is usually taken care of in TAG by stating that they are part of a tree, but metagrammars deal with partial trees. So additional constraints are needed to avoid missing parts or additional parts that result in ill-formed trees.

During the past years there have been different suggestions concerning the nature of the Caused Motion Construction/Resultative Construction within phrasal TAG approaches. Lichte & Kallmeyer (2017) and Kallmeyer & Osswald (2013) suggested that there is a construction spanning the complete sentence. Seyffarth (2019, 2023) suggested a VP construction that is adjoined to another VP. Some authors suggested that the construction is built from small pieces with reference to f-structure-like semantics (Burkhardt et al. 2020). As argued above, the feeding relations between phenomena cannot be covered in inheritance-based approaches. Furthermore it is unclear how cases of argument adjuncts like the dative NPs of benefactives would be covered. They cannot simply be treated as adjuncts since they interact with the dative passive. Like arguments the benefactive datives can be promoted to subject and then turn into nominatives while keeping their benefactive semantics. I just mention this problem here and point the interested reader to Müller (2025) for a more detailed discussion. Integrating the benefactive NPs into elementary trees without lexical rules would amount to further "just writing things down".

2.4 Subjects without a macrorole

Figure 7 showed two classes for sentences with a subject: Actor-subject and Undergoer-subject. The actor is linked to activities, the undergoer to processes. As was stated by Burkhardt et al. (2020: 19) themselves, this is not enough since subjects in the passive can be undergoers. So the authors added another class for passive subjects. As I pointed out, a further class is needed for expletives. Expletives neither get a semantic role nor a macrorole (Van Valin & LaPolla 1997: 149–150) and they can be embedded under other predicates so that it is not straightforward to refer to the type of the relation to which the expletive belongs:

(13) a. It will start to rain soon.
     b. It seems to be raining over there.

Datives do not get a macrorole either (Van Valin & LaPolla 1997: 354–355), but they can be promoted to subject. Benefactives are semantically modifiers.[12] Some datives

[11] Kallmeyer & Osswald (2013: 316) assume explicit statements about incompatible types ruling out subtypes of the respective incompatible types which would result by automatic combination without such an incompatibility statement. For example, the hierarchy of lexical frames developed by Seyffarth (2023: 115) explicitly states incompatibilities between *animate* and *inanimate*, between *entity*, *event*, and *path* and between *intransitive_action* and *transitive_action*. If no incompatibility is stated, open-world reasoning (Krieger & Schäfer 1994: 9) applies and the types can be conjunctively combined. An example for this is shown in Figure 8 where the type of the outermost AVM is the conjunction of *causation* and *activity*.

[12] I treat them as selected elements (Müller 2018a: 68). They are introduced into the argument structure list of a verb in parallel with the respective semantics. This is similar to the lexical rule suggested by van Noord & Bouma (1994) for the introduction of adjuncts into valence lists.

are body-part datives, which are also not semantic arguments of a verb. So even if one assigned datives macroroles (a further hack to get semantic raising to work), one would have to assume strange percolation mechanisms that include benefactive datives and body-part datives while excluding other datives, for example datives that are arguments of modifying prepositions.

3 A simple solution using mappings to new linguistic objects

This section discusses the simple way out, which has been argued for for several decades now in lexicalist frameworks like Categorial Grammar, LFG, HPSG, and variants of TAG. What is needed is a tool that maps one linguistic representation onto another. Since general transformations of the kind used in earlier transformational grammar are psycholinguistically implausible (Bresnan 1978) and computationally intractable (Kay 2011: 9–10, Peters & Ritchie 1973), metarules or lexical rules of the type Goldberg (2013) called lexical templates are used in HPSG (Briscoe & Copestake 1999, Meurers 2001, Davis & Koenig 2024) and some versions of CxG (Kay 2005, Sag et al. 2012). Lexical rules relate lexical items with information about *potential* structure to other lexical items (Müller 2019) rather than relating objects representing *actual* structure as in GB or transformational variants of TAG (that is, variants with lexical rules or metarules mapping elementary trees to other elementary trees).

For the data described here, the following lexical rules (LRs) are needed:

1. Participle lexical rule blocking the designated argument (for perfect and passive; Haider 1986, Müller 2003a)

2. Benefactive lexical rule adding the dative argument for verbs that take a nominative and accusative (Müller 2018a: Chapter 7.2.3.1)

3. Resultative lexical rule adding an accusative object and a result predicate to a strictly intransitive verb (Simpson 1983, Verspoor 1997, Wechsler & Noh 2001: 399, Müller 2002: Chapter 5.2, 2018a: Chapter 7.2.3.2, Butt, King & Raza 2025: 23–24)

4. *-bar* '-able' derivation lexical rule (Riehemann 1998, Müller 2003b: Section 5.2.2)

5. *Ge- -e*-nominalization lexical rule (Müller 2002: Chapter 6.2.5.4, 2003b: Section 5.2.1)

The morphological rules are independent of the benefactive and the resultative lexical rules but interact in necessary ways with these.

Figure 12 shows the example analysis of (12i). The resultative lexical rule applies to a mono-valent version of *fisch-* 'fish'. It adds an accusative object and a result predicate to the argument structure list and takes care of the semantic embedding and the linking. The benefactive LR needs a verbal stem selecting a nominative and an accusative (two NPs with structural case) as input and adds a dative argument. The lexical rule for verbal inflection applies on top of this and then the combination with arguments takes place. Note that the stem resulting from the application of the benefactive lexical rule can be used in dative passives (12l) and in normal passives (12k). The monovalent stem

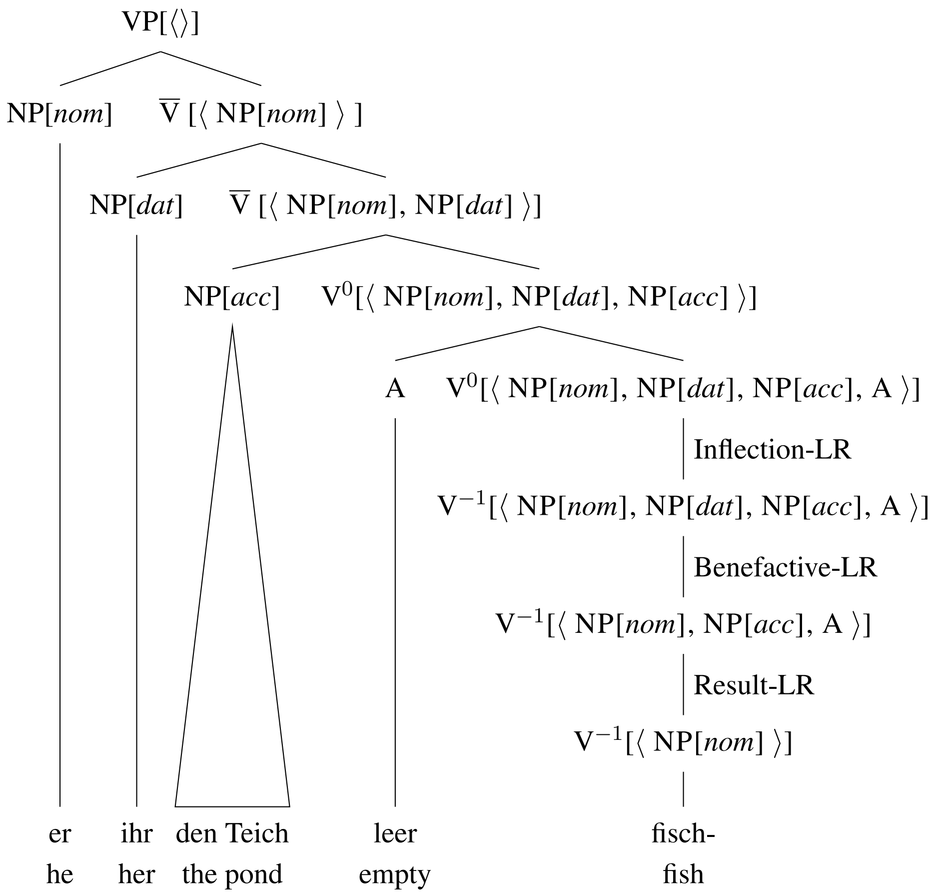

Figure 12: Analysis of [*dass*] *er ihr den Teich leer fischt* 'that he fishes the pond empty for her', an example in which the benefactive and the resultative construction interact

and the resultative stem can also be used in passives with the passive auxiliary *werden* ((12b) and (12f)). The lexical rules can only apply in the order given in Figure 12. There is a natural order of application. The problem of rule ordering that is frequently mentioned in the literature on argument structure (Goldberg 1995: 107, Crabbé et al. 2013: 596) does not exist. It does not exist in the fragment described here and I did not experience any rule ordering problems in any other part of grammars I worked on in the past 32 years (see Müller 2015 for a list of implemented grammars). Cases of alternation for which one does not want to assume a basic item from which other items are derived can be handled by disjunctions or by underspecification in the type hierarchy. See Bredenkamp, Markantonatou & Sadler (1996) on the latter.

4 Comments on lexical rules, Distributional Morphology, and LFG

The lexical rules that are assumed in HPSG are basically what Booij (2002, 2010) suggested under the name Construction Morphology. The general idea was suggested by

Riehemann (1993, 1998) much earlier within the framework of HPSG: lexical rules are basically unary branching rules in which material can be added to the phonology of the daughter. So for instance, in the lexical rule for *-bar* '-able' derivation, a verbal stem is taken as input and ⟨ *bar* ⟩ is added to the phonology of the verb. The projected category is an adjective stem contributing a modal operator scoping over the semantic contribution of the verbal daughter.

Among the arguments for this view of morphology was the point that one does not need to stipulate empty affixes (Riehemann 1998: 71), which would be needed in word-syntactic proposals of conversion and inflection. One does not need to assume subtractive morphemes or abstract morphs like Umlaut for the plural of *Mütter* 'mothers' of *Mutter* 'mother', since the projection of information allows the manipulation of phonological information within the rules.

It is sometimes claimed that lexical rules are non-monotonic and that the passive is derived from the active. This was true for transformational approaches and would be true for TAG approaches that map unfolded structures for active sentences onto complete structures for passive sentences. But it is not true for HPSG proposals which map verbal stems to finite word forms with an active argument structure and to participle word forms with passive argument structure. Lexical rules are monotonic. They do not change anything. The input lexical item is embedded within the output lexical item. It is just the usual mother–daughter relation. Daughters can be different from mothers. Having a mother does not change the daughter (Briscoe & Copestake 1999, Meurers 2001). Of course, the mother can differ from the daughter in arbitrary ways, but this is also true for approaches allowing for empty heads. For example, an empty nominal head can take a verbal argument and project its own part of speech and gender information and require arguments not required in this form by the verb.

Figure 13 shows the analysis of inflection using an empty affix and a unary branching rule. German feminine nouns have zero inflection in the singular. So, some affix-based approaches assume an empty affix.[13] Lexical rule-based approaches simply map a stem to a word without adding to the phonology. Recent LFG approaches (Lexical-Realizational Functional Grammar, L$_{\text{R}}$FG; Asudeh & Siddiqi 2025) assume something like Distributed Morphology (Halle & Marantz 1993) at the sublexical level. LFG syntax avoids empty elements by assuming a principle called "Economy of expression" (Dalrymple, Kaplan & King 2016). This principle basically prefers syntactic structures without empty elements, which results in branching with fewer daughters. The interesting thing is now that, if one applies this to the left picture, this results in unary branching rules for inflection as well. This is shown in Figure 13: if one removes the empty affix from the left figure, one gets the figure in the middle. See Bar-Hillel, Perles & Shamir (1961) for a general procedure to remove empty elements from phrase structure grammars. As I showed in Müller (2016: Chapter 19.5), the empty heads in Minimalist theories (Chomsky 1995) are like lexical rules: they can license additional arguments and add semantic information or change the semantic type. Of course these empty heads are also used in syntax, but the analog to unary branching lexical rules is also used in syntax in other frameworks. For example, syntactic type-shifting rules were suggested by Partee (1986), Flickinger (2008: 91–92), and Müller (2009, 2012).

[13] Others assume that the noun stem and the case affix are mapped to the form *Frau* as in the right picture in Figure 13. For analogous suggestions see Merchant (2015: 290), Asudeh, Bögel & Siddiqi (2023: 39).

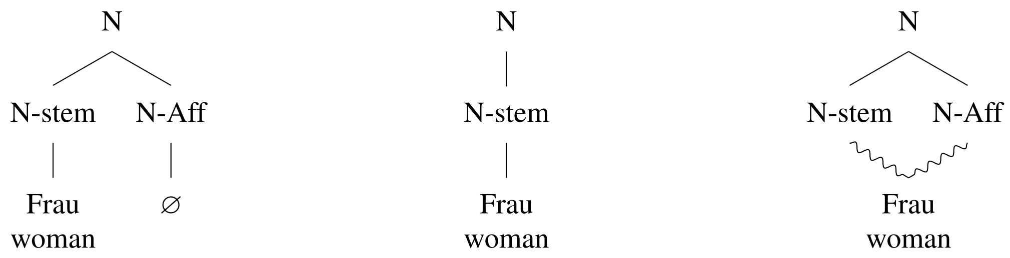

Figure 13: Empty affix vs. unary branching rule vs. approach with spanning

Turning to the details of $\mathrm{L_R}$FG, consider Figure 14. It contains nodes familiar from the DM literature: VoiceP, AgrP, TP. These categories are standard in Mainstream Generative Grammar but usually frowned upon in alternative theories. Non-mainstream theories usually assume that syntax is about distribution classes. They follow a what-you-see-is-what-you-get approach. So, if we talk about verbs and verbal projections, we assume that they are of the category *verb* or V. Of course, there are additional features that record finiteness and agreement information and so on. But there are no categories like NationalityP (Cinque 1994: 96, 99), VoiceP, HearerP, SpeakerP, TopicP, FocusP and so on (see Müller 2016: Section 4.6.1.1 for a list and discussion). These categories have been introduced into syntax because of the principle of Autonomy of Syntax (Chomsky 1977: 41–42), which does not allow reference to semantics, pragmatics and other "modules" of grammar (Müller 2023: Section 4.10.2.1).

So, the projected part-of-speech information should not be Voice or Agr but verb. But since lexical rules in HPSG are typed feature descriptions, they have "names". The passive lexical rule could have a type named *voice-lr*; the agreement lexical rule would be *agr-lr*. The feeding relation between lexical rules (mother-daughter relations) is like phrase structure rules:

(14) a. Agr′ $\rightarrow$ VoiceP Agr ($\mathrm{L_R}$FG)
b. agr-lr $\rightarrow$ voice-lr (ordered LRs)

So, after all, the approaches are similar enough to be comparable.

But there is an important point here when it comes to lexicalism. Lexicalists think that morphology differs from syntax and that there may also be other mechanisms at work. As already mentioned above, there are phenomena that would make the stipulation of subtractive morphs (Zimmermann 2017: 7) necessary. Furthermore, morphology is more templatic than syntax (Nordlinger 2010). So, Crysmann & Bonami (2012) and Bonami & Crysmann (2016) follow ideas of Matthews (1974), Spencer (1991), and Stump (2001) and argue that combinations and realizations of material in morphology are fundamentally different from syntactic combinations. (This does not preclude the option that morphology is described with AVMs like syntax. It can be AVMs and constructions all the way down, but the constructions may be different nevertheless.)

So instead of assuming a cascade of lexical rules or trees for functional projections that may or may not add phonological material, one lexical rule is assumed for inflection that can add material or not, or even subtract material. This provides a uniform mapping from uninflected to inflected words and avoids problems with languages in which parts of inflectional material are added in an order that is not predicted by the hierarchy of

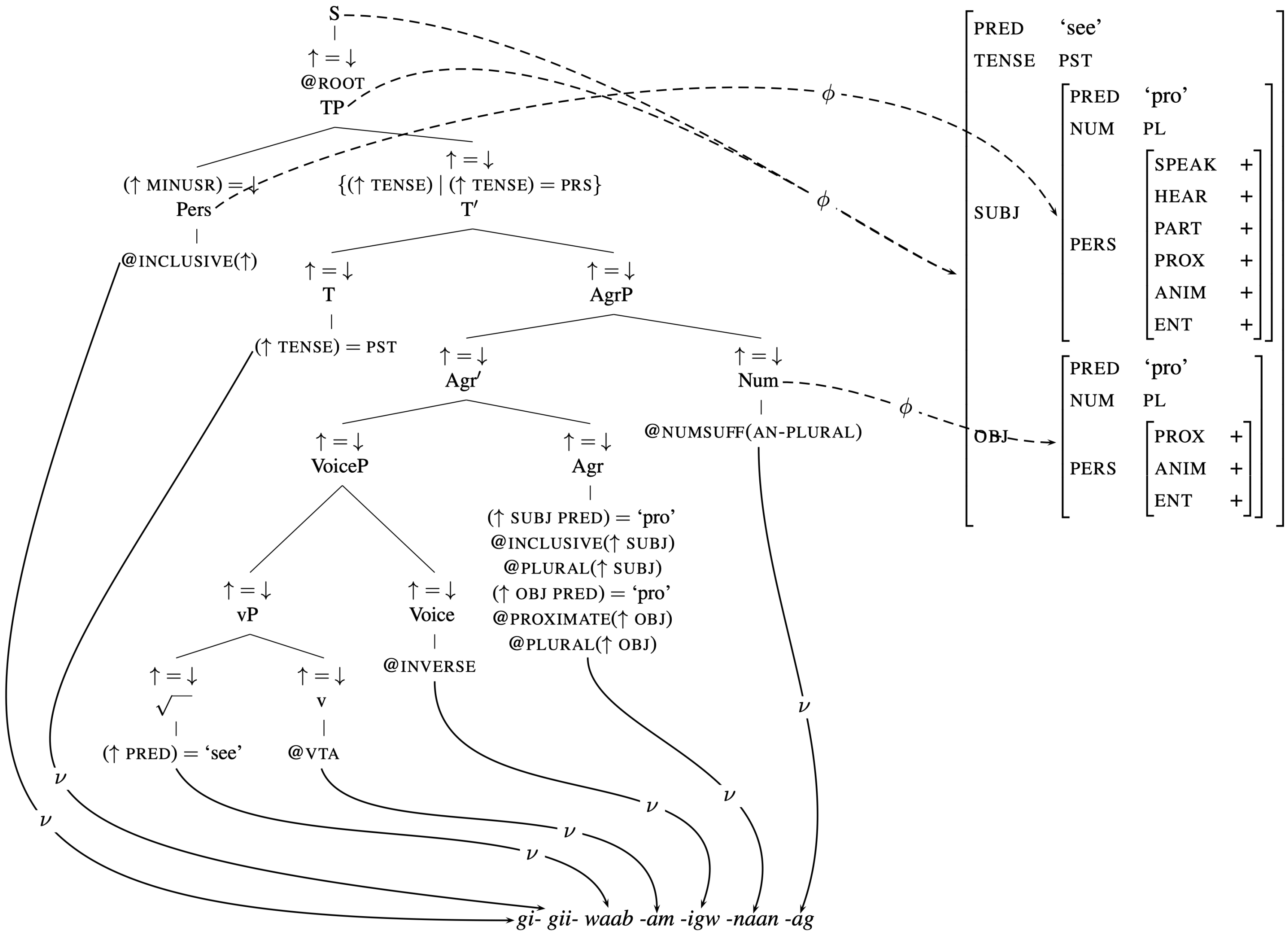

Figure 14: $\mathrm{L_RFG}$ c-structure, f-structure, and (simplified) v-structure for Ojibwe *gigiiwaabamigwnaanag* ‘They saw us(incl)’ according to Asudeh & Siddiqi (2023)

functional categories (see Crysmann & Bonami 2016: Section 3 for a general discussion of problems with the Mirror Principle).

Pointing out the templative nature of morphology and the existence of subtractive processes/morphemes and portmanteau phenomena will probably not impress proponents of Distributed Morphology and $\mathrm{L_RFG}$, but if the claim is that syntax and morphology basically use the same structures, arguments against functional projections in syntax should be relevant for the complete morpho-syntactic system. Haider (2010: 62–64) and Müller (2023: Section 4.10.2) argued against functional projections on various grounds. A relevant category is IP or TP, which is argued to be non-existent in grammars of German (Haider 1993, 1997, Berman 2003: Section 3.2.3.2, Müller 2018b: Section 3.5). TP and Agr projections, as present in Figure 14, are not assumed in grammars of German, although there is morphological information relevant for tense and subject-verb agreement. But if such functional projections are not assumed in syntax, their assumption in the morphological domain, which is claimed to be indistinguishable from syntax, would not make sense.

5 Conclusion

Lexicalism deals with several questions: "Where are arguments licenced?" and "What is visible to syntax?" I argued again for a lexical treatment of valence information and valence alternations. I also looked at more recent proposals in LFG that attempt to fuse LFG with work in Distributed Morphology. DM does not distinguish between syntax and morphology, but assumes that there are syntactic structures all the way down. I showed that at least the $\mathrm{L_RFG}$ approaches make assumptions about the sublexical level that are not made in LFG syntax proper. This means that there is an implicit assumption that morphology is different from syntax and this is what lexicalists believe.

References

Abeillé, Anne & Owen Rambow (eds.). 2000. *Tree Adjoining Grammars: Formalisms, linguistic analysis and processing* (CSLI Lecture Notes 107). Stanford, CA: CSLI Publications.

Abeillé, Anne & Yves Schabes. 1989. Parsing idioms in Lexicalized TAG. In Harold Somers & Mary McGee Wood (eds.), *Proceedings of the Fourth Conference of the European Chapter of the Association for Computational Linguistics*, 1–9. Manchester, England: Association for Computational Linguistics. https://www.aclweb.org/anthology/E89-1001 (28 December, 2025).

Asudeh, Ash, Tina Bögel & Dan Siddiqi. 2023. Modelling exponents. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG '23 Conference*, 23–44. Publikon. https://lfg-proceedings.org/lfg/index.php/main/article/view/38 (28 December, 2025).

Asudeh, Ash, Mary Dalrymple & Ida Toivonen. 2013. Constructions with lexical integrity. *Journal of Language Modelling* 1(1). 1–54. https://doi.org/10.15398/jlm.v1i1.56.

Asudeh, Ash & Daniel Siddiqi. 2023. Morphology. In Mary Dalrymple (ed.), *The handbook of Lexical Functional Grammar* (Empirically Oriented Theoretical Morphology and Syntax 13), 855–901. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185976.

Asudeh, Ash & Daniel Siddiqi. 2025. Realizational morphosemantics in LrFG. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG '25 Conference*, 21–40. Publikon.

Bar-Hillel, Yehoshua, Micha A. Perles & Eliahu Shamir. 1961. On formal properties of simple phrase-structure grammars. *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 14(2). 143–172. https://doi.org/10.1524/stuf.1961.14.14.143.

Becker, Tilman. 1994. *HyTAG: A new type of Tree Adjoining Grammars for hybrid syntactic representations of free word order languages*. Universität des Saarlandes. (Doctoral dissertation).

Berman, Judith. 2003. *Clausal syntax of German* (Studies in Constraint-Based Lexicalism 12). Stanford, CA: CSLI Publications.

Blevins, James P. 2003. Passives and impersonals. *Journal of Linguistics* 39(3). 473–520. https://doi.org/10.1017/S0022226703002081.

Bonami, Olivier & Berthold Crysmann. 2016. Morphology in constraint-based lexicalist approaches to grammar. In Andrew Hippisley & Gregory Stump (eds.), *The Cambridge handbook of morphology* (Cambridge Handbooks in Language and Linguistics 30), 609–656. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781139814720.022.

Booij, Geert. 2002. Constructional idioms, morphology, and the dutch lexicon. *Journal of Germanic Linguistics* 14(4). 301–329. https://doi.org/10.1017/S1470542702000168.

Booij, Geert. 2010. Construction morphology. *Language and Linguistics Compass* 4(7). 543–555. https://doi.org/10.1111/j.1749-818X.2010.00213.x.

Bredenkamp, Andrew, Stella Markantonatou & Louisa Sadler. 1996. Lexical rules: What are they? In Jun-ichi Tsujii (ed.), *Proceedings of COLING-96. The 16th International Conference on Computational Linguistics. Copenhagen, Denmark, August 5–9, 1996*, 163–168. Copenhagen: Association for Computational Linguistics. https://aclanthology.org/C96-1029/ (28 December, 2025).

Bresnan, Joan. 1978. A realistic Transformational Grammar. In Morris Halle, Joan Bresnan & George A. Miller (eds.), *Linguistic theory and psychological reality* (MIT bicentennial studies 3), 1–59. Cambridge, MA: MIT Press. https://mitpress-request.mit.edu/sites/default/files/titles/content/9780262580434_sch_0001.pdf (28 December, 2025).

Bresnan, Joan. 1982. Control and complementation. *Linguistic Inquiry* 13(3). 343–434. https://www.jstor.org/stable/4178286 (28 December, 2025).

Briscoe, Ted J. & Ann Copestake. 1999. Lexical rules in constraint-based grammar. *Computational Linguistics* 25(4). 487–526. https://aclanthology.org/J99-4002/ (28 December, 2025).

Burkhardt, Benjamin, Timm Lichte & Laura Kallmeyer. 2020. *An analysis of secondary predication with LTAG and semantic frames*. Handout, University of Düsseldorf

TreeGraSP Meeting #5. https://treegrasp.phil.hhu.de/wp-content/uploads/2020/11/meeting_5_LTAG_resultatives.pdf (28 December, 2025).

Butt, Miriam, Tracy Holloway King & Ghulam Raza. 2025. Wiping the table clean: What resultatives and complex predicates tell us about the nature of primary and secondary predication. In Carmel OShannessy, James Gray & Denise Angelo (eds.), *Projecting voices: Studies in language and linguistics in honour of Jane Simpson*, 81–116. Canberra: ANU Press. https://doi.org/10.22459/PV.2025.

Candito, Marie-Hélène. 1998. Building parallel LTAG for French and Italian. In Pierre Isabelle (ed.), *Proceedings of the 36th Annual Meeting of the Association for Computational Linguistics and 17th International Conference on Computational Linguistics*, 211–217. Montreal, Quebec, Canada: Association for Computational Linguistics. https://doi.org/10.3115/980845.980880.

Chomsky, Noam. 1977. *Essays on form and interpretation* (Studies in Linguistic Analysis 2). New York, NY: North Holland. https://archive.org/details/essaysonforminte00chom (28 December, 2025).

Chomsky, Noam. 1995. *The Minimalist Program* (Current Studies in Linguistics 28). Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/9780262527347.001.0001.

Cinque, Guglielmo. 1994. On the evidence for partial N movement in the Romance DP. In Guglielmo Cinque, Jan Koster, Jean-Yves Pollock, Luigi Rizzi & Raffaella Zanuttini (eds.), *Paths towards Universal Grammar: Studies in honor of Richard S. Kayne* (Georgetown studies in Romance literature), 287–309. Washington, D.C.: Georgetown University Press. https://doi.org/10.1017/CBO9780511554261.011.

Crabbé, Benoît, Denys Duchier, Claire Gardent, Joseph Le Roux & Yannick Parmentier. 2013. XMG: eXtensible MetaGrammar. *Computational Linguistics* 39(3). 591–629. https://doi.org/10.1162/COLI_a_00144.

Crysmann, Berthold & Olivier Bonami. 2012. Establishing order in type-based realisational morphology. In Stefan Müller (ed.), *Proceedings of the 19th International Conference on Head-Driven Phrase Structure Grammar, Chungnam National University Daejeon*, 123–143. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2012.8.

Crysmann, Berthold & Olivier Bonami. 2016. Variable morphotactics in Information-based Morphology. *Journal of Linguistics* 52(2). 311–374. https://doi.org/10.1017/S0022226715000018.

Culicover, Peter W. & Ray Jackendoff. 2005. *Simpler Syntax* (Oxford Linguistics). Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199271092.001.0001.

Culicover, Peter W. & Giuseppe Varaschin. 2025. *Deconstructing syntactic theory: A critical theory*. Oxford University Press. https://doi.org/10.1093/9780198947776.001.0001.

Dalrymple, Mary (ed.). 2023. *The handbook of Lexical Functional Grammar* (Empirically Oriented Theoretical Morphology and Syntax 13). Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10037797.

Dalrymple, Mary, Ronald M. Kaplan & Tracy Holloway King. 2016. Economy of expression as a principle of syntax. *Journal of Language Modelling* 3(2). 377–412. https://doi.org/10.15398/jlm.v3i2.82.

Davis, Anthony R. & Jean-Pierre Koenig. 2024. The nature and role of the lexicon in HPSG. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, 2nd edn. (Empirically Oriented Theoretical Morphology and Syntax 9), 133–184. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.13644994.

Dowty, David R. 1979. *Word meaning and Montague Grammar: The semantics of verbs and times in Generative Semantics and Montagues PTQ* (Synthese Language Library 7). Dordrecht: D. Reidel Publishing Company. https://doi.org/10.1007/978-94-009-9473-7.

Felfe, Marc. 2020. Von der Valenz zur Konstruktion und wieder zurück? Resultativkonstruktionen und kognate Objekte. *Linguistische Berichte* Sonderheft 28. Variation in der Argumentstruktur des Deutschen. 243–272.

Fillmore, Charles J., Paul Kay & Mary Catherine O'Connor. 1988. Regularity and idiomaticity in grammatical constructions: The case of *let alone*. *Language* 64(3). 501–538. https://doi.org/10.2307/414531.

Findlay, Jamie Y. 2023. Lexical Functional Grammar as a Construction Grammar. *Journal of Language Modelling* 11(2). 197–266. https://doi.org/10.15398/jlm.v11i2.338.

Flickinger, Dan. 2008. Transparent heads. In Stefan Müller (ed.), *Proceedings of the 15th International Conference on Head-Driven Phrase Structure Grammar, National Institute of Information and Communications Technology, Keihanna*, 87–94. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2008.5.

Gazdar, Gerald, Ewan Klein, Geoffrey K. Pullum & Ivan A. Sag. 1985. *Generalized Phrase Structure Grammar*. Cambridge, MA: Harvard University Press.

Goldberg, Adele E. 1995. *Constructions: A Construction Grammar approach to argument structure* (Cognitive Theory of Language and Culture). Chicago, IL: The University of Chicago Press.

Goldberg, Adele E. 2013. Argument structure Constructions vs. lexical rules or derivational verb templates. *Mind and Language* 28(4). 435–465. https://doi.org/10.1111/mila.12026.

Goldberg, Adele E. & Ray Jackendoff. 2004. The English resultative as a family of constructions. *Language* 80(3). 532–568. https://doi.org/10.1353/lan.2004.0129.

Haider, Hubert. 1986. Fehlende Argumente: Vom Passiv zu kohärenten Infinitiven. *Linguistische Berichte* 101. 3–33.

Haider, Hubert. 1993. *Deutsche Syntax – generativ: Vorstudien zur Theorie einer projektiven Grammatik* (Tübinger Beiträge zur Linguistik 325). Tübingen: Gunter Narr Verlag.

Haider, Hubert. 1997. Projective economy: On the minimal functional structure of the German clause. In Werner Abraham & Elly van Gelderen (eds.), *German: Syntactic problems—Problematic syntax* (Linguistische Arbeiten 374), 83–103. Tübingen: Max Niemeyer Verlag. https://doi.org/10.1515/9783110914726-006.

Haider, Hubert. 2010. *The syntax of German* (Cambridge Syntax Guides). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511845314.

Halle, Morris & Alec Marantz. 1993. Distributed morphology and the pieces of inflection. In Kenneth Hale & Samuel Jay Keyser (eds.), *The view from building 20:*

Essays in linguistics in honor of Sylvain Bromberger (Current Studies in Linguistics 24), 111–176. Cambridge, MA: MIT Press.

Jackendoff, Ray. 1990. *Semantic structures* (Current Studies in Linguistics 18). Cambridge, MA: MIT Press.

Jacobson, Pauline. 1987. Review of Gerald Gazdar, Ewan Klein, Geoffrey K. Pullum, and Ivan A. Sag, 1985: Generalized Phrase Structure Grammar. *Linguistics and Philosophy* 10(3). 389–426. https://doi.org/10.1007/BF00584132.

Johnson, Mark. 1986. A GPSG account of VP structure in German. *Linguistics* 24(5). 871–882. https://doi.org/10.1515/ling.1986.24.5.871.

Joshi, Aravind K., Leon S. Levy & Masako Takahashi. 1975. Tree Adjunct Grammars. *Journal of Computer and System Science* 10(1). 136–163. https://doi.org/10.1016/S0022-0000(75)80019-5.

Joshi, Aravind K. & Yves Schabes. 1997. Tree-Adjoning Grammars. In Grzegorz Rozenberg & Arto Salomaa (eds.), *Handbook of formal languages: Beyond words*, vol. 3, 69–123. Berlin: Springer-Verlag. https://doi.org/10.1007/978-3-642-59126-6_2.

Kallmeyer, Laura, Timm Lichte, Rainer Osswald & Simon Petitjean. 2016. Argument linking in LTAG: A constraint-based implementation with XMG. In David Chiang & Alexander Koller (eds.), *Proceedings of the 12th International Workshop on Tree Adjoining Grammars and Related Formalisms (TAG+12)*, 48–57. Düsseldorf, Germany. https://aclanthology.org/W16-3305 (28 December, 2025).

Kallmeyer, Laura & Rainer Osswald. 2013. Syntax-driven semantic frame composition in Lexicalized Tree Adjoining Grammars. *Journal of Language Modelling* 1(2). 267–330. https://doi.org/10.15398/jlm.v1i2.61.

Kay, Martin. 2011. Zipf's law and *L'Arbitraire du Signe*. *Linguistic Issues in Language Technology* 6(8). Special Issue on Interaction of Linguistics and Computational Linguistics, 1–25. https://doi.org/10.33011/lilt.v6i.1251.

Kay, Paul. 2005. Argument structure constructions and the argument-adjunct distinction. In Mirjam Fried & Hans C. Boas (eds.), *Grammatical constructions: Back to the roots* (Constructional Approaches to Language 4), 71–98. Amsterdam: John Benjamins Publishing Co. https://doi.org/10.1075/cal.4.05kay.

Krieger, Hans-Ulrich & Ulrich Schäfer. 1994. *$\mathcal{TDL}$—A type description language for HPSG. Part 1: Overview*. Research Report RR-94-37. Saarbrücken: Deutsches Forschungszentrum für Künstliche Intelligenz. https://doi.org/10.22028/D291-25048.

Lakoff, George. 1987. *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago, IL: The University of Chicago Press.

Lichte, Timm & Laura Kallmeyer. 2017. Tree-Adjoining Grammar: A tree-based constructionist grammar framework for natural language understanding. In Luc Steels & Jerome Feldman (eds.), *Proceedings of the AAAI 2017 Spring Symposium on Computational Construction Grammar and Natural Language Understanding* (Technical Report SS-17-02), 205–212. Palo Alto, CA: Association for the Advancement of Artificial Intelligence. https://cdn.aaai.org/ocs/15330/15330-68218-1-PB.pdf (28 December, 2025).

Lichte, Timm & Simon Petitjean. 2015. Implementing semantic frames as typed feature structures with XMG. *Journal of Language Modelling* 3(1). 185–228. https://doi.org/10.15398/jlm.v3i1.96.

Matthews, Peter H. 1974. *Morphology: An introduction to the theory of word-structure*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139166485.

Merchant, Jason. 2015. How much context is enough? Two cases of span-conditioned stem allomorphy. *Linguistic Inquiry* 46(2). 273–303. https://doi.org/10.1162/LING_a_00182.

Meurers, W. Detmar. 2001. On expressing lexical generalizations in HPSG. *Nordic Journal of Linguistics* 24(2). 161–217. https://doi.org/10.1080/033258601753358605.

Müller, Stefan. 2002. *Complex predicates: Verbal complexes, resultative constructions, and particle verbs in German* (Studies in Constraint-Based Lexicalism 13). Stanford, CA: CSLI Publications. https://hpsg.hu-berlin.de/~stefan/Pub/complex.html (28 December, 2025).

Müller, Stefan. 2003a. Object-to-subject-raising and lexical rule: An analysis of the German passive. In Stefan Müller (ed.), *Proceedings of the 10th International Conference on Head-Driven Phrase Structure Grammar, Michigan State University*, 278–297. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2003.16.

Müller, Stefan. 2003b. Solving the bracketing paradox: An analysis of the morphology of German particle verbs. *Journal of Linguistics* 39(2). 275–325. https://doi.org/10.1017/S0022226703002032.

Müller, Stefan. 2006. Phrasal or lexical constructions? *Language* 82(4). 850–883. https://doi.org/10.1353/lan.2006.0213.

Müller, Stefan. 2009. On predication. In Stefan Müller (ed.), *Proceedings of the 16th International Conference on Head-Driven Phrase Structure Grammar, University of Göttingen, Germany*, 213–233. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2009.11.

Müller, Stefan. 2010. Persian complex predicates and the limits of inheritance-based analyses. *Journal of Linguistics* 46(3). 601–655. https://doi.org/10.1017/S0022226709990284.

Müller, Stefan. 2012. *On the copula, specificational constructions and type shifting*. Ms. Freie Universität Berlin. http://hpsg.hu-berlin.de/~stefan/Pub/copula.html.

Müller, Stefan. 2013a. *Head-Driven Phrase Structure Grammar: Eine Einführung*. 3rd edn. (Stauffenburg Einführungen 17). Tübingen: Stauffenburg Verlag. https://hpsg.hu-berlin.de/~stefan/Pub/hpsg-lehrbuch.html (28 December, 2025).

Müller, Stefan. 2013b. Unifying everything: Some remarks on Simpler Syntax, Construction Grammar, Minimalism and HPSG. *Language* 89(4). 920–950. https://doi.org/10.1353/lan.2013.0061.

Müller, Stefan. 2015. The CoreGram project: Theoretical linguistics, theory development and verification. *Journal of Language Modelling* 3(1). 21–86. https://doi.org/10.15398/jlm.v3i1.91.

Müller, Stefan. 2016. *Grammatical theory: From Transformational Grammar to constraint-based approaches*. 1st edn. (Textbooks in Language Sciences 1). Berlin: Language Science Press. https://doi.org/10.17169/langsci.b25.167.

Müller, Stefan. 2017. Default inheritance and derivational morphology. In Martijn Wieling, Martin Kroon, Gertjan van Noord & Gosse Bouma (eds.), *From semantics to dialectometry: Festschrift in honor of John Nerbonne* (Tributes 32), 253–262. Rickmansworth: College Publications. https://hpsg.hu-berlin.de/~stefan/Pub/default-morph.html (28 December, 2025).

Müller, Stefan. 2018a. *A lexicalist account of argument structure: Template-based phrasal LFG approaches and a lexical HPSG alternative* (Conceptual Foundations of Language Science 2). Berlin: Language Science Press. https://doi.org/10.5281/zenodo.1441351.

Müller, Stefan. 2018b. *Grammatical theory: From Transformational Grammar to constraint-based approaches*. 2nd edn. (Textbooks in Language Sciences 1). Berlin: Language Science Press. https://doi.org/10.5281/zenodo.1193241.

Müller, Stefan. 2019. Complex predicates: Structure, potential structure and underspecification. *Linguistic Issues in Language Technology* 17(3). 1–8. https://doi.org/10.33011/lilt.v17i.1423.

Müller, Stefan. 2023. *Germanic syntax: A constraint-based view* (Textbooks in Language Sciences 12). Berlin: Language Science Press. https://doi.org/10.5281/zenodo.7733033.

Müller, Stefan. 2024. HPSG and Construction Grammar. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, 2nd edn. (Empirically Oriented Theoretical Morphology and Syntax 9), 1497–1553. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.5599882.

Müller, Stefan. 2025. *TAG is not a phrasal Construction Grammar, it is a Transformational Grammar, or is it? A comment on the nature of argument structure constructions*. https://ling.auf.net/lingbuzz/009130.

Müller, Stefan, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.). 2024. *Head-Driven Phrase Structure Grammar: The handbook*. 2nd edn. (Empirically Oriented Theoretical Morphology and Syntax 9). Berlin: Language Science Press. https://doi.org/10.5281/zenodo.13637708.

Müller, Stefan & Stephen Wechsler. 2014. Lexical approaches to argument structure. *Theoretical Linguistics* 40(1–2). 1–76. https://doi.org/10.1515/tl-2014-0001.

Nerbonne, John. 1986. 'Phantoms' and German fronting: Poltergeist constituents? *Linguistics* 24(5). 857–870. https://doi.org/10.1515/ling.1986.24.5.857.

Noonan, Michael. 1994. A tale of two passives in Irish. In Barbara A. Fox & Paul J. Hopper (eds.), *Voice: Form and function* (Typological Studies in Language 27), 279–311. Amsterdam: John Benjamins Publishing Co. https://doi.org/10.1075/tsl.27.12noo.

Nordlinger, Rachel. 2010. Verbal morphology in Murrinh-Patha: Evidence for templates. *Morphology* 20(2). 321–341. https://doi.org/10.1007/s11525-010-9184-z.

Osborne, Timothy & Thomas M. Groß. 2012. Constructions are catenae: Construction Grammar meets Dependency Grammar. *Cognitive Linguistics* 23(1). 165–216. https://doi.org/10.1515/cog-2012-0006.

Özkaragöz, nci. 1986. Monoclausal double passives in Turkish. In Dan I. Slobin & Karl Zimmer (eds.), *Studies in Turkish linguistics* (Typological Studies in Language 8), 77–91. Amsterdam: John Benjamins Publishing Co. https://doi.org/10.1075/tsl.8.05ozk.

Partee, Barbara H. 1986. Noun phrase interpretation and type-shifting principles. In Jeroen Groenendijk, Dick de Jongh & Martin Stokhof (eds.), *Studies in Discourse Representation Theory and the theory of generalized quantifiers* (Groningen-Amsterdam Studies in Semantics 8), 115–143. Dordrecht: Foris Publications. Reprint as: Noun phrase interpretation and type-shifting principles. In Barbara H. Partee (ed.), *Compositionality in formal semantics: Selected papers by Barbara H. Partee* (Explorations in Semantics 1), 203–230. Dordrecht: Blackwell Publishers Ltd, 2004. https://doi.org/10.1002/9780470751305.ch10.

Peters, P. Stanley & Robert W. Ritchie. 1973. On the generative power of Transformational Grammar. *Information Sciences* 6. 49–83. https://doi.org/10.1016/0020-0255(73)90027-3.

Pustejovsky, James. 1991. The Generative Lexicon. *Computational Linguistics* 17(4). 409–441. https://aclanthology.org/J91-4003/ (28 December, 2025).

Richter, Frank & Manfred Sailer. 2009. Phraseological clauses as constructions in HPSG. In Stefan Müller (ed.), *Proceedings of the 16th International Conference on Head-Driven Phrase Structure Grammar, University of Göttingen, Germany*, 297–317. Stanford, CA: CSLI Publications. https://doi.org/10.21248/hpsg.2009.15.

Riehemann, Susanne. 1993. *Word formation in lexical type hierarchies: A case study of* bar-*adjectives in German*. Also published as SfS-Report-02-93, Seminar für Sprachwissenschaft, University of Tübingen. Universität Tübingen. (MA thesis).

Riehemann, Susanne Z. 1998. Type-based derivational morphology. *Journal of Comparative Germanic Linguistics* 2(1). 49–77. https://doi.org/10.1023/A:1009746617055.

Sag, Ivan A. 1997. English relative clause constructions. *Journal of Linguistics* 33(2). 431–483. https://doi.org/10.1017/S002222679700652X.

Sag, Ivan A. 2010. English filler-gap constructions. *Language* 86(3). 486–545. https://doi.org/10.1353/lan.2010.0002.

Sag, Ivan A. 2012. Sign-Based Construction Grammar: An informal synopsis. In Hans C. Boas & Ivan A. Sag (eds.), *Sign-Based Construction Grammar* (CSLI Lecture Notes 193), 69–202. Stanford, CA: CSLI Publications.

Sag, Ivan A., Hans C. Boas & Paul Kay. 2012. Introducing Sign-Based Construction Grammar. In Hans C. Boas & Ivan A. Sag (eds.), *Sign-Based Construction Grammar* (CSLI Lecture Notes 193), 1–29. Stanford, CA: CSLI Publications.

Schabes, Yves, Anne Abeillé & Aravind K. Joshi. 1988. *Parsing strategies with 'lexicalized' grammars: Application to Tree Adjoining Grammars*. Technical Report MS-CIS-88-65. University of Pennsylvania Department of Computer & Information Science. https://repository.upenn.edu/handle/20.500.14332/7639 (28 December, 2025).

Seyffarth, Esther. 2019. Modeling the induced action alternation and the caused-motion construction with Tree Adjoining Grammar (TAG) and semantic frames. In Rainer Osswald, Christian Retoré & Peter Sutton (eds.), *Proceedings of the IWCS 2019 workshop on computing semantics with types, frames and related structures*, 19–27. Gothenburg, Sweden: Association for Computational Linguistics. https://doi.org/10.18653/v1/W19-1003.

Seyffarth, Esther. 2023. *Computing the semantics of verb alternations: A constructional approach*. Faculty of Arts & Humanities at Heinrich Heine University. (Doctoral dissertation). https://docserv.uni-duesseldorf.de/servlets/DocumentServlet?id=69643 (28 December, 2025).

Simpson, Jane. 1983. Resultatives. In Lori S. Levin, Malka Rappaport & Annie Zaenen (eds.), *Papers in Lexical Functional Grammar*, 143–157. Bloomington, IN: Indiana University Linguistics Club. Reprint as: Resultatives. In Miriam Butt & Tracy Holloway King (eds.), *Lexical semantics in LFG* (Studies in Constraint-Based Lexicalism 17), 149–161. Stanford, CA: CSLI Publications, 2006.

Spencer, Andrew. 1991. *Morphological theory: An introduction to word structure in Generative Grammar* (Blackwell Textbooks in Linguistics). Oxford: Blackwell Publishers Ltd.

Steedman, Mark & Jason Baldridge. 2006. Combinatory Categorial Grammar. In Keith Brown (ed.), *The encyclopedia of language and linguistics*, 2nd edn., 610–621. Oxford: Elsevier Science Publisher B.V. (North-Holland). https://doi.org/10.1016/B0-08-044854-2/02028-9.

Stump, Gregory T. 2001. *Inflectional morphology: A theory of paradigm structure* (Cambridge Studies in Linguistics 93). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511486333.

Timberlake, Alan. 1982. The impersonal passive in Lithuanian. In Monica Macaulay, Orin D. Gensler, Claudia Brugmann, Inese ivkulis, Amy Dahlstrom, Katherine Krile & Rob Sturm (eds.), *Proceedings of the Eighth Annual Meeting of the Berkeley Linguistics Society*, 508–524. Berkeley: University of California. https://doi.org/10.3765/bls.v8i0.2067.

Uszkoreit, Hans. 1987. *Word order and constituent structure in German* (CSLI Lecture Notes 8). Stanford, CA: CSLI Publications.

Van Valin, Robert D., Jr. & Randy J. LaPolla. 1997. *Syntax: Structure, meaning and function* (Cambridge Textbooks in Linguistics). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139166799.

van Noord, Gertjan & Gosse Bouma. 1994. Adjuncts and the processing of lexical rules. In Makoto Nagao (ed.), *Proceedings of COLING 94*, 250–256. Kyoto, Japan: Association for Computational Linguistics. https://doi.org/10.3115/991886.991928.

Verspoor, Cornelia Maria. 1997. *Contextually-dependent lexical semantics*. University of Edinburgh. (Doctoral dissertation). http://hdl.handle.net/1842/515 (28 December, 2025).

Vijay-Shanker, K. & Yves Schabes. 1992. Structure sharing in Lexicalized Tree-Adjoining Grammars. In Antonio Zampolli (ed.), *Proceedings of the 15th International Conference on Computational Linguistics (COLING '92), August 23–28*, vol. 1, 205–211. Nantes, France: Association for Computational Linguistics. https://aclanthology.org/C92-1034/ (28 December, 2025).

Wechsler, Stephen & Bokyung Noh. 2001. On resultative predicates and clauses: Parallels between Korean and English. *Language Sciences* 23(4–5). 391–423. https://doi.org/10.1016/S0388-0001(00)00031-0.

Wunderlich, Dieter. 1995. Argument extension by lexical adjunction. In Fritz Hamm, Joachim Kolb & Arnim von Stechow (eds.), *The Blaubeuren papers* (Seminar für Sprachwissenschaft (AuTS) 08-95), 434–474. Tübingen: Universität Tübingen.

Wunderlich, Dieter. 1997. Argument extension by lexical adjunction. *Journal of Semantics* 14(2). 95–142. https://doi.org/10.1093/jos/14.2.95.

Zimmermann, Eva. 2017. *Morphological length and prosodically defective morphemes* (Oxford Studies in Phonology and Phonetics 1). Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198747321.001.0001.

Adjective licensers in Japanese

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Abstract

Japanese has two types of adjectives, which we refer to as *na*- and *i*-adjectives, that show different syntactic behaviour. In this paper, we argue that the *na* of *na*-adjectives is an adjective licenser, that is, it is a marker that licenses a predicative adjective to occur attributively. Attributive adjectives show certain similarities with relative clauses in Japanese, which has led to some authors analysing attributive adjectives syntactically as relative clauses. However, there are arguments against assuming a similar structure for adjectives and relative clauses. Our analysis captures the functional and semantic parallels between relative clauses and attributive adjectives without having to assume structural similarities. One issue with a relative clause analysis that has been raised in the literature is that it leads to the assumption that all adjectives are intersective. We show in some detail that this is not a problem for our analysis.

1 Introduction

Japanese has two types of adjectives, referred to here as *na*- and *i*-adjectives, that show different syntactic behaviour.[†] In this paper, following an analysis of similar elements by Börjars & Payne (2018), we argue that the *na* of *na*-adjectives is an adjective licenser, that is, it is a marker that licenses a predicative adjective to occur attributively. Attributive adjectives in Japanese are known to show certain syntactic, functional and semantic similarities with relative clauses in Japanese. In particular, both occur in prehead position, relative clauses lack a TOPIC structure and adjectives appear to be able to carry tense. This has led some authors to analyse attributive adjectives syntactically as relative clauses. However, we show here that there are arguments against assuming such an analysis. Our LFG analysis, presented in section 3, captures the functional and semantic parallels between relative clauses and attributive adjectives by assigning them different c-structures but parallel f-structures. One issue that has been raised in the literature as a general issue with relative clause analyses of attributive adjectives is that it leads to the assumption that all attributive adjectives must be given an intersective interpretation. This issue applies equally to our analysis, but in the final section of this paper, we show in some detail how it can be resolved.

2 Japanese adjectives

There are two kinds of adjectives in Japanese: adjectives that take *-i* both attributively and predicatively; and adjectives that take *-na* atttributively and copula *da* predicatively. As the examples of both types in (1) and (2) illustrate, the distinction is not based on semantics.[1]

[†]We are grateful to Bjarke Frellesvig and Thomas Östergren for help with the Japanese data. Any errors in the data are, of course, our fault. We also benefitted from comments from the audience when we presented this at the LFG conference in Barcelona. The comments from two anonymous referees also helped us improve the paper. We will use the Kunrei-shiki Romanization for all the Japanese examples. Long vowels will be represented by a double letter rather than a single letter with a macron; this enables morpheme boundaries to be shown, as in (1-a) and (1-b).

[1]Indeed, there are some adjectives that may occur with either form (see Backhouse 2004: 63).

(1) a. utukusi-i hana
beautiful-NPST flower
'a/the beautiful flower'

b. Hana ga utukusi-i.
flower NOM beautiful-NPST
'The flower is beautiful.'

(2) a. kirei-na hana
pretty-ATTR flower
'a/the pretty flower'

b. Hana ga kirei da.
flower NOM pretty COP.NPST
'The flower is pretty.'

There is a substantial literature on Japanese adjectives, much of which focuses on the category status of the two types and what features may be used to categorise them. Terms used in the literature for the types represented in (1) versus the type in (2) include 'true adjectives' vs 'nominal adjective' (e.g. Yamakido 2005), 'adjective' vs 'adjectival noun' (e.g. Miyagawa 1987), '(canonical) adjective' vs 'nominal adjective' (e.g. Yamakido 2000; Nishiyama 1999; Morita 2010). Backhouse (2004), who refers to them as 'inflected' versus 'uninflected' adjectives, shows that the *i*-adjectives share some inflectional properties with verbs and *na*-adjectives share certain forms with nouns. However, he also points out that there are substantial differences between *i*-adjectives and verbs, on the one hand, and *na*-adjectives and nouns, on the other, in terms of syntactic distribution and derivational behaviour, but also inflectionally. For example neither class has an imperative form or can itself be modified by an adjective, and both can be modified by certain adverbials such as *totemo* 'very' or be followed by comparative expressions. We therefore follow Backhouse (2004) and many others in considering them all adjectives, and we will refer to them simply as *i*-adjectives and *na*-adjectives.

The *-i* is the original form, and in earlier stages *ki* was used attributively and *si* predicatively; the modern *-i* is a reduced form of *ki* (Frellesvig 2010, 2022). The *i*-adjectives are associated with etymologically Japanese roots, and they form a closed class. We will gloss *-i* as a non-past tense marker (following e.g. Baker 2003; Morita 2010), recognising that this is not an uncontroversial choice, an issue that we return to below.

As shown in (2-b), *da* is used when a *na*-adjective occurs predicatively, and it is glossed as a copula. This is the same copula that occurs with nominals or prepositional phrases, as shown in (3) and (4).

(3) Kare ga sensei da.
he NOM teacher COP.NPST
'He is a teacher.'

(4) Kare ga Tookyoo de da.
he NOM Tokyo in COP.NPST
'He is in Tokyo'

The past tense of the copula is *datta*, and this is used to form a predicative construction with a *na*-adjective, as in (5).

(5) Hana ga kirei datta.
flower NOM pretty COP.PST
'The flower was pretty.'

As indicated by the ungrammaticality of (6), *i*-adjectives cannot occur with the copula. Instead, *i*-adjectives are marked by *-katta* in the past tense as in (7). Note that this form preserves the historical consonant *k*. Indeed, Morita (2010) refers to these as *k*-adjectives, rather than *i*-adjectives, and both he and Nishiyama (1999) analyse *k* as an independent morpheme heading a functional projection in the syntax (a^0 and Pred, respectively).

(6) *Hana ga utukusi-i da.
flower NOM beautiful-NPST COP.NPST
Intended 'The flower is beautiful.'

(7) Hana ga utukusi-katta.
flower NOM beautiful-PST
'The flower was beautiful.'

The glossing of *-i* as a non-past tense is based on the contrast with the past tense in main clauses, but is an oversimplification. From the discussion in Yamakido (2005: 68–73), we surmise that the Japanese non-past does not introduce, in Reichenbach's (1947) terms, an independent reference time contemporaneous with the speech time (RT = ST). This would be the non-past of English, which allows for instance a relative clause to indicate present time in a matrix past environment: *Taroo bought a painting which is* (*now*) *expensive*. In Japanese, non-past is rather a dependent tense which sets an event time (ET) contemporaneous either directly with ST, or with an externally etablished RT. This is illustrated in (8) (= Yamakido 2005: 72, ex (85a)).[2]

(8) Taroo wa [taka-i e] o ka-tta
Taroo TOP [expensive-NPST painting] OBJ buy-PST
'Taroo bought an expensive painting.'

The external reference time is supplied by the standard past tense of the clause (RT<ST), and the painting referred to could be either one which Taroo (luckily) bought cheaply at the time but that is expensive now (ET = ST), but more likely one which was expensive when Taroo bought it (ET = RT). The reference time for a non-past attributive adjective can also be established by an NP-internal temporal adjunct, as illustrated in (9) (= Yamakido 2005: 72, ex (87)). The particle *no* here functions as a linker which most commonly indicates the modification of one nominal expression by another.

(9) a. [kinoo no [[$_{\text{AP}}$ oisi-i] cake]]
yesterday NO delicious-NPST cake
'yesterday's delicious cake'
b. *[kinoo no [[$_{\text{AP}}$ oisi-katta] cake]]
yesterday NO delicious-PST cake

[2] We have adopted a single standard for the glossing of examples. This entails that examples cited from Japanese linguists may have minor adjustments to their glossing, e.g. OBJ rather than ACC for the particle *o*. We sometimes also add (labelled) brackets.

In general, then, the reference time for a NPST attributive adjective must come from outside the AP itself, a fact which suggests that attributive APs in Japanese cannot have independent tense. Despite the NPST marking of *-i* adjectives in attributive function, this leads us to suppose that attributive APs in Japanese are essentially normal APs, i.e. unable to have independent time reference.

3 Analysis

3.1 Adjective licensers

Börjars & Payne (2018) argue on the basis of a sample of languages, including Old Icelandic, Kildin Saami and Modern Persian, that attributive adjectives need to be licensed. This implies, at least for the languages they consider, that the predicative adjective is the unmarked form, *pace* Croft (1991) and Bhat (1994).[3] The analysis proposed there is based on the assumption that both predicative and attributive adjectives require a SUBJ, and the role of the licenser is to provide information relating to this. The assumption that adjectives require a SUBJ leads to an XCOMP analysis of copula constructions (e.g. Zweigenbaum 1988; Wechsler 2009) as opposed to the PREDLINK analysis put forward for instance by Butt et al. (1999) and Attia (2008).[4]

Börjars & Payne (2018), with reference to Pullum & Huddleston (2002) and Zweigenbaum (1988), show that for both English and French there is evidence that adjectives require a subject. Such evidence can be found also for Japanese. There is first of all strong evidence that attributive adjectives require a subject. In (10) the attributive adjective phrase *zibun ni tyuuzitsuna* includes the reflexive pronoun *zibun* that requires a subject antecedent.

(10) zibun ni tyuuzitsu-na seizika
self DAT true-ATTR politician
'a politician true to himself'

The postulation of a parallel subject argument for adjectives in a predicative function then leads to a straightforward account of examples such as (11).

(11) Kare wa yuuhuku ni naru tumorida.
he TOP wealthy COP.NFIN become.NPST intend.NPST
'He intends to become wealthy.'

In (11), the adjectival subject will enter a chain of control relations which identify it with the subject of the the control verb *tumorida*.[5]

The lexical entry for the copula *da* is as in (12), and for the adjective *kirei* as in (13).

[3]Bhat (1994: 105–6) points out that there are languages in which predicative adjectives are more marked morphologically than attributive adjectives; such languages may need a different analysis.

[4]See also Dalrymple et al. (2004), Nordlinger & Sadler (2007) and Dalrymple et al. (2019: 32–33) for analyses of copula clauses in LFG.

[5]The Japanese equivalent of English *become* consists of two separate components, *naru* 'become' and a non-finite form *ni* of the copula. The control relationship will thus pass first between the subject of *tumorida* 'intend' and the subject of *naru*, and then between the subject of *naru* and the subject of *ni*. In the XCOMP analysis we are adopting here, this subject will in turn be identified straightforwardly with the subject of the predicative adjective.

(12) *da* V ($\uparrow$PRED) = 'be < SUBJ, XCOMP >'
($\uparrow$SUBJ) = ($\uparrow$XCOMP SUBJ)

(13) *kirei* A ($\uparrow$PRED) = 'pretty < SUBJ >'

For predicative adjectives combining with a copula, the SUBJ is then identified in the same way as a verbal predicate with a SUBJ argument through the control equation in (12). For an attributive adjective, on the other hand, the SUBJ cannot be directly accessed, and some additional mechanism is required. In our analysis, this is what the adjective licenser contributes. At c-structure the attributive adjective heads an AP adjunct. The f-structure, on the other hand, will be the same as that needed for relative clauses, albeit without such complications as long-distance dependencies. We therefore adopt for this purpose a stripped-down version of Dalrymple's (2001) analysis of relative clauses. The adjective licenser will provide a RELPRO attribute and add a pronominal PRED value to it. This RELPRO will be linked directly and uniquely to the SUBJ function of the attributive adjective rather than to an arbitrary GF through a long-distance path as in relative clauses proper.

This analysis of attributive licensers is supported by the fact that some of the elements analysed in Börjars & Payne (2018) developed diachronically from relative markers. In Japanese, there are no overt relative markers as such. However, the fact that the adjective licenser *-na* derives diachronically from a form of the copula (see section 2) suggests that attributive adjectives marked by *-na* indeed have a similar predicative origin.

We note that there is a generally held intuition that attributive adjectives in Japanese share properties with relative clauses, based for instance on the fact that a relative clause in Japanese takes the shape of a basic finite clause in prenominal position and lacks any additional structural complexity, as in (14). Relative clauses thus appear to parallel an attributive adjective in position and structural simplicity.

(14) ima it-ta kuruma
now go-PST car
'the/a car which left just now'

Many of the formal analyses that aim to capture the parallels between attributive adjectives and relative clauses assume a full parallel structure for the two, for instance Nishiyama (1999) and Hoshi (2002), a structure that is motivated only theory-internally.[6] However, there are also structural differences between an attributive adjective and a relative clause that refute the idea of complete structural parallel; the former follows a demonstrative, as in (15), whereas a relative clause precedes it, as in (16) (examples from Yamakido (2005: 45, fn 5) with reference to Whitman (1981)).

(15) ano ao-i mi
that blue-NPST berry
'that blue berry'

[6]Smith (1961) analyses even English attributive adjectives as reduced relative clauses, an analysis that was criticised by Bolinger (1967). For Japanese, the relative-clause analysis of attributive adjectives goes back at least to Kuno (1973). Yamakido (2005) provides arguments against a structural analysis of prenominal adjectives as relative clauses, and instead argues in favour of an analysis of *-i* and *-na* as case markers.

(16) ima it-ta ano kuruma
now go-PST that car
'that car which left just now'

There are also differences in the flexibility of tense-marking. We have already argued with respect to the examples in (9) that attributive APs in Japanese are best analysed as not having independent temporal reference and thus not being able to be marked with past tense. Relative clauses marked by non-past tense are temporally dependent in the same way, but as full clauses they are able to have temporal independence and to introduce a new past reference time with a past-marked form. Yamakido (2005: 73) cites examples from Hoshi (2002) which show that when *kinoo* 'yesterday' is used as a clausal adjunct, not as an NP-internal adjunct linked by *no*, past tense marking of an adjective is indeed possible (Yamakido 2005: 73, fn 32):

(17) Hanako wa [[$_{IP}$ kinoo oisi-katta] cake] o ototoi yai-ta.
Hanako TOP yesterday delicious-PST cake OBJ the day before bake-PST
'The day before yesterday Hanako baked [the cake which was delicious yesterday].'

(18) *Hanako wa [[$_{IP}$ kinoo oisi-i] cake] o ototoi yai-ta.
Hanako TOP yesterday delicious-NPST cake OBJ the day before bake-PST
'The day before yesterday Hanako baked [the cake which was delicious yesterday].'

We therefore accept Yamakido's (2005: 73) argument that examples with past tense marking of *i*-adjectives should not be analysed as simple AP adjuncts in Japanese, but must instead structurally represent full relative clauses.[7] A *na*-adjective in the same environment must indeed be accompanied by the past form of the copula:

(19) Taroo wa [[$_{IP}$ kinoo hen datta] hito] o ototoi dinner
Taroo TOP yesterday strange COP.PST man OBJ the day before dinner
ni syootai-si-ta.
DAT invite-do-PST
'The day before yesterday Taroo invited to dinner [the man who was strange yesterday].'

(20) *Taroo wa [[$_{IP}$ kinoo hen-na] hito] o ototoi dinner ni
Taroo TOP yesterday strange-ATTR man OBJ the day before dinner DAT
syootai-si-ta.
invite-do-PST
'The day before yesterday Taroo invited to dinner [the man who was strange yesterday].'

The advantage of our analysis is then that we capture the insight of a functional and semantic similarity between attributive adjectives and relative clauses without having to

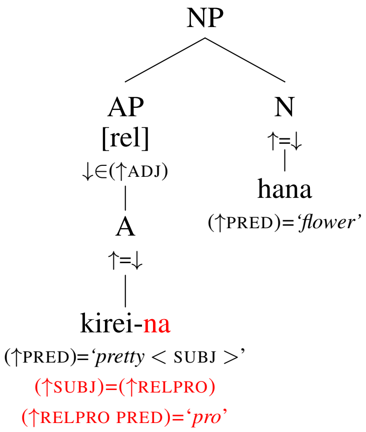
[7]That is, in (17), just as in (19), the adjective is not the head of an attributive AP requiring a licenser, but rather a predicative adjective within an independently tensed relative clause. For concreteness we have assigned the category label IP to the (structural) relative clauses in these examples: Japanese has no analogue of wh-fronting (see above) which might motivate a full CP structure, nor do Japanese relative clauses permit the topic structure of root clauses.

posit unwarranted syntactic structure for genuinely attributive cases.

We turn now to the formal analysis of the attributive adjectives. In an example of the attributive use of a *na*-adjective such as (2-a), the adjective has only the PRED feature, as in (13), *na* contributes the other required features, as in (21). The resulting tree for the noun phrase in (2-a) is (22). In both (22) and (25), we indicate the features contributed by the inflectional marking in red.

(21) *-na* $(\uparrow \mathrm{SUBJ}) = (\uparrow \mathrm{RELPRO})$
$(\uparrow \mathrm{RELPRO\ PRED}) = \text{‘}\textit{pro}\text{’}$

(22)



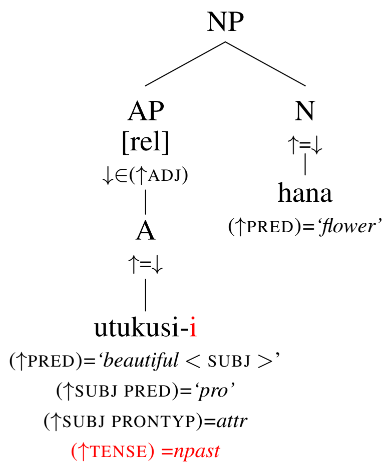
The c-structure rule for attributive APs will annotate the AP with a semantic resource [rel] which is formally identical to the [rel] which is annotated on relative CPs in Dalrymple's (2001) analysis of relative clauses proper. It is a property of the structure, rather than the individual lexical items, and has the same semantic function, i.e. allowing the adjunct, whether CP or AP, to combine with a nominal to form a new nominal with an appropriately modified semantics.

For *i*-adjectives, on the other hand, the SUBJ features are included in the lexical entry of the adjective, as in (23), with *-i* contributing only a TENSE feature, giving the tree in (25).

(23) *utukusi* A $(\uparrow \mathrm{PRED}) = \text{‘beautiful} < \mathrm{SUBJ} >\text{’}$
$(\uparrow \mathrm{SUBJ}) = (\uparrow \mathrm{RELPRO})$
$(\uparrow \mathrm{RELPRO\ PRED}) = \text{‘}\textit{pro}\text{’}$

(24) *-i* $(\uparrow \mathrm{TENSE}) = \textit{npast}$

(25)



The f-structures for the two examples in (1-a) and (2-a) then differ only in the TENSE feature.[8]

(26)
$$\left[\begin{array}{ll} \text{PRED} & \text{`}\textit{flower}\text{'} \\ \text{ADJ} & \left\{\left[\begin{array}{ll} \text{PRED} & \text{`}\textit{pretty/beautiful} < \text{SUBJ} >\text{'} \\ \text{SUBJ} & \\ \text{RELPRO} & \left[\text{PRED} \quad \text{`}\textit{pro}\text{'}\right] \\ \text{(TENSE} & \textit{npast}) \end{array}\right]\right\} \end{array}\right]$$

The function of RELPRO will be to create a relative clause f-structure out of the ultimately predicative f-structure of the adjective, i.e., from the PRED "(is) pretty/beautiful" requiring a SUBJ it creates a relative clause f-structure "(which is) pretty/beautiful" which can then serve as an adjunct of the noun *flower*. Omitting the potential complexity of the non-past TENSE feature required for *i*-adjectives, the interpretation of the resulting f-structure can then follow Dalrymple's (2001) analysis of relative clause semantics.[9] In (27) we summarise the lambda-calculus contributions of the individual semantic resources provided by example (2-a), with a *na*-adjective:

(27)

[pretty]	$\lambda x.pretty(x)$	$\langle e,t \rangle$
[pro]	$\lambda P.\lambda x.P(x)$	$\langle\langle e,t\rangle,\langle e,t\rangle\rangle$
[rel]	$\lambda P.\lambda Q.\lambda x.P(x) \wedge Q(x)$	$\langle\langle e,t\rangle,\langle\langle e,t\rangle,\langle e,t\rangle\rangle\rangle$
[flower]	$\lambda x.flower(x)$	$\langle e,t \rangle$

[8] Coordination of attributive adjectives will be permitted because governable grammatical functions are distributive features (Dalrymple 2001). The SUBJ of the f-structure set corresponding to the adjectival coordination must be the same as the SUBJ of each individual adjective. Exactly the same principle is invoked by Dalrymple (2001) for the coordination of relative clauses.

[9] We remind the reader that the TENSE feature here is a shorthand for a more complex temporal feature (see discussion in section 2).

The adjective simply provides its own <e,t> resource. Since the adjective licenser in Japanese is invariant in form, [pro] itself contributes no independent semantic information about the nature of its antecedent (unlike for example the relative pronouns *who/which* of English). It is also a type of pronoun which derives its meaning non-contextually, that is, there are no binding conditions conditions involved. The [pro] resource will combine (vacuously in this case) with the adjective resource to give an identical <e,t> resource, as in (28).

(28) [pretty-pro] λx.pretty(x)

This in turn combines with the [rel] resource to give

(29) [pretty-pro-rel] λQ.λx.pretty(x) $\wedge$ Q(x)

This is of the correct type to combine with the noun resource, giving

(30) [pretty-pro-rel-flower] λx.pretty(x) $\wedge$ flower(x)

The reader will note that the end result is the same as in Dalrymple's (2001) analysis of (non-intensional) attributive adjectives. By subsuming the analysis of attributive adjectives under the analysis of relative clauses, it obviates the need for a separate treatment of the former.

4 Intersectivity

4.1 Non-subsective and non-intersective adjectives in Japanese

It is immediately apparent that the relative-clause-like analysis of attributive adjectives presented above implies that predicative adjectives used attributively should have intersective interpretations. In an Adjective-Noun construction, henceforth AN, an **intersective** adjective is one which validates the inference from AN(x) to A(x) and N(x), i.e. a 'pretty flower' should be something which is both pretty and a flower. The semantic representation of [pretty-pro-rel-flower] in the analysis above, viz. λx.pretty(x) $\wedge$ flower(x), directly encodes this inference. Both philosophers, e.g. Sibley (2001), and semanticists, e.g. Asher et al. (2017), have long debated the existence of potentially non-intersective AN constructions in English, and how they might be analysed. There is also a limited discussion of a number of corresponding constructions in Japanese (see for instance Hoshi 2002: 9–12 and Yamakido 2000: 62–68). These constructions may appear to present a prima facie problem for the intersective analysis above. However, some can be discounted, we argue, as not being genuinely adjectival. For others, an enhanced analysis is indeed required, but satisfactory solutions either already exist or can be provided.

Below, we divide the constructions at issue into different types, and compare how they are rendered in Japanese with how they are rendered in English. In cases which we consider genuinely adjectival, we for the most part just refer to existing proposals in the literature. For the final type, however, we provide a detailed and in several respects novel solution.

4.1.1 Type A: Potentially non-subsective constructions

Ignoring AN constructions involving attributive-only adjectives like *mere*, which has no direct counterpart in Japanese, there are first of all AN constructions which have been argued to be non-intersective by virtue of not even being subsective. A **subsective** adjective is one which validates only the weaker inference from AN(x) to N(x). As we will show below, it is in fact not at all clear that either English or Japanese employs any genuinely non-subsective adjectives. Note that even attributive-only adjectives like *mere* in English are subsective: *He is a mere shadow of his former self* entails *He is a shadow of his former self.*

Some putative non-subsective AN constructions in English appear not to involve adjectives proper, and also have Japanese translations which do not involve adjectives. For example, the best Japanese translation of the phrase *alleged murderer* in English, supposedly non-subsective because an alleged murderer is not necessarily a murderer, involves a compound noun in Japanese (a more direct equivalent of the nominal *murder suspect* in English):

(31) satuzin-yogisya (compound noun)
murder-suspect
'murder suspect'

The pre-head modifier *alleged* in English, which has no Japanese equivalent, is arguably a passive participle rather than an adjective. It is the passive of the verb *allege* in *They are alleged to be murderers*, and cannot occur in isolation predicatively: **These murderers are alleged.*

There are also examples in which a putatively non-subsective AN construction in English involving a genuine adjective corresponds to a Japanese construction which is not adjectival. There has been much discussion of the English modifier *fake* in *fake gun*, the claim being that a fake gun is not actually a gun (however see Sibley 2001, who disputes this on the grounds that a fake gun has many of the properties that we would expect to find in a gun). The modifier *fake* is plausibly treatable as an adjective even though there is a corresponding noun (as in *a fake*), for example it is modifiable by an adverb in *an obviously fake gun*. However the Japanese equivalent is clearly nominal in nature:

(32) nise no zyuu (noun linker noun)
fake NO gun
'fake gun'

(33) *zyuu wa nise desita
gun TOP fake be.PST
intended: 'the gun was fake'

The form *nise* 'fake' lacks Japanese adjectival morphology and cannot occur predicatively with a finite copula.

Despite this general avoidance strategy, Japanese does nevertheless possess examples of AN constructions which directly correspond to putatively non-subsective AN constructions in English. The English example *potential disaster*, where (as for *alleged murderer*) it is claimed that a potential disaster is not necessarily a real disaster, has an adjectival counterpart with a *-na* adjective in Japanese:

(34) senzaiteki-na sagai
potential-ATTR disaster

The way to preserve subsectivity in cases such as these is clearly to modify the semantics in such a way as to permit modal interpretations: in a possible worlds semantics of modality the nominal *senzaiteki-na sagai* 'potential disaster' will then map onto the set of disasters in worlds which have the property of being potential worlds. In one (generalised) instantiation of this idea, Asher et al. (2017) provide a modification of the standard intersective formula which places an operator on the interpretation of the noun, viz, $\lambda x(\mathrm{O_A}(\mathrm{N}(\mathrm{x}) \wedge \mathrm{M_N}(\mathrm{A}(\mathrm{x}))))$. In the case of example (34) the noun N in the above formula will denote a set of disasters, but whether this set is located in the real world or in other possible worlds will depend on the meaning of the adjective. The operator $\mathrm{O_A}$ in the formula will vary the denotation of the noun by selecting the correct, in this case potential, worlds. Such a solution could equally be applied to examples such as *fake gun*, where the meaning of *gun* would be found in worlds where deception was intended.

Note that in the proposal outlined in the previous paragraph there is also a corresponding operator $\mathrm{M_N}$ which allows the meaning of the adjective to vary depending on the meaning of the noun. This is designed first of all to capture the cases in which the meaning of an adjective seems to depend on a comparison set. Such examples are extremely common, and are found both in English and Japanese:

(35) omo-i nomi
heavy-NPST flea

Obviously a flea cannot plausibly be deemed heavy in relation to any interpretation of whatever it might mean to be heavy independently of the object being weighed, but a flea can be heavy in comparison with other fleas. The intention of the operator introduced by Asher et al. (2017) is also found in more detailed semantic proposals which spell out the precise role of comparison sets in the interpration of the adjective, (e.g. Dalrymple 2001). Whichever proposal is adopted, however, the intersectivity of the construction can be preserved.

4.1.2 Type B: Potentially non-intersective examples

Turning to more specific potential cases of non-intersectivity which depend on the interpretation of the adjective we find that, as with the putative non-subsective cases, Japanese often employs a non-adjectival strategy to convey the same meanings.

The first set of examples involves English adjectives whose meaning can be thought of as covertly representing a thematic nominal, for example a *medical student* is an x who is a student of medicine (for many subjects of study the corresponding form is nominal, as in *chemistry student*). Japanese in this case just employs nominal strategies:

(36) igaku-sei (*igaku* = noun)
medicine-SEI

(37) kagaku no gakusei (*kagaku* = noun)
chemistry NO student

In *igaku-sei* ‘medical student’, the strategy is to use a derivational morpheme meaning something like ‘junior’, while for other subjects of study we see a full syntactic construction where the modifier noun is linked to the head noun by the linker *no*, that is (37) mirrors English *chemistry student*.

Considerably more complex and in need of a fully satisfactory analysis are however a second set of (typically ambiguous) examples where in one sense the adjective appears to be predicated of an implied nominal.We give a representative set of English examples below:

- *heavy smoker*

  → x who is a smoker and whose smoking is heavy

- *Chinese chef*

  → x who is a chef and whose food is Chinese

- *beautiful dancer*

  → x who is a dancer and whose dancing is beautiful

- *old friend*

  → x who is a friend and whose friendship is old (=long-standing)

- *complete fool*

  → x who is a fool and whose foolishness is complete

Such potentially non-intersective examples appear much rarer in Japanese. There seems to be no direct equivalent in Japanese of *heavy smoker* in the required sense, and the equivalent of *Chinese chef* in the sense *x whose food is Chinese* is a purely nominal construction which directly reflects the semantics:

(38) tyuuka-ryori no syehu
Chinese-food NO chef
‘Chinese chef’

The equivalent of *beautiful dancer* is an AN construction, but according to the judgment of Hoshi (2002: 15) the example in (39) can only have the meaning *x who is beautiful and who is a dancer*.

(39) kanozyo wa utukusi-i dansaa da.
she TOP beautiful-ATTR dancer COP.NPST
‘She is a dancer who is beautiful.’

That is, only the intersective reading is available.

Nevertheless, there do exist AN constructions in Japanese with the required non-intersective sense as equivalents of *old friend* and *complete fool*. Consider first the examples in (40) and (41) (examples from Yamakido 2005: 67).

(40) Peter-ga koorei-na tomodati da.
Peter-NOM old-ATTR friend COP.NPST
'Peter is a friend who is of advanced age.'

(41) Peter-ga huru-i tomodati da.
Peter-NOM long-standing.NPST friend COP.NPST
'Peter has been a friend for a long time.'

The *-na* adjective *koorei* 'old' straightforwardly provides the intersective reading, i.e. *x who is of advanced age*. A distinct *-i* adjective *huru-i*, meaning something like *long-standing*, provides the apparently non-intersective reading where, although it is syntactically attributed to the noun *tomodati*, it applies semantically to the age of the friendship. According to both Yamakido (2005: 66–67) and Hoshi (2002: 10), it sounds awkward to use *huru-i* predicatively of a person.

To our knowledge, there is just **one** potential example with a non-intersective interpretation of a *na*-adjective in Japanese, namely the equivalent of *complete fool* (Yamakido 2005: 68).[10]

(42) a. Max ga kanzen-na baka da
Max NOM complete-ATTR fool COP.NPST
'Max is a complete fool'
b. #Max ga kanzen da
Max NOM complete COP.NPST
#'Max is complete'

Note that the predicative construction can only have the (very weird) intersective reading in which Max is somehow "whole". In the non-intersective reading, *kanzen* 'complete' appears to apply semantically to the foolishness attributable to Max.

4.2 Semantic analysis of non-intersectivity

Clearly the examples with both *huru-i* and *kanzen* represent prima facie counterexamples to the analysis of attributive adjectives as intersective, as do the similar (more extensive) examples found in English. In this section we propose a detailed semantic analysis of *kanzen-na baka* 'complete fool' which preserves intersectivity. This is intended as a template for the analysis of similar examples, although some detailed adaptations will be necessary, e.g. the introduction of temporal semantics into the analysis of *huru-i tomodati* 'old friend'.

The solution we propose involves a type-shifted semantic analysis in which an attributive adjective is predicated of an appropriate implied nominal. In particular, in the case of *kanzen-na baka* 'complete fool', *kanzen* 'complete' is predicated of "foolishness", the characteristic property of fools. This analysis has affinities with the generative lexicon proposals of Pustejovsky (1995), although the characteristic property of a noun is not one of the original "qualia" proposed in that framework.

[10]Hoshi (2002: 12) may be the first to note the issues with this example, using the expression 'a fool the degree of which is complete as a fool' as an attempted paraphrase.

Essentially, the meaning of *baka* ‘fool’ will be optionally type-shifted from a set denotation to a relational denotation by adding an extra argument for “foolishness”. This kind of operation is well-established in the analysis of genitive dependents (e.g. Vikner & Jensen 2002; Payne et al. 2013), although the type-shifting we propose is one level of complexity greater.[11] The basic idea of using such a relational denotation for “gradable” nouns such as *fool* is in itself not new: it can be found in Constantinescu (2013), and is subsequently used by Rutland (2022). Nevertheless, the analysis provided here differs from these previous ones in its typing, and in the provision of a full new account of the compositionality involved. The type-shifting of *baka* ‘fool’ entails that the attributive marker too must be correspondingly shifted to take a relational noun rather than a set-denoting noun as argument. The result is then that the adjective *kanzen* ‘complete’ is predicated of “foolishness” rather than “fool”, and the resulting meaning is therefore available only attributively. We presume that the type-shifting process is initially driven by the noun, since the choice of nouns that permit it is language specific. This language specificity also suggests that the process is a semantic one rather than one driven by general pragmatic inferencing.

Nouns like “foolishness” are (at the individual level) variously treated in the formal semantics literature as

(a) as “tropes” (instances of properties) (Constantinescu 2013)

(b) as states (instances of state types) (Rutland 2022)

(c) as “portions” of a mass (Francez & Koontz-Garboden 2015)

All these types, and certainly others too, may well be required in a wider analysis of non-intersectivity. For example, “friendship” will be best treated as a state for which a temporal duration can be specified. Nouns such as “smoker” (in English, but not Japanese) will need a semantics appropriate for agentive nouns. However, the notion of “portion” seems to fit well with the concept of “completeness”, and we adopt it here. In the treatment of property concepts by Francez & Koontz-Garboden (2015), “portions” of a property are entities, i.e. of type <e>. In the formula below corresponding to *complete fool*, “d” should therefore be interpreted as a variable over portions (this is their choice of variable, and should not be confused with “d” representing “degree”). For clarity, we use English rather than Japanese for the semantic primitives involved:

(43) *complete fool*:
$\lambda x.\mathrm{fool}(x) \wedge \exists d[\mathrm{foolishness}(d) \wedge \textsc{poss}(x,d) \wedge \mathrm{complete}(d)]$

Simply, this formula denotes the set of x such that x is a fool and there exists a portion “d” of foolishness such that x possesses d and d is complete.

An immediate issue that arises here is compositionality. How do we get from the individual meanings of *fool*, *complete* and the attributive marker *-na* to the final representation of *complete fool* above? The first stage looks deceptively simple; we could take the type-shifted formula corresponding to *fool* to be as follows:

[11]The type shifting required for nouns taking genitive dependents takes a basic noun meaning of type <e,t> and adds an extra argument of type <e>, resulting in a shifted type <e,<e,t>>. The type shifting required for nouns like *fool* will add an extra argument of type <e,t>, resulting in a shifted type of <<e,t>,<e,t>>.

(44) *fool* (type-shifted)
$\lambda x.\text{fool}(x) \wedge \exists d[\text{foolishness}(d) \wedge \textsc{poss}(x,d)]$

But then to capture the required modification by *complete* we have the difficulty of introducing into this formula a new clause involving the variable "d", which is already bound by the existential quantifier. One possible solution might be to introduce the existential quantifier at a later stage, after the introduction of *complete*. This however has its own issues, not least the arbitrariness of deciding non-arbitrarily when existential closure should apply.

Similar issues arise in event semantics, where it is necessary sometimes to introduce adverbial modification of a verb inside a quantified event structure. In the nominal realm, we suggest a solution analogous to that of Champollion (2015), who proposes that verbs denote sets of events. The denotation of type-shifted nouns like *fool* will then be a relation between sets of individuals and sets of properties, viz.

(45) [fool] (type-shifted):
$\lambda P.[\lambda x.\text{fool}(x) \wedge \exists d[\text{foolishness}(d) \wedge \textsc{poss}(x.\ d) \wedge P(d)]]$

In the relative clause semantics we have adopted, [*complete*] will first be combined with [*pro*] in the usual manner, and the corresponding type-shifting of [*complete-pro*] will be introduced by a type-shifted variant of [*rel*], where P and Q are both of type <e,t>, and **Q** is of type <<e,t>,<e,t>>. Let us call this [*rel**]:

(46) [rel*]:
$\lambda Q.\lambda \mathbf{Q}.\lambda P.\mathbf{Q}(\lambda d.Q(d) \wedge P(d))$

The denotation of [*complete-pro-rel**] will correspondingly be:

(47) [complete-pro-rel*]:
$\lambda \mathbf{Q}.\lambda P.\mathbf{Q}(\lambda d.\text{complete}(d) \wedge P(d))$

And when this is applied to the type-shifted *fool*, we derive:

(48) [complete-pro-rel*-fool]:
$\lambda \mathbf{Q}.\lambda P.\mathbf{Q}(\lambda d.\text{complete}(d) \wedge P(d))[\lambda P'.[\lambda x.\text{fool}(x) \wedge \exists d[\text{foolishness}(d) \wedge \textsc{poss}(x.\ d) \wedge P'(d)]]]$

This simplifies to:

(49) [complete-pro-rel*-fool]:
$\lambda P.[\lambda x.\text{fool}(x) \wedge \exists d[\text{foolishness}(d) \wedge \textsc{poss}(x.\ d) \wedge \text{complete}(d) \wedge P(d)]]$

Each (enhanced) attributive adjective meaning thus brings with itself the possibility of further modification of the same kind.

In order to achieve CLOSURE (in this case getting back to a standard noun denotation of type <e,t>), we apply the denotation of *complete-pro-rel*-fool* to the universal set of entities, denoted by U:

(50) [complete-pro-rel*-fool] (closed):
$\lambda P.[\lambda x.\text{fool}(x) \wedge \exists d[\text{foolishness}(d) \wedge \textsc{poss}(x.\ d) \wedge \text{complete}(d) \wedge P(d)]](U)$

This in turn simplifies to:

(51) [complete-pro-rel*-fool] (closed):
λx.fool(x) $\wedge$ $\exists$d[foolishness(d) $\wedge$ POSS(x. d) $\wedge$ complete(d) $\wedge$ U(d)]

This effectively says that the expression $\exists$d[foolishness(d) $\wedge$ POSS(x. d) $\wedge$ complete(d) is true of all entities in U as long as one of them is a portion of foolishness possessed by x which is complete. In other words, since U(d) is necessarily true, the final expression denoting [*complete-pro-rel*-fool*] is logically equivalent to:

(52) [complete-pro-rel*-fool] (closed):
λx.fool(x) $\wedge$ $\exists$d[foolishness(d) $\wedge$ POSS(x,d) $\wedge$ complete(d)]

In the basic analysis of non-intersective *complete fool* above, the initial type-shifting of the noun *fool* of type <e,t> to the higher type <<e,t>,<e,t>> was applied to the lexical item *fool*. In a generalised analysis, this operation may need to be applied to already modified nominals of type <e,t>. This would allow for a standard (intersective) modifier to intervene between *complete* and *fool* as in (for English) *complete argumentative fool*. Similarly the CLOSURE operation which brings expressions of the higher type <<e,t>,<e,t>> back down to the standard nominal type <e,t> will necessarily have to apply before any determiner can be added. However, in a generalised analysis it may need to apply earlier in order to allow a standard (intersective) modifier to apply to the higher level nominal *complete fool*, as in (for English) *argumentative complete fool*. The basic analysis already straightforwardly allows iteration of non-intersective mofifiers, as in English *complete total fool*.

5 Conclusion

In this paper we have followed many others in assuming that *i*- and *na*-adjectives in Japanese all belong to one class. We have also taken on board the common intuition that attributive adjectives share some functional properties with relative clauses. However, our analysis captures these parallels without having to assume structural similarity. It is based rather on the assumption that both predicative and attributive adjectives require a subject, and for attributives it is the licenser that provides the SUBJ feature and assigns a value to it. The distributional differences between *i*- and *na*-adjectives are accounted for by *na*-adjectives requiring a licenser, whereas for *i* adjectives, the required features are part of the lexical entry for the adjective, and *-i* contributes only a TENSE feature.

An issue that has been raised in relation to relative-clause analyses of attributive adjectives in Japanese is the fact that relative clauses are associated with an intersective reading, whereas attributive adjectives need not involve intersectivity. We show that many, possibly most, of the examples of non-intersectivity that have been discussed for English do not exist in Japanese, and for the examples that can be identified, we provide a semantic analysis that resolves the issue. This analysis involves the type-shifting of non-intersectively modified nouns from the basic type $<$e,t$>$ to the higher type $<<$e,t$>$,$<$e,t$>>$, together with a corresponding shift of non-intersective attributes to the type $<<<$e,t$>$,$<$e,t$>>$, $<<$e,t$><$e,t$>>>$. We note that this type-shifting operation shifts nouns and their modifiers to a level higher than that required either for basic nouns or for relational nouns. This appropriately reflects the comparative rarity of non-intersective adjectival constructions in languages like Japanese.

References

Asher, Nicholas, Tim Van de Cruys, Antoine Bride & Márta Abrusán. 2017. Integrating type theory and distributional semantics: A case study on adjective-noun compositions. *Computational Linguistics* 42(4). 703–725. https://doi.org/10.1162/COLI_a_00264.

Attia, Mohammed. 2008. A unified analysis of copula constructions in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'08 Conference*, 89–108. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2008/papers/lfg08attia.pdf.

Backhouse, Anthony E. 2004. Inflected and uninflected adjectives in Japanese. In R M W Dixon & Alexandra Y Aikhenvald (eds.), *Adjective classes: a cross-linguistic typology*, 50–73. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780199270934.001.0001.

Baker, Mark. 2003. Verbal adjectives as adjectives without phi-features. In Yukio Otsi (ed.), *Proceedings of the fourth Tokyo conference on psycholinguistics*, 1–22. Tokyo: Hituzi Syobo Publishers. https://www.hituzi.co.jp/hituzibooks/ISBN4-89476-209-9.htm.

Bhat, D N S. 1994. *The adjectival category: criteria for differentiation and identification*. Amsterdam: John Benjamins.

Bolinger, Dwight. 1967. Adjectives in English: attribution and predication. *Lingua* 18. 1–34.

Butt, Miriam, Tracy Holloway King, María Eugenia Niño & Fédérique Segond. 1999. *A grammar writer's cookbook*. Stanford, CA: CSLI Publications.

Börjars, Kersti & John Payne. 2018. Licensing attributive adjective marking. Paper presented at *The LFG'18 Conference*, Vienna.

Champollion, Lucas. 2015. The interaction of compositional semantics and event semantics. *Linguistics and Philosophy* 38(1). 31–66. https://doi.org/10.1007/s10988-014-9162-8.

Constantinescu, Camelia. 2013. Big eaters and real idiots: evidence for adnominal degree modification? In Emmanuel Chemla, Vincent Homer & Grégoire Winterstein (eds.), *Proceedings of Sinn und Bedeutung 17*, 183–200. https://ojs.ub.uni-konstanz.de/sub/index.php/sub/article/view/340.

Croft, William. 1991. *Syntactic categories and grammatical relations*. Chicago, IL: University of Chicago Press.

Dalrymple, Mary. 2001. *Lexical Functional Grammar* (Syntax and Semantics 34). New York: Academic Press. https://doi.org/10.1163/9781849500104.

Dalrymple, Mary, Helge Dyvik & Tracy Holloway King. 2004. Copular complements: closed or open? In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'04 Conference*, 188–198. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2004/pdfs/lfg04ddk.pdf.

Dalrymple, Mary, John Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Francez, Itamar & Andrew Koontz-Garboden. 2015. Semantic variation and the grammar of property concepts. *Language* 91(3). 533–63. https://doi.org/10.1353/lan.2015.0047.

Frellesvig, Bjarke. 2010. *A history of the Japanese language*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511778322.

Frellesvig, Bjarke. 2022. On the reconstruction of Pre-Old Japanese morphology: OJ grammatical morphemes reflecting Pre-OJ **k-* **s-*. In Kaoru Horie, Kimi Akita, Yusuke Kubota, David Y. Oshima & Akira Utsugi (eds.), *Japanese/Korean Linguistics 29*, 25–49. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/site/JK29Abstract.shtml.

Hoshi, Koji. 2002. The Kaynean analysis of nominal modification and its parametric implication. *Language, Culture and Communication* 29. 1–25.

Kuno, Susumu. 1973. *The structure of the Japanese language*. Cambridge MA: MIT Press.

Miyagawa, Shigeru. 1987. Lexical categories in Japanese. *Lingua* 73(1–2). 29–51.

Morita, Chigusa. 2010. The internal structure of adjectives in Japanese. *Linguistic Research* 26. 105–117.

Nishiyama, Kunio. 1999. Adjectives and the copulas in Japanese. *Journal of East Asian Linguistics* 8(3). 183–222.

Nordlinger, Rachel & Louisa Sadler. 2007. Verbless clauses: revealing the structure within. In Annie Zaenen, Jane Simpson, Tracy Holloway King, Jane Grimshaw, Joan Maling, Chris Manning, Jane Simpson & Annie Zaenan (eds.), *Architectures, rules, and preferences: a Festschrift for Joan Bresnan*, 139–60. Stanford, CA: CSLI Publications.

Payne, John, Geoffrey K Pullum, Barbara Scholz & Eva Berlage. 2013. Anaphoric *one* and its implications. *Language* 89(4). 794–829. https://doi.org/10.1353/lan.2013.0071.

Pullum, Geoffrey K & Rodney Huddleston. 2002. Prepositions and preposition phrases. In Rodney Huddleston & Geoffrey K Pullum (eds.), *The Cambridge grammar of the English language*, 597–662. Cambridge: Cambridge University Press.

Pustejovsky, James. 1995. *The generative lexicon*. Cambridge, MA: MIT Press.

Reichenbach, Hans. 1947. *Elements of symbolic logic*. New York: The Free Press.

Rutland, Colin. 2022. *The lexical semantics of gradable nouns in English*. Ph.D. thesis, The University of Manchester. https://www.proquest.com/openview/0190bc8dee0e860684d8589eb819b619/1?pq-origsite=gscholar&cbl=2026366&diss=y.

Sibley, Frank. 2001. Adjectives, predicative and attributive. In Frank Sibley, John Benson, Betty Redfern & Jeremy Roxbee Cox (eds.), *Approach to aesthetics: collected papers on philosophical aesthetics*, 154–175. Oxford: Oxford University Press. https://doi.org/10.1093/0198238991.001.0001.

Smith, Carlota S. 1961. A class of complex modifiers in English. *Language* 37(3). 342–365.

Vikner, Carl & Per Anker Jensen. 2002. A semantic anaysis of the English genitive. Interaction of lexical and formal semantics. *Studia Linguistica* 56(2). 191–226. https://doi.org/10.1111/1467-9582.00092.

Wechsler, Stephen. 2009. Attributive and predicative adjectives (summary and proposal). *Linguistlist* August 21, 2009. https://listserv.linguistlist.org/pipermail/lfg/2009-August/001605.html.

Whitman, John. 1981. The internal structure of NP in verb final languages. In Robert A Hendrick, Carrie S Masek & Mary Frances Miller (eds.), *Papers from the seventeenth regional meeting of the Chicago Linguistic Society*, 411–418. Chicago: Chicago Linguistics Society.

Yamakido, Hiroko. 2000. Japanese attributive adjectives are not (all) relative clauses. In Roger Billerey & Brook Danielle Lillehaugen (eds.), *WCCFL 19: Proceedings of the 19th West Coast Conference on Formal Linguistics*, 588–602. Somerville, MA: Cascadilla Press. https://www.cascadilla.com/wccfl19.html.

Yamakido, Hiroko. 2005. *The nature of adjectival inflection in Japanese*. Ph.D. thesis, Stony Brook University. https://linguistics.stonybrook.edu/_pdf/dissertation/Yamakido_2005_dissertation.pdf.

Zweigenbaum, Pierre. 1988. Attributive adjectives, adjuncts, and cyclic f-structures in Lexical-Functional Grammar. Tech. rep. Paris: Département Intelligence Artificielle et Médecine, Paris 6. https://perso.lisn.upsaclay.fr/pz/FTPapiers/ZweigenbaumLFG1988.pdf.

Slightly less flat coordinate structures

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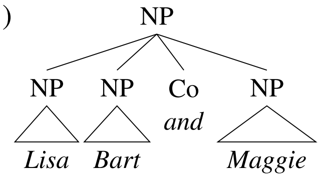
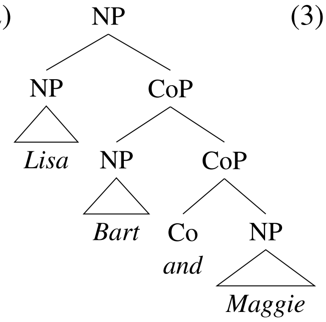
Abstract

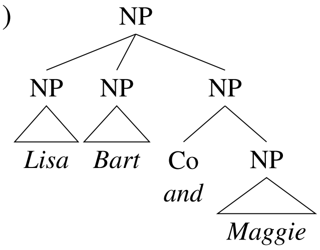
The aim of this paper is to argue that the constituency structure of coordination is slightly less flat than commonly assumed in LFG and to show this does not (have to) impact the resulting functional structures.[†]

1 Introduction

LFG assumes completely flat coordinate structures, as in (1), where other theories assume either strictly binary structures, as in (2), or at least slightly less flat structures, in which the coordinator (conjunction) forms a constituent with the following coordinand (conjunct), as in (3).[1,2]

(1)


(2)


(3)


Completely flat structures such as (1) have been universally assumed in LFG ever since the early 1980s (Peterson 1982, 1986: 248, Kaplan & Maxwell 1988, …, Dalrymple et al. 2019: ch. 16, Patejuk 2023) and no alternatives have ever been seriously considered, with the exception of a brief discussion in Hristov (2012: §2.2.1), taken up in §3 below.

Similarly, binary structures have almost universally been assumed in Chomskyan linguistics ever since the late 1980s (e.g., Munn 1987; Collins 1988, …, Zhang 2023), mostly for theory-internal reasons (X′-theory in GB, binary Merge in Minimalism), with the particular instantiation in (2) proposed in Munn (1993: 24).

Finally, the almost flat structure in (3) has been assumed in HPSG (e.g., Pollard & Sag 1994: §4.6.1, Abeillé & Chaves 2024) and, earlier, in GPSG (e.g., Sag et al. 1985), as well as in early transformational work (especially Ross 1967: 162–165). Interestingly, it has recently been revived within Chomskyan linguistics (Neeleman et al. 2023). Unlike in (2) and other strictly binary variants, the coordinator is *not* a projecting head in (3), but rather a marker, so that the [Co X] constituent has all the features of X, including its category.

[†]For useful feedback, I am grateful to the reviewers and audience of the LFG 2025 conference and, especially, to the reviewers and editors of LFG 2025 proceedings. This paper is dedicated to the memory of John Robert "Haj" Ross (7 May 1938–13 May 2025), whose terms we all use, whether we talk about coordination (*coordinate structure constraint*, *gapping*), or other phenomena (*syntactic islands*, *heavy NP shift*, *sloppy identity*, *sluicing*, *pied-piping*…). Work reported in this paper was carried out within the NCN OPUS-25 project 2023/49/B/HS2/02546 "Coordination: Symmetric or Asymmetric?" financed by the National Science Centre, Poland.

[1]I use here terms promoted by Martin Haspelmath (e.g., 2007) as less ambiguous than *conjunction* (does it include or exclude disjunctions?) and *conjunct* (does it include or exclude disjuncts?).

[2]I am agnostic about the NP/DP/KP issue and mark all nominal maximal projections as NPs.

The aim of this paper is to present and extend arguments – mostly voiced before but largely ignored in LFG so far – for the slightly less flat coordination structure in (3). While perhaps none of the arguments adduced in §2 is decisive alone, they collectively show that this structure is crosslinguistically much more likely than the completely flat structure (1) assumed in LFG. I also perform an easy but necessary exercise of demonstrating in §4 that modifications of recent LFG analyses of coordination needed to accommodate such less flat c-structures are trivial and do not affect resulting f-structures.

2 Arguments for slightly less flat coordinate structures

I will not argue here against binary structures such as (2) or the many variants functioning within Chomskyan linguistics, as convincing arguments against such always binary structures are offered in Borsley (1994, 2005) and in Neeleman et al. (2023) (see also Hristov 2012: §2.2.1).[3] Most of these arguments are irrelevant for the issue at hand, i.e., for deciding between structures (1) and (3).

The arguments for the slightly less flat coordinate structure in (3) presented in the following subsections are based on a number of typologically diverse languages, with arguably the strongest arguments provided by relatively "exotic" non-Indo-European languages. Given that, in LFG, f-structure rather than c-structure is the locus of crosslinguistic constancy, it is logically possible that only some – more "exotic" – languages have the slightly less flat c-structure, while others – like English – have the fully flat c-structure universally assumed in LFG hitherto. However, as I am not aware of any language-specific arguments *against* the less flat structure advocated here, and some of the arguments given below *for* the less flat structure do apply to run-of-the-mill Indo-European languages, I adopt Occam's razor and make the strong claim that such a slightly less flat structure of coordination is valid crosslinguistically.

2.1 Prosody

Some arguments for the coordinator forming a constituent with the following coordinand, as in (3), were originally given in Ross (1967). One of these arguments concerns prosody. Ross (1967: 164–165) notes that sentences such as (4) have the prosodic structure as indicated in (5a), and not as in, for example, (5b–c).[4]

(4) Tom, and Dick, and Harry all love watermelon.

(5) a. (Tom (and Dick) (and Harry)) all love watermelon.
    b. #((Tom) (and) (Dick) (and) (Harry)) all love watermelon.
    c. #((Tom and) (Dick and) Harry) all love watermelon.

Prosody is also considered to be a good indicator of the syntactic structure of coordination in *The Cambridge Grammar of the English Language* (Huddleston & Pullum 2002: 1276), as well in a chapter on coordination in a typological survey of linguistic phenomena (Haspelmath 2007: 8).

[3] Attempts to refute some of Borsley's arguments may be found in de Vries (2005) and in Zhang (2009: §3.6.3).

[4] I use # to signal prosodic or semantic unnaturalness rather than syntactic ungrammaticality.

It is easy to dismiss this argument by citing the common belief that prosody is a poor indicator of constituency, but Wagner (2005, 2010) argues at length that this common belief is largely unjustified. In particular, while he does not argue directly that coordinators form constituents with immediately following coordinands, he demonstrates that prosody very strongly correlates with interpretive possibilities. This is readily explained if prosody indicates constituency, on the common assumption that constituency provides a backbone for semantic composition.

One class of arguments for the direct correspondence between constituency structure and prosodic structure is in fact based on coordinations involving more than two coordinands. Wagner notes that apparently ternary coordinations as in (6) may have three kinds of prosodic profiles: one "flat", as in (7a), where the two prosodic boundaries, marked as |, are of equal strengths, and two "nested", as in (7b–c), where one of the boundaries, marked as ||, is stronger.

(6) Lysander and Demetrius and Hermia

(7) a. Lysander | and Demetrius | and Hermia
    b. Lysander | and Demetrius || and Hermia
    c. Lysander || and Demetrius | and Hermia

While in many contexts the meaning of (6) would be the same regardless of the particular prosodic profile in (7a–c), some contexts reveal interpretative differences. For example, as a reply to the question in (8), (9a) is not felicitous given that exactly two apples were involved, while (9b–c) are felicitous, but they differ in which two people shared an apple: Lysander and Demetrius in (9b) and Demetrius and Hermia in (9c).

(8) Two apples were give out, but I don't know to who. Who was given an apple?

(9) a. #Lysander | and Demetrius | and Hermia respectively.
    b. Lysander | and Demetrius || and Hermia respectively.
    c. Lysander || and Demetrius | and Hermia respectively.

Similarly, as also discussed in Borsley (1994, 2005), *both* can precede a string such as (6) only when it is interpreted as a nested coordination, which is indicated by one of the prosodic boundaries being stronger than the other one:

(10) a. #both Lysander | and Demetrius | and Hermia
     b. both Lysander | and Demetrius || and Hermia
     c. both Lysander || and Demetrius | and Hermia

See Wagner (2010: §2) for many more examples of prosody correlating with interpretation in apparently *n*-ary coordinations.

Wagner (2010: §6) also convincingly argues that at least some apparent mismatches between constituency and prosody are not mismatches at all, but rather involve constituency that is different than commonly assumed. One such mismatch discussed in the literature involves relative clauses. For example, it has been long known (Chomsky 1965: 13, Chomsky & Halle 1968: 372) that (11) might have prosodic breaks as in (12a) despite the commonly assumed constituency in (12b).

(11) This is the cat that caught the rat that stole the cheese.

(12) a. This is the cat | that caught the rat | that stole the cheese.

b. This is [the cat that caught [the rat that stole the cheese]].

However, Wagner (2010) points out that it has also been long known that relative clauses – even restrictive relative clauses – may occupy positions outside of the nominal constituent, as in (13) and, especially strikingly, (14).

(13) I saw [the cat]$_i$ yesterday [that caught [the rat]$_j$ on Monday [that had stolen the cheese on Sunday]$_j$]$_i$.

(14) [A man]$_i$ entered the room and [a woman]$_j$ went out [who were quite similar]$_{i+j}$. (Perlmutter & Ross 1970)

Given that (11) might have the structure made conspicuous by the insertion of temporal modifiers in (13), the prosody indicated in (12a) is expected, and does not constitute an example of syntax–prosody mismatch.

On the other hand, it seems relatively clear that some such mismatches do exist. A few are cited in Bögel et al. (2009), where a new architecture for the syntax–prosody interface is proposed. One of these examples, originally from Lahiri & Plank (2010: 374, 376), is (15a), with the constituent structure given in (15b) and phonological phrasing in natural rapid speech indicated in (15c).[5]

(15) a. Drink a pint of milk a day.

b. [Drink [a [pint [of milk]]] [a day]].

c. (Drink a) (pint of) (milk a) day.

Note that evidence for the syntax–prosody parallelism of the kind given in (13) is not readily available here: while *Drink a pint of milk a day next week* is acceptable and *Drink next week a pint of milk a day* seems at least marginally acceptable, **Drink a next week pint of milk a day* is clearly out on the intended meaning. Hence, (15) seems to be a genuine syntax–prosody mismatch.

In summary, Ross's (1967) observations concerning prosody in coordinate structures might provide a stronger argument for the advocated structure of coordination than it initially seems, but a better assessment of the strength of this argument must await a more comprehensive theory of the syntax–prosody interface and the kinds of mismatches that it permits.

2.2 Sentence-initial coordinators

Another argument of Ross (1967: 163) is that, when a coordinated sentence, e.g. (16), is broken into two, the coordinand always accompanies the second, as in (17a) (rather than (17b)):

(16) John left, and he didn't even say goodbye.

(17) a. John left. And he didn't even say goodbye.

b. *John left and. He didn't even say goodbye.

[5]I am grateful to an anonymous reviewer of LFG 2025 proceedings for pointing out this possible syntax–prosody mismatch to me. ((15b) corrects the constituent structure indicated in Bögel et al. 2009: 153, (8), and also the reference to the original source of (15) is corrected here.)

This argument may be understood as a variant of the previous one, about a natural place for a longer break, but it may also be understood as a more direct claim about the possibility of [Co X] constituents. Ross (1967: 164) makes such a claim more explicitly on the basis of (18), while Borsley (1994: 240) offers (19).

(18) Even Harold, and he is the smartest boy in our class, failed.

(19) The professor, and he's an expert, thinks the recession will continue.

In both, the sequence *and he...* is a parenthetical, and there is no preceding material that could be understood as the initial coordinand, so the parenthetical is best analysed as a [Co IP] constituent.

Examples (18)–(19) are constructed by linguists, but similar examples are easy to find *in vivo*, e.g. the following, involving literally parenthetical [Co IP]s.[6]

(20) The only caveat (and it's a big one) is that the pair has to be really old; over a century is a good starting point.

(21) If the measurement of a marker (and BP is simply a marker) is inaccurate, it follows that recommendations based upon it will be flawed.

(22) But (and I'm talking to myself here more than anyone) it's worth being precise about the establishment (if such it is) that we are trying to overturn.

(23) The premise of the book (and you don't have to read beyond the title to know this) is to report history through the eyes of THE PEOPLE.

(24) This means (and Sony has said as much) that Venom takes place outside of the MCU, and it definitely feels isolated from other superhero world events.

This is not just a quirk of English *and*; other conjunctive coordinators in other languages behave similarly, as the following attested examples from Polish illustrate:[7,8]

(25) *i* 'and' (ordinary conjunctive coordinator)

a. Poddani swoistemu praniu mózgu (i tu z pomocą
subjected.PL.M.NOM kind.DAT brainwashing.DAT and here with help
przyszedł tekst książeczki), omamieni wizją
came text.SG.M.NOM book.SG.F.GEN) deluded.PL.M.NOM vision.DAT
bogactw i rozlicznych uciech, szybko wpasowali się w
riches.GEN and multiple.GEN joys.GEN quickly adjusted.PL.M REFL into
rolę foteli dla dam. (Polish)
role.ACC armchachairs.GEN for ladies

'Subjected to a kind of brainwashing (and here the text of the booklet came to the rescue), deluded by visions of riches and various pleasures, they quickly fit into the role of armchairs for ladies.'

[6] Unless indicated otherwise, attested English examples come from the English Web 2021 corpus accessible via SketchEngine (www.sketchengine.eu; Jakubíček et al. 2013; Kilgarriff et al. 2014).

[7] Unless indicated otherwise, attested Polish examples come from the 300-million-token balanced subcorpus of the National Corpus of Polish (nkjp.pl; Przepiórkowski et al. 2012).

[8] Morphosyntactic annotations follow the conventions of Leipzig Glossing Rules; additional abbreviations are defined as and when needed.

b. Powiedziałem (i była to jedna z tych bzdur, które brzmią w
said.1SG.M and was.3SG.F this one of these humbugs which sound in
ludzkich uszach prawdopodobnie), że Azef nie mógł działać sam…
human ears plausible that Azef NEG could act alone
(Polish)
'I said (and it was one of those nonsenses that sound plausible to people's ears) that Azef could not have acted alone...'

(26) *a* 'and, while' (contrastive adversative coordinator)

a. Leszek Lu odruchowo (a odruch był szybszy niż świadoma myśl)
Leszek Lu instinctively and instinct was faster than conscious thought
ukrył się za drzewem. (Polish)
hid REFL behind tree
'Leszek Lu instinctively (and the instinct was faster than conscious thought) hid behind a tree.'

b. Któryś z nich (a może było ich wielu) przeszedł tędy tysiąc lat
one of them and perhaps were they many) passed here thousand years
temu… (Polish)
ago
'One of them (or perhaps there were many of them) passed through here a thousand years ago…'

(27) *ale* 'but' (mirative adversative coordinator)

a. Gadamy jedząc, popijając (ale czy to przeszkadza?), siedząc przy stole…
talk.1PL eating drinking but Q this disturbs sitting at table
(Polish)
'We talk while eating, drinking (but does it bother us?), sitting at the table…'

b. A jeśli przypadkiem (ale któż wierzył w takie przypadki!) usiadła na
and if accidentally but who believed in such accidents sat.3SG.F on
statku, stawała się złowróżbnym zwiastunem nieszczęścia...
ship became.3SG.F REFL ominous harbinger misfortune
(Polish)
'And if by chance (but who believed in such chances!) she sat on a ship, she became an ominous harbinger of misfortune...'

While it is more difficult to find similar examples with disjunctive coordinators, the translation of (26b) contains one, and a few attested examples are given below.

(28) Now, the beginning of this Cold War Part II (or should it be called Part III?) is not bad either: the Taliban are no more and Osama is on the run.

(29) My grandfather had very little schooling, and when he would receive letters, apparently one of his officers (or perhaps it was just a buddy) would read his letters to him.

(30) Bare-tube (or maybe you have heard the more old-school term, "bare-bulb,") means nothing more than having your flash tube sitting out there in open space pushing its light out into (nearly) a 360-degree sphere of coverage.

The opposite situation, of coordinators occurring without the *following* coordinand, only happens with very specific kinds of intonation, inviting the addressee to finish an obviously incomplete sentence or suggesting that the list could be continued, e.g.:

(31) In what foreign countries did he live on consulting assignments? Mexico, Chile, United Kingdom and. . . ?

(32) Are there two individuals from the 19th century who had more of an effect on human history (however one might choose to assess that) than Lincoln and Darwin? Can't think of any offhand (Marx and. . . ?).

Note the similarity of (31)–(32) to other cases of incomplete sentences used as questions, e.g.:[9]

(33) The laughter pleased the archeologist, who swiftly produced a fourth bouquet with a grin. 'And that's for. . . ?' – Melinda asked with amusement.

(34) And you did that because. . . ?

But just as examples such as (33)–(34) do not provide evidence that prepositions or complementizers form constituents with preceding elements to the exclusion of following constituents, examples such as (31)–(32) do not make a case for coordinators forming constituents with preceding coordinands.

In summary, various coordinators may co-occur with the following coordinand in constructions that do not involve any other coordinands, so at least in such constructions they must form a constituent.

Single-coordinand coordination is an interesting phenomenon, one that apparently has not been analysed in any depth so far. It might seem that it provides an at most suggestive argument for less flat coordinate structures. This is because, at the c-structural level, it can apparently be easily described with a slight modification of the usual rule responsible for the completely flat structures, namely, by replacing the Kleene plus ("1 or more") in rules such as (35) with the Kleene star ("0 or more"), as in (36).[10]

(35) $\text{XP} \rightarrow \underset{\downarrow\in\uparrow}{\text{XP}^{+}} \quad \text{Co} \quad \underset{\downarrow\in\uparrow}{\text{XP}}$

(36) $\text{XP} \rightarrow \underset{\downarrow\in\uparrow}{\text{XP}^{*}} \quad \text{Co} \quad \underset{\downarrow\in\uparrow}{\text{XP}}$

However, the effect of this straightforward analytical modification would be that all phrases could be optionally preceded by a coordinator, so for example sentences such as the following should in principle be grammatical:

(37) *[$_{\text{NP}}$ Lisa] saw [$_{\text{NP}}$ and [$_{\text{NP}}$ Bart]].

(38) *Marge was waiting [$_{\text{PP}}$ or [$_{\text{PP}}$ for Homer]].

But, in fact, only certain kinds of constituents starting with a coordinator (namely, sentential constituents) may occur in certain positions outside of coordination, so they should not bear exactly the same category as coordinator-less constituents.[11] Hence,

[9]Punctuation has been adjusted in (33) for clarity.

[10]Throughout the paper I employ the usual convention that the lack of functional descriptions is equivalent to $\downarrow = \uparrow$.

[11]An anonymous reviewer of LFG 2025 proceedings asks about the possibility of non-sentential par-

the simple replacement of $+$ with $*$ in (35)–(36) must be augmented by some additional analytical adjustments to the effect that syntactic positions earmarked for constituents of category X may only be filled by non-coordinate constituents bearing X or by coordinations with at least two X coordinands.

Nevertheless, while such theoretical considerations suggest that the argument adduced in the current subsection should not be dismissed too quickly, much stronger arguments for less flat structures are presented in the following subsection.[12]

2.3 Coordinand-internal coordinators

2.3.1 Shifting coordinators

Ross (1967: 163–164) notes that some coordinators in some languages may be placed inside the following – but not the preceding – coordinand, e.g., in German:[13]

(39) [Sie will tanzen], aber [ich will nach Hause gehen]. (German)
she wants dance but I want to house go
'She wants to dance, but I want to go home.'

(40) a. [Sie will tanzen]; [ich will aber nach Hause gehen]. $= (39)$
b. #[Sie will aber tanzen]; [ich will nach Hause gehen]. $\neq (39)$ (hence #)

Similar "shifting coordinators" (Weisser 2024) also occur in Polish, as in the following examples from the National Corpus of Polish cited in Patejuk (2018), where the relevant coordinators are called "incorporating":

(41) …[uzyskał zwolnienie wszystkich zakładników], [władze sowieckie wyraziły
achieved release all hostages authorities Soviet expressed
zaś zgodę na ich powrót]. (Polish)
but consent on their return
'He achieved the release of all hostages, whereas the Soviet authorities agreed to their return.'

(42) …[należy karać tych chrześcijan, którzy są oskarżeni przed władzą], [nie
should penalise those Christians who are accused before authority NEG

---

entheticals, as in *I saw Lisa there (and Bart)*. These are parentheticals of a different kind: what is in parentheses is actually integrated in the main sentence, as witnessed by the grammaticality of *I saw Lisa there and Bart* without the strong prosodic break witnessed in examples such as (18)–(24). (See the last apparent counterargument in §3 for a brief discussion of such apparent extrapositions.) I assume that in such cases a more general rule suffices which puts any (optional) sentence constituent in parentheses, as in the current sentence and in the following corpus examples:

(i) Many RDF APIs exist currently (in various programming languages).

(ii) In an insightful letter (to Thomas Jefferson), James Madison wrote…

(iii) For those interested in participating in this (free) contest, please meet in the Coleman room…

[12] Another anonymous reviewer wonders whether a specialized rule, Paren $\rightarrow$ Co IP, could be posited for parentheticals involving sentence-initial coordinators, with the usual fully flat structure of coordination left intact. This perhaps might be a reasonable way to go if sentence-initial coordinators were the only argument for less flat structures, but even then non-parenthetical sentence-initial coordinators, as in (17a), (34), (53), (55a), or (56), would need to be accounted for. By contrast, on the formalization proposed in §4 below, both kinds of sentences starting with a coordinator are constituents by virtue of the general approach to coordination advocated here, an approach motivated also by other phenomena.

[13] In this section coordinands are in square brackets and coordinators are underlined for conspicuity.

trzeba ich natomiast wyszukiwać]. (Polish)
need them but seek.INF
'One should penalise those Christians who were accused by the authorities, but one should not search for them.'

Another language well-known for such shifting coordinators is Latin. However, unlike in German and Polish, the shifting coordinators *que* 'and' and *ve* 'or' usually occur after the first word of the final coordinand. The following examples come from Weisser (2024: §3.1), with (45) illustrating that the notion of the first word that is relevant here is prosodic (*de provincia* 'from province'), and not orthographic (*de* 'from'):

(43) ...ut consules [sortir-entur] [conparar-ent=ve inter se]
that consul.NOM.PL draw.lots-PASS.3PL arrange=or between REFL
(Latin)
'...that the consuls should draw lots or arrange between themselves'

(44) [cunctis oppidis] [castellis=que desertis] (Latin)
defeated towns fortresses=and deserted
'the towns defeated and the fortresses deserted'

(45) [is istum reliqui-t] [de provincia=que decess-it] (Latin)
he it leave.PERF-3SG from province=and depart.PERF-3SG
'he left it and departed from the province'

What this phenomenon seems to show is that at least some coordinators in some languages occur *within* the coordinand, contrary to the usual rule in (35) or its variant in (36). If so, then – in the absence of arguments to the contrary – it may be assumed that all coordinands in all languages form a constituent with one coordinand, to the exclusion of the others. However, if the argument were only based on these three (and similar) languages, it would only be suggestive.

This is most clear in the case of Latin, where rules responsible for the realization of the coordinator are uncontroversially prosodic: the coordinator must occur after the first prosodic word of the final coordinand. However, this is compatible with the usual LFG approach to coordination, if the observed linear order is not necessarily completely determined by c-structural configurations, but may be influenced by the prosodic component of the grammar, as in Bögel et al. (2010) or in $\mathrm{L_R}$FG (see, especially, Asudeh et al. 2023 and Asudeh & Siddiqi 2024). On such analyses, the coordinator could occur in c-structure *before* the last coordinand, hence, not necessarily forming a constituent with that coordinand, and be placed *within* that coordinand only when c-structure is mapped to utterance by the prosodic component. A similar escape hatch is readily available for other languages with Latin-type shifting coordinators, including – according to Weisser (2024: ch. 3) – various other extinct Indo-European languages (Ancient Greek, Hittite, Old Irish, Gaulish, Gothic), as well as Oklahoma Cherokee, and possibly Kalaallisut (i.e., West Greenlandic).

As for German, Polish, and a couple of other languages (Yorùbá and the closely related Nupe, both Niger-Congo languages, as well as perhaps Slovenian), Weisser (2024: ch. 4) argues that the position of shifting coordinators is also prosodically determined, namely, that they occur after the first prosodic *phrase* of the respective coordinand. If so, then – assuming a sufficiently powerful prosodic component – these languages also do not provide a decisive argument for the less flat structure of coordination advocated here.

However, Weisser (2024: chs. 5–6) also discusses two other groups of languages, where shifting coordinators are positioned within respective coordinands on the basis of purely (morpho)syntactic factors.

In one group of languages, the coordinator is always placed after the first major constituent of the relevant coordinand. This pattern is apparently "fairly common crosslinguistically" and "extremely widespread in Caucasian… and Turkic languages" (Weisser 2024: 166), but also witnessed, e.g., in Yavapai (Yuman; Arizona, US), Udihe (Tungusic; Russian Far East), Rangi (Bantu; Tanzania), and Makalero (Papuan; East Timor). Unlike in the previous two groups, which included Latin, German, and Polish, shifting coordinators in languages belonging to this group may not occur *within* major constituents of the coordinand, only between them. A particularly telling example is (46) (Haspelmath 1993: 366 apud Weisser 2024: 154) from Lezgian (Nakh-Dagestanian), where the coordinator occurs after a very long constituent which contains a clausal complement (marked by substantivized participle in superessive case).[14]

(46) … [Dağustandi-n har sa xür-e lap q^hsan wa ag'alt'aj pis adet-ar
Daghestan-GEN every one village-INESS very good and extremely bad custom-PL
awa-j-da-l sa šak-<u>ni</u> ala-č] (Lezgian)
be.in-PTCP-SBST-SRESS one doubt-and be.on-NEG
'… and there is no doubt that there are very good and extremely bad customs in every Daghestanian village.'

Note that, despite a number of maximal projections within the clausal complement, the coordinator occurs only after the whole top-level constituent in the coordinand.

In the other – more heterogeneous – group of languages, coordinators attach to specific categories, but again honouring syntactic structure. For example, in Khwarshi (Nakh-Dagestanian), they attach to major absolutive phrases or – when such an absolutive nominal is missing at the top level of the coordinand – to the first major constituent, as in languages of the previous group. This is illustrated with (47) (Khalilova 2009: 128 apud Weisser 2024: 178).[15]

(47) [zamana m-eλ'-aλa] [∅-ešt'-un žahaλ'a-<u>n</u> [soyro b-eγ^w-a]] (Khwarshi)
time.III III-go-ANTR I-let-PST.UW again-and horse.III III-sell-INF
'Some time passed and he sent (him) again to sell the horse.'

While there is an absolutive phrase in the second coordinand (see *syoro* 'horse.III'), it is not a top-level constituent (it is embedded within an infinitival phrase), so the coordinator *-n* attaches to an earlier top-level constituent. Similar constraints are observed in various Caucasian (especially Nakh-Dagestanian) and Dravidian languages, as well as in Sinhala (Indo-European), areally close to the Dravidian language Tamil.

Crucially, in both groups of languages, factors determining the position of the coordinator within the coordinand are purely (morpho)syntactic, not phonological or

[14] INESS = inessive, SRESS = superessive, SBST = substantivizer.

[15] I and III are gender markers, ANTR = anterior, UW = unwitnessed. The free translation of this example is my interpretation, as the translations provided in Khalilova (2009: 128) and Weisser (2024: 178) are not fully coherent.

prosodic. This means that it is very unlikely that prosodic rules are responsible in such languages for placing the coordinator where it is observed; if they were, they would have to be bestowed with powers reserved so far for syntactic rules.

On the basis of such and more data, Weisser (2024: 209) reaches the generalization that "[s]hifting coordinators always appear inside the coordinand that they form a constituent with", in consonance with Ross's claim. I believe that shifting coordinators, where they are positioned on the basis of (morpho)syntactic factors, indeed provide a strong argument for the existence of constituents encompassing a coordinator and a single coordinand, to the exclusion of other coordinands, i.e., for the less flat structure of coordination advocated here.

2.3.2 Word-internal coordinators

The above argument that coordinators may be encoded within coordinands is further strengthened by data from languages in which coordinators are encoded morphologically or even phonologically.

For instance, Haspelmath (2007: 15) notes that, in Djabugay (a Pama-Nyungan language of Australia), coordinators are realized as suffixes which may be followed by case suffixes, as in the following example from from Patz (1991: 292):

(48) yaba-nggu nyumbu-djada-nggu (Djabugay)
brother-ERG father-AND-ERG
'my brother and father'

Another language with a similar phenomenon is Tundra Nenets (Uralic), where two coordinands can be coordinated by marking each with a word-internal dual marker, which loses its usual dual function in such cases (i.e., each coordinand is singular). This is illustrated in (49) from Nikolaeva (2014: 418) apud Weisser (2024: 63), where one grandfather and one grandmother is referred to.

(49) yir'i-xəyu-n° xadake-x°yu-n° m'adoncey°-m xana-q
grandfather-DU-1SG grandmother-DU-1SG present-ACC take-IMP
(Tundra Nenets)
'Take the present to my grandfather and my grandmother.'

Note that the marker is again word-internal, and may be followed by a possessive affix, as in the example above.

Even more strikingly, coordination in Telugu (Dravidian) is marked by lengthening the final vowels of both coordinands, as in (50):

(50) kamalaa wimalaa poDugu (Telugu)
Kamala Vimala tall
'Kamala and Vimala are tall.' (Krishnamurti & Gwynn 1985: 325 apud Drellishak & Bender 2005: 111 apud Abeillé & Chaves 2024: 781)

In all these cases, as well as at least some of those involving shifting coordinators, the standard LFG rule for coordination, repeated as (51), is inapplicable, as there is no overt coordinator preceding the final coordinand.

(51) $$\mathrm{XP} \rightarrow \underset{\downarrow\in\uparrow}{\mathrm{XP}^{+}} \quad \mathrm{Co} \quad \underset{\downarrow\in\uparrow}{\mathrm{XP}}$$

Instead, a rule like (52a) is needed, indicating a constituent with internally expressed monosyndetic coordinator, or – in the case of polysyndetic coordination as in (49)–(50) – a rule like (52b), indicating that all coordinands express coordinators internally.

(52) a. $\begin{array}{cccc} \text{XP} & \rightarrow & \text{XP}^{+} & \text{XP}_{\&} \\ & & \downarrow\in\uparrow & \downarrow\in\uparrow \end{array}$ b. $\begin{array}{cccc} \text{XP} & \rightarrow & \text{XP}^{+}_{\&} & \text{XP}_{\&} \\ & & \downarrow\in\uparrow & \downarrow\in\uparrow \end{array}$

In §4, I will propose a variant of such rules.[16] But let us first examine counterarguments offered within the LFG literature against such slightly less flat structures.

3 Counterarguments?

The only attempt at countering arguments such as above that I am aware of is Hristov (2012: 19–20), which refers to three arguments for [Co X] given in Huddleston & Pullum (2002: 1277). The first – not commented on in Hristov (2012) – concerns intonation breaks and mirrors Ross's first argument discussed in §2.1 above.

The second mirrors Ross's second argument, discussed in §2.2, and it is illustrated with (53), suggesting that *and* forms a constituent with the following sentence.

(53) She thoroughly enjoyed it. And so did her mother.

To this, Hristov (2012: 20) replies that "[t]he initial *and* in [(53)] can equally plausibly be deemed a sentential adjunct", but does not provide any arguments for this hypothesis.

In fact, there are multiple arguments against this hypothesis. One argument is that, as shown in §2.2 above, not only *and*, but also other coordinators – both in English and crosslinguistically – may occur sentence-initially, and it is unlikely that they all lead double lives as sentential adjuncts. A stronger argument is that – while actual sentential adjuncts are not restricted to sentence-initial positions, see (54a) and the attested (54b) – *and* must remain sentence-initial, see (55a–b).

(54) a. Unfortunately, document-level information retrieval can lead to...
     b. Document-level information retrieval can unfortunately lead to...

(55) a. And document-level information retrieval can lead to...
     b. Document-level information retrieval (*and) can (*and) lead (*and) to...

Finally, a particularly strong argument against the hypothesis that sentence-initial coordinators are sentential adjuncts may be constructed on the basis of V2 languages such as German – see the attested (56).

(56)

Und	natürlich	sind	das	OnePlus 9	und	das	OnePlus 9 Pro	auch	beim	Ratenkauf
and	naturally	are	ART	OnePlus 9	and	ART	OnePlus 9 Pro	also	at.ART	installment.purchase

SIM-frei. (German)
SIM-free

'And, of course, the OnePlus 9 and OnePlus 9 Pro are also SIM-free when purchased on installments.'

[16] On the other hand, I will have nothing to say about how information about the presence and kind of a coordinator within an $\text{XP}_{\&}$ conjunct makes its way to the top level of that $\text{XP}_{\&}$. See Patejuk (2018) for one LFG analysis of shifting coordinators in Polish, as well as Goldstein & Haug (2016) for an extension of c-structure rules that could be employed in another such analysis.

If *und* ‘and’ were an adjunct, then there would be two pre-verbal constituents in (56) – not an option in German matrix declarative clauses.[17] Hence, it is very unlikely that sentence-initial coordinators are adjuncts; instead, they are what they seem – coordinators combining with a single coordinand.

Ross’s third argument, based on shifting coordinators and discussed in §2.3.1, is not considered in Hristov (2012). The final argument that is considered in Hristov (2012) is illustrated with examples such as (57), where the [Co X] sequence seems to be extraposed, which suggests that it is a constituent.

(57) a. Did the boss [or her secretary] tell you that?

b. Did the boss tell you that [or her secretary]?

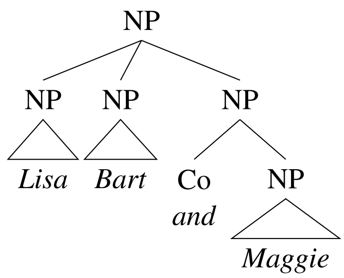
This argument was apparently first given in Munn (1993: 15), but – as rightly noted in Hristov (2012: 20) and, independently, many times elsewhere (e.g., Wagner 2005: §3.4.1, Chaves 2007: 42–43) – it is flawed; for example, if such extraposition were possible, then the ungrammatical sentence (58) should be grammatical, given that *each other* would be bound by *John and Mary*, as in (59), from which *and Mary* is extraposed. (The currently common view is that examples such as (57b) involve sentential coordination and ellipsis.)

(58) *John resembled each other [and Mary].

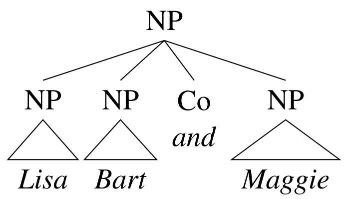
(59) John [and Mary] resembled each other.

In summary, only one of the arguments for [Co X] constituents discussed in §2 is addressed in Hristov (2012), the argument from sentence-initial coordinators in §2.2, and the offered explanation – in terms of coordinators such as *and* sometimes acting as adjuncts – does not stand scrutiny. Hence, it is fair to say that the completely flat structure traditionally assumed in LFG, such as that repeated in (61), is not and has never been motivated, and that the slightly less flat structure, such as that repeated in (60), should be adopted instead.

(60) motivated (see §2):



(61) not motivated (see §3):



4 Formalization

It is a relatively easy exercise to modify existing LFG accounts of coordination in such a way that c-structures such as (60) rather than (61) are licensed, but resulting f-structures are unchanged. The following subsections provide translations of the standard LFG

[17] In fact, Weisser (2024: 46, 122–124) takes such co-occurrence with a pre-verbal constituent as a reliable test distinguishing coordinators from adjuncts in German.

analysis in *The Oxford Reference Guide* (Dalrymple et al. 2019: ch. 16), which assumes that all coordinands bear the same category, as well as the analysis in Przepiórkowski & Patejuk (2021), which deals with unlike category coordination.

The gist of the translations is that single rules such as (62) responsible for ordinary coordination in run-of-the-mill languages are replaced with double rules such as (63) (suggested already in §2.3.2) or, equivalently, (64); in either case, while the c-structure is less flat, the hybrid f-structure representation of coordination remains essentially the same as in standard LFG analyses assuming rules such as (62).[18]

(62) $$\begin{array}{llccc} \mathrm{XP} & \rightarrow & \mathrm{XP}^{+} & \mathrm{Co} & \mathrm{XP} \\ & & \downarrow\in\uparrow & & \downarrow\in\uparrow \end{array}$$

(63) a. $$\begin{array}{llcc} \mathrm{XP} & \rightarrow & \mathrm{XP}^{+} & \mathrm{XP}_{\&} \\ & & \downarrow\in\uparrow & \downarrow\in\uparrow \end{array}$$

b. $$\begin{array}{llcc} \mathrm{XP}_{\&} & \rightarrow & \mathrm{Co} & \mathrm{XP} \end{array}$$

(64) a. $$\begin{array}{llcc} \mathrm{XP} & \rightarrow & \mathrm{XP}^{+} & \mathrm{XP}_{\&} \\ & & \downarrow\in\uparrow & \end{array}$$

b. $$\begin{array}{llcc} \mathrm{XP}_{\&} & \rightarrow & \mathrm{Co} & \mathrm{XP} \\ & & & \downarrow\in\uparrow \end{array}$$

Replacing one rule with two might seem less than satisfactory, but the two rules in (63) or (64) are needed anyway. First, rules such as (63a) or (64a), not mentioning a coordinator between the coordinands, are needed for word-internal coordinators exemplified in §2.3.2 and possibly also for coordination involving "shifting coordinators" discussed in §2.3.1. Second, rules such as (63b) or (64b), with a coordinator co-occurring with a single constituent, are needed for sentence-initial coordinators, discussed in §2.2.[19] Thus, the resulting grammar is actually leaner, as it does not assume rules such as (62) on top of independently needed (63a–b) or (64a–b).

The following subsections demonstrate how two specific LFG analyses of coordination mentioned above may be modified in line with the general schema in (64) (§4.1) or in (63) (§4.2).

4.1 Standard LFG (Dalrymple et al. 2019)

In what follows, I slightly simplify the analysis of coordination in Dalrymple et al. (2019: ch. 16) by ignoring so-called "preconjunctions" such as English *either* and *both*, as their syntactic category and position is controversial; for example, they are argued to be focus particles in Hendriks (2004). For this reason, I will not distinguish between the complex categories Cnj[pre] ("preconjunctions") and Cnj[main] (ordinary coordinators), and hence I will assume that coordinators have the simple category Co (and will rename some macros correspondingly).

Dalrymple et al. (2019: 622–623) employ rule macros in their analysis of coordination. Such macros are used to define and parameterize right-hand sides of syntactic rules. Specifically, Dalrymple et al. define the CO macro in (65) and the ENGLISH-COORD macro in (66); the latter macro is used in syntactic rules as illustrated in (67).

[18] Recall the convention that the lack of functional descriptions is equivalent to $\downarrow = \uparrow$.

[19] Note that, according to (63b) and (64b), such constituents have the category $\mathrm{XP}_{\&}$ rather than XP, with the effect that the distribution of the two kinds of constituents is not necessarily the same (as it would be, if Kleene plus were only replaced by Kleene star in (62)).

(65) $$\textsc{co}(\_\textsc{c}) \quad \equiv \quad \begin{array}{cc} \text{Co} & \_\textsc{c} \\ \downarrow = \uparrow & \downarrow \in \uparrow \end{array}$$

(66) $$\textsc{english-coord}(\_\textsc{c}) \quad \equiv \quad \begin{array}{cccc} \_\textsc{c} & \{\ \_\textsc{c}^{*} & \mid\ @\textsc{co}(\_\textsc{c})^{*}\ \} & @\textsc{co}(\_\textsc{c}) \\ \downarrow \in \uparrow & \downarrow \in \uparrow & & \end{array}$$

(67) $$\begin{array}{lcl} \text{V} & \rightarrow & @\textsc{english-coord}(\text{V}) \\ \text{IP} & \rightarrow & @\textsc{english-coord}(\text{IP}) \\ \text{NP} & \rightarrow & @\textsc{english-coord}(\text{NP}) \\ \ldots & & \end{array}$$

The disjunction in (66) takes care of monosyndentic coordination, where the coordinator only occurs before the last coordinand (*Lisa, Bart, and Maggie*), and polysyndetic coordination, with one fewer coordinator than the number of coordinands (*Lisa, and Bart, and Maggie*).

Only a minor modification is necessary to adjust this analysis to the view advocated in this paper: the CO macro definition in (65) should be replaced by an almost identical syntactic rule, as in (68), and the ENGLISH-COORD macro should be adjusted accordingly, as shown in (69).

(68) $$\_\textsc{c}[\text{co}] \quad \rightarrow \quad \begin{array}{cc} \text{Co} & \_\textsc{c} \\ & \downarrow \in \uparrow \end{array} \qquad\qquad (\_\textsc{c} \in \{\text{V, IP, NP}, \ldots\})$$

(69) $$\textsc{english-coord}(\_\textsc{c}) \quad \equiv \quad \begin{array}{cccc} \_\textsc{c} & \{\ \_\textsc{c}^{*} & \mid\ \_\textsc{c}[\text{co}]^{*}\ \} & \_\textsc{c}[\text{co}] \\ \downarrow \in \uparrow & \downarrow \in \uparrow & & \end{array}$$

The rule in (68) employs a convention that also makes it possible to replace the set of rules alluded to in (67) with a single rule, namely, (70).

(70) $$\_\textsc{c} \quad \rightarrow \quad @\textsc{english-coord}(\_\textsc{c}) \qquad\qquad (\_\textsc{c} \in \{\text{V, IP, NP}, \ldots\})$$

Such rules are sometimes called metarules (Gazdar et al. 1985); they are employed in some LFG analyses (especially in the analysis of Polish shifting coordinators in Patejuk 2018, but also in Asudeh et al. 2024: 57 in an L_{R}FG analysis of Latin declension), and they are implemented in XLE (Crouch et al. 2011).

In (68), I additionally employ complex categories (see _C[co]), with the effect that this metarule is equivalent to the following set of rules:

(71) $$\begin{array}{lccc} \text{V[co]} & \rightarrow & \text{Co} & \text{V} \\ & & & \downarrow \in \uparrow \\ \text{IP[co]} & \rightarrow & \text{Co} & \text{IP} \\ & & & \downarrow \in \uparrow \\ \text{NP[co]} & \rightarrow & \text{Co} & \text{NP} \\ & & & \downarrow \in \uparrow \\ \ldots & & & \end{array}$$

It is easy to see that this analysis results in exactly the same f-structures as in standard LFG analyses of coordination: the rule in (68) licenses hybrid f-structures containing the final coordinand, while the rule macro (69) ensures that all other coordinands are also members of such hybrid f-structures, as commonly assumed in LFG.

In summary, the modification of the standard LFG analysis of coordination in Dalrymple et al. (2019) necessary to implement the "slightly less flat" view is trivial and consists in replacing one macro, (65), with an almost identical syntactic rule, (68), and with corresponding straightforward adjustments in another macro, (66). The employment of metarules in the process makes it also possible to replace a presumably large collection of rules in (67) with a single metarule in (70).

4.2 Category-less coordination (Przepiórkowski & Patejuk 2021)

Dalrymple (2017) notes that prepositions may combine with NPs (as in (72a)) and, on certain uses, with PPs (as in (72b)), and hence also with unlike category coordinations involving NPs and PPs, as in (73) from the NOW corpus (Davies 2016–).

(72) a. I removed them from [$_{\text{NP}}$ the box].

b. I removed them from [$_{\text{PP}}$ under the bed].

(73) I removed them from [[$_{\text{NP}}$ the box] and [$_{\text{PP}}$ under the bed]].

She also notes that the intuitive PP rule in (74) does not handle such examples, as it simply requires that the whole coordinate structure in (73) be either an NP or a PP, and not that all coordinands should be of these categories.

(74) $$\text{P}' \quad \rightarrow \quad \text{P} \quad \begin{array}{c}\{\text{NP}|\text{PP}\}\\ (\uparrow \textsc{obj}) = \downarrow\end{array}$$

She finally notes some problems with a potential solution based on the CAT predicate introduced in Kaplan & Maxwell (1996: 93), and proposes a novel solution, based on complex categories such as [N +, V −, P +, ADJ −, ADV −] in the case of the coordination in (73).

Przepiórkowski & Patejuk (2021) argue that this solution does not extend to those cases of unlike category coordination where not only categories, but also morphosyntactic or lexical features of coordinands matter for well-formedness. One of their examples is (75), where the coordination of PP and CP is possible because of the subcategorization properties of *believe*, but where not just any PP and CP will do: the PP must be headed by *in* (and not, say, *on*, which in other contexts may also be used as a non-semantic preposition), and the CP must be headed by *that* (and not, say, *whether*).

(75) We all believe [[$_{\text{PP}[\textit{in}]}$ in positive energy] and [$_{\text{CP}[\textit{that}]}$ that what you give comes back]].

They develop a solution based on the radical idea of moving categorial information from c-structure to f-structure, where it is encoded via the distributive CAT feature. On this solution, the rule in (74) is a shorthand for the rule in (76), with information about projection level (P′ vs. P, etc.) omitted here (but see, e.g., Lowe & Lovestrand 2020).

(76) $$\bullet \quad \rightarrow \quad \begin{array}{c}\bullet\\ (\downarrow \textsc{cat}) =_c \text{P}\\ \downarrow = \uparrow\end{array} \quad \begin{array}{c}\bullet\\ (\downarrow \textsc{cat}) \in_c \{\text{P}, \text{N}\}\\ (\uparrow \textsc{obj}) = \downarrow\end{array}$$

They argue that this solution removes a number of redundancies in the grammar, e.g., the repetition of the head's basic category symbol on the left-hand side of a rule (see P repeated in P′ in (74)), even though this often follows from the head status of the relevant constituent. They moreover propose that descriptions such as $(\downarrow \textsc{cat}) \in_c \{\text{P}, \text{N}\}$ should be understood distributively, i.e., satisfied for each coordinand independently; this aspect of the analysis is further discussed and formalized in Przepiórkowski (2022: §7.1).

Przepiórkowski & Patejuk (2021) do not provide specific rules for coordinate structures, but they implicitly assume a variant of the standard LFG approach schematically given in (62) above, repeated as (77). I modify this approach by applying the variant of the "slightly less flat" view which was suggested in §2.3.2 and made more explicit in (63), repeated as (78) below.

(77)
$$\begin{array}{llccc} \mathrm{XP} & \rightarrow & \mathrm{XP}^{+} & \mathrm{Co} & \mathrm{XP} \\ & & \downarrow\in\uparrow & & \downarrow\in\uparrow \end{array}$$

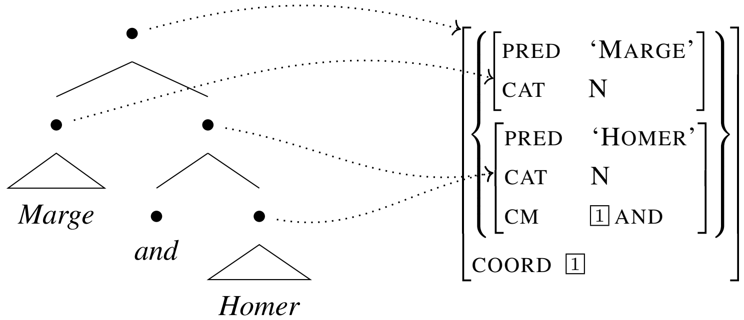
(78)
a.
$$\begin{array}{llcc} \mathrm{XP} & \rightarrow & \mathrm{XP}^{+} & \mathrm{XP}_{\&} \\ & & \downarrow\in\uparrow & \downarrow\in\uparrow \end{array}$$

b.
$$\mathrm{XP}_{\&} \rightarrow \mathrm{Co} \quad \mathrm{XP}$$

A specific rule corresponding to the schematic (78b) is given in (79).[20]

(79)
$$\begin{array}{llcc} \bullet & \rightarrow & \bullet & \bullet \\ & & (\downarrow \textsc{cat}) =_c \mathrm{Co} & \\ & & (\uparrow \textsc{cm}) = (\downarrow \textsc{coord}) & \end{array}$$

The first constituent is a coordinator (see $(\downarrow$ CAT$)$ $=_c$ Co). I follow the standard assumption that coordinators lexically specify the value of CONJ (e.g., AND or BUT), but I rename this feature to COORD, in line with terminological conventions adopted here.[21] The value of this feature becomes the value of the newly introduced COORD-MARK feature of the constituent licensed by (79).[22] I assume that COORD-MARK is an instantiated feature, so this rule cannot be used recursively, and I abbreviate COORD-MARK to CM in syntactic rules and f-structures. The second constituent in (79) lacks functional descriptions, so it is the head. This rule makes the simplifying assumption that all categories may be coordinated, but this may be constrained by an explicit annotation such as $(\downarrow$ CAT$)$ $\in_c$ $\{\mathrm{V}, \mathrm{N}, \mathrm{P}\ldots\}$. The net effect of this rule is that a constituent is marked by a coordinator, as in the f-structure for *and Homer* in (80).

(80)


A specific rule corresponding to the schematic (78a) is given in (81). It has the same empirical scope as the rules considered in the previous subsection, i.e., it contains a disjunction responsible for both monosyndetic and polysyndetic coordination.

[20]Note that this is an ordinary rule, not a metarule, even though it has the effect of multiple rules thanks to moving category information to f-structures.

[21]See fn. 1. In the LFG literature, this feature is also sometimes called CONJ-FORM (e.g., Hristov 2012) or COORD-FORM (e.g., Patejuk 2015).

[22]This aspect of the analysis is similar to HPSG analyses of coordination; see Abeillé & Chaves (2024: §3.1) and references therein.

(81) $$\bullet \quad \rightarrow \quad \underset{\neg(\downarrow \textsc{cm})}{\underset{\downarrow\in\uparrow}{\bullet}} \quad \left\{ \underset{\neg(\downarrow \textsc{cm})}{\underset{\downarrow\in\uparrow}{\bullet^*}} \;\middle|\; \underset{(\uparrow \textsc{coord}) =_c (\downarrow \textsc{cm})}{\underset{\downarrow\in\uparrow}{\bullet^*}} \right\} \quad \underset{(\uparrow \textsc{coord}) = (\downarrow \textsc{cm})}{\underset{\downarrow\in\uparrow}{\bullet}}$$

The COORD value of the coordinate structure is the COORD-MARK value of the final coordinand. If that coordinand has no COORD-MARK, then the equation $(\uparrow \textsc{coord}) = (\downarrow \textsc{cm})$ makes this rule inapplicable.[23] The corresponding constraining equation in the polysyndetic part of the rule only checks that that value is also the value of COORD-MARK on all non-initial coordinands. The initial coordinand may not be marked with a coordinator in any case,[24] and neither may other non-final coordinands in the monosyndetic part of the rule. The syntactic structure of *Marge and Homer* licensed by these rules is given in (80) above.

Note that, as postulated in Przepiórkowski & Patejuk (2021), the hybrid structure licensed by such rules has no CAT feature, so that coordination of unlike categories itself has no category. However, when constituents bearing the same category are coordinated, as in (80), then it makes sense to talk about this category as also being the category of the coordinate structure, given that CAT is a distributive feature and assuming the following definition of distributive properties in Dalrymple & Kaplan (2000: 779), with the biconditional "iff":

(82) For any DISTRIBUTIVE property P and set s, $P(s)$ iff $\forall f \in s.\ P(f)$.

Let us finally note that, as suggested at the beginning of this section, the two rules in (79) and (81) may be used independently, i.e., they do not have to work in tandem.

First, the rule (79), responsible for combining a coordinator and a coordinand, is used alone in constructions with sentence-initial coordinators discussed in §2.2. Whatever contexts license, say, IPs preceded by *and*, they simply specify the presence of a constituent with f-structure f specified as $(f\ \textsc{cat}) =_c \mathrm{I} \wedge (f\ \textsc{cm}) =_c \textsc{and}$.[25]

However, dually, care must be taken when an ordinary – coordinator-less – category is expected in a given position. To this end, a macro, CAT, can be defined as in (83).

(83) $\textsc{cat}(\mathrm{X}) \equiv (\downarrow \textsc{cat}) \in_c \mathrm{X} \wedge \neg(\downarrow \textsc{cm})$

Given this macro, the above PP rule in (76) may be rewritten as in (84).

(84) $$\bullet \quad \rightarrow \quad \underset{\downarrow = \uparrow}{\underset{@\textsc{cat}(\{\mathrm{P}\})}{\bullet}} \quad \underset{(\uparrow \textsc{obj}) = \downarrow}{\underset{@\textsc{cat}(\{\mathrm{P},\mathrm{N}\})}{\bullet}}$$

Second, the rule (81) may be used alone at least in those languages, exemplified in §2.3.2, in which coordinators are expressed morphologically or phonologically. In such cases, the respective forms, e.g., *nyumbu-djada-nggu* 'father-AND-ERG' in Djabugay, specify the value of COORD-MARK. This rule is possibly also used alone in at least some of the languages with "shifting coordinators", although a comprehensive analysis of this phenomenon is left for future research.

[23]This is because the resulting f-description is then "indeterminate" (Kaplan & Bresnan 1982: 202–203).

[24]I follow the standard assumption that, if "preconjunctions" are really coordinators, they have their own dedicated PRECOORD-MARK feature; cf. CONJ vs. PRECONJ in Dalrymple et al. (2019: ch. 16).

[25]Perhaps another constraint, to the effect that f must be a maximal projection, is also needed.

5 Conclusion

The basic syntactic structure of coordination universally assumed in LFG differs from structures assumed in virtually all other frameworks. Interestingly, with the notable exception of Hristov (2012), no attempt has ever been made to justify this difference.

In this paper, I argue that there is some evidence for less flat coordinate structures, i.e., for structures in which a coordinator forms a constituent with one coordinand to the exclusion of others. The strongest evidence comes from those "exotic" languages in which the coordinator may be expressed word-internally, i.e., squarely within the coordinand. The evidence from a number of more or less "exotic" languages with shifting coordinators at first seems weaker, as at least in some of these languages (including Latin, German, and Polish) the phenomenon lies at the syntax–prosody interface. However, there are also languages where prosody does not seem to matter, i.e., where the coordinand-internal position of a coordinator is a matter of pure (morpho)syntax, and at least in the case of these languages the evidence from shifting coordinators is strong.

Two other arguments might be weaker, but perhaps not as weak as it might seem at first. Contrary to a sometimes expressed view, prosody does correlate relatively strongly with constituency, and it indicates that also in familiar languages such as English the coordinator forms a constituent with the following coordinand. Finally, it might be possible to account for sentence-initial coordinators by a relaxation of the standard LFG rule for coordination, i.e., by replacing the Kleene plus with the Kleene star in the specification of non-final coordinands, but such a relaxation alone does not suffice, and a more careful analysis maintaining completely flat structures would have to be developed.

I conclude that the cumulative evidence for the slightly less flat constituent structure of coordination is sufficiently strong to warrant its adoption in LFG.

References

Abeillé, Anne & Rui Chaves. 2024. Coordination. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-driven Phrase Structure Grammar: The handbook* (2nd edn.), 775–829. Language Science Press. https://langsci-press.org/catalog/book/478.

Asudeh, Ash, Bronwyn Bjorkman, Frances Dowle, Neil Myler, Daniel Siddiqi & Lisa Sullivan. 2024. Fusional morphology, metasyncretism, and secondary exponence: A morphemic, realizational approach to Latin declension. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 45–68. Publikon. https://lfg-proceedings.org/lfg/index.php/main/article/view/49/55.

Asudeh, Ash, Tina Bögel & Daniel Siddiqi. 2023. Modelling exponents. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 Conference*, 23–44. Publikon. https://lfg-proceedings.org/lfg/index.php/main/article/view/38/26.

Asudeh, Ash & Daniel Siddiqi. 2024. The story of *er*. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 69–89. Publikon. https://lfg-proceedings.org/lfg/index.php/main/article/view/47/53.

Borsley, Robert D. 1994. In defense of coordinate structures. *Linguistic Analysis* 24(3–4). 218–245.

Borsley, Robert D. 2005. Against ConjP. *Lingua* 115. 461–482. https://doi.org/10.1016/j.lingua.2003.09.011.

Bögel, Tina, Miriam Butt, Ronald M. Kaplan, Tracy Holloway King & John T. Maxwell, III. 2009. Prosodic phonology in LFG: A new proposal. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'09 Conference*, 146–166. CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2009/papers/lfg09boegeletal.pdf.

Bögel, Tina, Miriam Butt, Ronald M. Kaplan, Tracy Holloway King & John T. Maxwell, III. 2010. Second position and the prosody-syntax interface. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'10 Conference*, 106–126. CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2010/papers/lfg10boegeletal.pdf.

Chaves, Rui P. 2007. *Coordinate structures: Constraint-based syntax-semantics processing*. Ph.D. dissertation, Universidade de Lisboa. http://hdl.handle.net/10451/592.

Chomsky, Noam. 1965. *Aspects of the theory of syntax*. MIT Press.

Chomsky, Noam & Morris Halle. 1968. *The sound pattern of English*. Harper and Row.

Collins, Chris. 1988. Part1: Conjunction adverbs. Unpublished manuscript, December 19, 1988.

Crouch, Dick, Mary Dalrymple, Ron Kaplan, Tracy King, John Maxwell & Paula Newman. 2011. XLE documentation. https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/xle_toc.html.

Dalrymple, Mary. 2017. Unlike phrase structure category coordination. In Victoria Rosén & Koenraad De Smedt (eds.), *The very model of a modern linguist* (Bergen Language and Linguistics Studies 8), 33–55. University of Bergen Library. https://doi.org/10.15845/bells.v8i1.1332.

Dalrymple, Mary & Ronald M. Kaplan. 2000. Feature indeterminacy and feature resolution. *Language* 76(4). 759–798. https://doi.org/10.2307/417199.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Davies, Mark. 2016. Corpus of News on the Web (NOW). https://www.english-corpora.org/now/.

Drellishak, Scott & Emily M. Bender. 2005. A coordination module for a crosslinguistic grammar resource. In Stefan Müller (ed.), *Proceedings of the HPSG 2005 Conference*, 108–128. CSLI Publications. https://doi.org/10.21248/hpsg.2005.6.

Gazdar, Gerald, Ewan Klein, Goeffrey K. Pullum & Ivan A. Sag. 1985. *Generalized Phrase Structure Grammar*. Blackwell / Harvard University Press.

Goldstein, David M. & Dag T. T. Haug. 2016. Second-position clitics and the syntax-phonology interface: The case of ancient Greek. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, 297–317. CSLI Publications. https://proceedings.hpsg.xyz/issue/view/27.

Haspelmath, Martin. 1993. *A grammar of Lezgian*. Walter de Gruyter.

Haspelmath, Martin. 2007. Coordination. In Timothy Shopen (ed.), *Language typology and syntactic description. Volume II: Complex constructions* (2nd edn.), 1–51. Cambridge University Press.

Hendriks, Petra. 2004. *Either*, *both* and *neither* in coordinate structures. In Alice ter Meulen & Werner Abraham (eds.), *The composition of meaning: From lexeme to discourse*, 115–138. John Benjamins.

Hristov, Bozhil. 2012. *Agreement, case assignment and nominal coordination*. Ph.D. dissertation, University of Oxford. https://ora.ox.ac.uk/objects/uuid:36b5e5b9-884e-445a-b0cd-f7dfde9cebbe.

Huddleston, Rodney & Geoffrey K. Pullum. 2002. *The Cambridge grammar of the English language*. Cambridge University Press.

Jakubíček, Miloš, Adam Kilgarriff, Vojtěch Kovář, Pavel Rychlý & Vít Suchomel. 2013. The TenTen corpus family. In *7th international corpus linguistics conference (CL2013)*, 125–127. https://www.sketchengine.eu/wp-content/uploads/The_TenTen_Corpus_2013.pdf.

Kaplan, Ronald M. & Joan Bresnan. 1982. Lexical-Functional Grammar: A formal system for grammatical representation. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 173–281. MIT Press.

Kaplan, Ronald M. & John T. Maxwell, III. 1988. Constituent coordination in Lexical-Functional Grammar. In *Proceedings of the 12th International Conference on Computational Linguistics (COLING 1988)*, 303–305.

Kaplan, Ronald M. & John T. Maxwell, III. 1996. *LFG: Grammar writer's workbench*. Xerox Corporation. Version 3.1, November, 1996.

Khalilova, Zaira. 2009. *A grammar of Khwarshi*. LOT Publishings. https://www.lotpublications.nl/a-grammar-of-khwarshi-a-grammar-of-khwarshi.

Kilgarriff, Adam, Vít Baisa, Jan Bušta, Miloš Jakubíček, Vojtěch Kovář, Jan Michelfeit, Pavel Rychlý & Vít Suchomel. 2014. The Sketch Engine: Ten years on. *Lexicography* 1. 7–36. https://doi.org/10.1007/s40607-014-0009-9.

Krishnamurti, BH. & J. P. L. Gwynn. 1985. *A grammar of modern Telugu*. Oxford University Press.

Lahiri, Aditi & Frans Plank. 2010. Phonological phrasing in Germanic: The judgement of history, confirmed through experiment. *Transactions of the Philological Society* 108(3). 370–398. https://doi.org/10.1111/j.1467-968X.2010.01246.x.

Lowe, John J. & Joseph Lovestrand. 2020. Minimal phrase structure: A new formalized theory of phrase structure. *Journal of Language Modelling* 8(1). 1–51. https://doi.org/10.15398/jlm.v8i1.247.

Munn, Alan. 1987. Coordinate structure and X-bar Theory. *McGill Working Papers in Linguistics* 4. 121–140.

Munn, Alan Boag. 1993. *Topics in the syntax and semantics of coordinate structures*. Ph.D. dissertation, University of Maryland. http://hdl.handle.net/1903/31808.

Neeleman, Ad, Joy Philip, Misako Tanaka & Hans van de Koot. 2023. Subordination and binary branching. *Syntax* 26(1). 41–84. https://doi.org/10.1111/synt.12244.

Nikolaeva, Irina. 2014. *A grammar of Tundra Nenets*. De Gruyter Mouton. https://doi.org/10.1515/9783110320640.

Patejuk, Agnieszka. 2015. *Unlike coordination in Polish: An LFG account*. Cracow. Ph.D. dissertation, Institute of Polish Language, Polish Academy of Sciences. http://nlp.ipipan.waw.pl/Bib/pat:15.pdf.

Patejuk, Agnieszka. 2018. Incorporating conjunctions in Polish. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'18 Conference*, 283–303. CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG-2018/.

Patejuk, Agnieszka. 2023. Coordination. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 309–374. Language Science Press. https://doi.org/10.5281/zenodo.10185948.

Patz, Elizabeth. 1991. Djabugay. In R. M. W. Dixon & Barry Blake (eds.), *The handbook of Australian languages, vol. iv*, 245–347. Oxford University Press.

Perlmutter, David M. & John Robert Ross. 1970. Relative clauses with split antecedents. *Linguistic Inquiry* 1(3). 350. https://www.jstor.org/stable/4177573.

Peterson, Peter G. 1982. Conjunction in LFG. Unpublished manuscript, MIT and University of Newcastle.

Peterson, Peter G. 1986. Establishing verb agreement with disjunctively conjoined subjects: Strategies vs principles. *Australian Journal of Linguistics* 6(2). 231–249. https://doi.org/10.1080/07268608608599364.

Pollard, Carl & Ivan A. Sag. 1994. *Head-driven Phrase Structure Grammar*. Chicago University Press / CSLI Publications.

Przepiórkowski, Adam. 2022. Coordination of unlike grammatical cases (and unlike categories). *Language* 98(3). 592–634. https://doi.org/10.1353/lan.0.0272.

Przepiórkowski, Adam, Mirosław Bańko, Rafał L. Górski & Barbara Lewandowska-Tomaszczyk (eds.). 2012. *Narodowy Korpus Języka Polskiego*. Wydawnictwo Naukowe PWN. https://nkjp.pl/.

Przepiórkowski, Adam & Agnieszka Patejuk. 2021. Coordinate structures without syntactic categories. In I Wayan Arka, Ash Asudeh & Tracy Holloway King (eds.), *Modular design of grammar: Linguistics on the edge*, 205–220. Oxford University Press. https://doi.org/10.1093/oso/9780192844842.003.0013.

Ross, John. 1967. *Constraints on variables in syntax*. Ph.D. dissertation, Massachusetts Institute of Technology. https://dspace.mit.edu/handle/1721.1/15166.

Sag, Ivan A., Gerald Gazdar, Thomas Wasow & Steven Weisler. 1985. Coordination and how to distinguish categories. *Natural Language and Linguistic Theory* 3(2). 117–171. https://doi.org/10.1007/BF00133839.

de Vries, Mark. 2005. Coordination and syntactic hierarchy. *Studia Linguistica* 59(1). 83–105. https://doi.org/10.1111/j.1467-9582.2005.00121.x.

Wagner, Michael. 2005. *Prosody and recursion*. Ph.D. dissertation, Massachusetts Institute of Technology. http://hdl.handle.net/1721.1/33713.

Wagner, Michael. 2010. Prosody and recursion in coordinate structures and beyond. *Natural Language and Linguistic Theory* 28(2). 183–237. https://doi.org/10.1007/s11049-009-9086-0.

Weisser, Philipp. 2024. A typology of shifting coordinators and what they can tell us about clitics and their formal modelling. Habilitationsschrift, Universität Leipzig, https://ling.auf.net/lingbuzz/008434.

Zhang, Niina Ning. 2009. *Coordination in syntax*. Cambridge University Press. https://doi.org/10.1017/CBO9780511770746.

Zhang, Niina Ning. 2023. *Coordinate structures*. Cambridge University Press. https://doi.org/10.1017/9781009326643.

Evidence for the parallel architecture from the syntax-phonology interface

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Abstract

Two competing views exist on the origin of interface categories (prosodic words, phonological phrases, intonational phrases): rhythmic determinism, which holds that they originate in phonology, and syntactic determinism, which derives them from syntactic constituents. This paper presents empirical evidence from Japanese and Wenzhounese, showing that at least a subset of interface categories cannot be derived from syntax and therefore must be rhythmically determined. These rhythmically determined interface categories call for a generative phonological module, which is incompatible with the classic T-model's assumption that only syntax can generate hierarchical structure. Consequently, evidence for rhythmic determinism supports a parallel architecture, where phonology can be generative and is not secondary to syntax. In LFG's parallel architecture, adopting rhythmic determinism entails that a direct correspondence from c-structure to p-structure is empirically insufficient. I discuss two LFG approaches to the syntax-phonology interface, showing that they can capture the Japanese and Wenzhounese data, though some theoretical issues remain to be addressed.

1 Introduction

According to Ito & Mester (2012: 280–281), the prosodic hierarchy (1) comprises two groups of categories.[†] Syllables and feet are rhythmic categories, defined in purely phonological terms. Prosodic words, phonological phrases, and intonational phrases are interface categories, as they respectively correspond to lexical words, syntactic phrases, and syntactic clauses.

(1)

$$\left.\begin{array}{c}\text{Intonational Phrase } (\iota)\\ | \\ \text{Phonological Phrase } (\varphi)\\ | \\ \text{Prosodic Word } (\omega)\end{array}\right\}\textit{interface categories}$$

$$\begin{array}{c}|\end{array}$$

$$\left.\begin{array}{c}\text{Foot } (\Sigma)\\ | \\ \text{Syllable } (\sigma)\end{array}\right\}\textit{rhythmic categories}$$

There are two views regarding the genesis of the interface categories. *Rhythmic determinism* holds that the interface categories originate from phonology, while *syntactic determinism* assumes that they are derived from syntax (Lahiri & Plank 2010, 2022).[1] Works under the Minimalist tradition usually adopt a mixed approach (e.g., Kratzer & Selkirk 2020; Selkirk 2011), taking syntactic determinism as the default and rhythmic determinism as a fallback mechanism. Works under the LFG tradition may take a mixed approach (Bögel 2015; Butt & King 1998) or a purely rhythmic determinist approach (Dalrymple et al. 2019; Dalrymple & Mycock 2011).

I will argue in Section 2 that while both rhythmic determinism and a mixed approach can be accommodated in a parallel architecture of grammar, neither is compatible with

[†]I thank the two anonymous reviewers and the LFG25 audience (in particular, Ash Asudeh, Frances Dowle, Miriam Butt, and Tina Bögel) for their invaluable comments. All remaining errors are mine.

[1]Bögel (2015) refers to these as the parallel approach and the derivative approach, respectively.

Chomsky's (1995) T-model. The T-model presupposes syntactic determinism, which is empirically insufficient because at least a subset of interface categories must be rhythmically determined (Section 3). Consequently, the necessity of rhythmic determinism supports an architecture that acknowledges a generative phonology, i.e., the parallel architecture. Against this background, Section 4 discusses the consequences of adopting rhythmic determinism in the LFG setting and reviews two LFG approaches to the syntax-phonology interface.

2 The origin of interface categories

Rhythmic determinism and syntactic determinism diverge in whether the interface categories are defined independently of syntactic constituents, but neither prevents information from other modules from influencing prosodic phrasing. In this section, I first introduce these two views (for an overview, see Bögel 2015: §2.5 and Xie 2024: §3.3). Then I discuss how these views fit in different architectures of grammar (Section 2.3). It is commonly assumed that both syntactic determinism and rhythmic determinism are required at the syntax-phonology interface (Section 1), but I shall argue that this mixed approach, as well as pure rhythmic determinism, is untenable under the T-model.

2.1 Rhythmic determinism

Rhythmic determinism defines the interface categories in phonological terms. Arguments for rhythmic determinism mainly come from prosodic words because they may radically misalign with syntactic words. A classic example is *drinka pinta milka day* 'drink a pint of milk a day', where right-attaching syntactic words end up prosodically left-attaching (Lahiri & Plank 2010, 2022; Sweet 1885). According to Lahiri & Plank (2022: 140), the prosodic word (ω) in Germanic languages and beyond "begins with a stressed syllable and ends with the syllable that precedes the next main stress." This definition of ω is based on the foot (Σ) rather than a matching syntactic word, indicating that ω is not fundamentally distinct from the rhythmic categories in (1).

Radical mismatches are common at the word level but less common at the phrase and clause level. This leads Lahiri & Plank (2022: 162) to conjecture that "presumably it's syntax and ultimately semantics and pragmatics" that governs the grouping of φ and ι. However, not all work subscribing to rhythmic determinism adopts this mixed approach (e.g., Dalrymple & Mycock 2011; Xie 2023). For example, Dalrymple et al. (2019: 399) assume that all prosodic constituents are "defined independently of units at any other level such as c-structure." Xie (2024: 65) explicates that a higher degree of isomorphism at the phrase and clause level does not necessitate syntactic determinism or a mixed approach. This is because p(rosodic)-structure is headed, meaning that any non-recursive C_n (prosodic category of level n) must immediately dominate a C_{n-1}. Due to this headedness, once ω is rhythmically determined, all higher categories can be licensed without referring to c-structure.

The p-structure rules in (2) define these higher categories.[2] To begin with, (2a) cap-

[2]These rules should be interpreted as node admissibility conditions à la McCawley (1968). They are not rewriting rules, but are a characterisation of the daughters that a p-structure node can dominate (see Dalrymple et al. 2019: 140).

tures Lahiri & Plank's (2022) proposal that ω is based on Σ. It states that a prosodic word immediately dominates one or more feet (one of which would be the head) and zero or more unparsed syllable(s). Higher-level categories φ and ι are licensed by (2b), which requires that a C_n should dominate at least one C_{n-1} and optionally dominate some category lower than C_{n-1}. Finally, (2c) permits recursive p-structures in which a C_n dominates a C_n and other units, but it prohibits vacuous recursion of the form $[_{C_n}$ [... $[_{C_n} C_n]]]$.

(2) a. $\omega \to \Sigma^+, \sigma^*$
b. $C_n \to C^+_{n-1}, C^*_{n-m} (1 < m < n)$
c. $C_n \to C_n, C^+_{n-m} (0 \leq m < n)$

In sum, p-structure — like c-structure with phrase structure rules — can be licensed by purely phonological conditions such as those in (2). Thus, prosodic categories up to the ι-level are consistently rhythmically determined, regardless of whether they align with their c-structure counterparts. Importantly, these p-structure rules may be too permissive for a given language (e.g., ω in a language may be binary branching but (2a) licenses n-ary branching ωs). This overgeneration is not problematic, since rules like (2) are meant to work in consort with other types of constraints, including interface constraints, to ultimately determine the p-structure shape (Sections 3.1, 4.1). Therefore, the independence of p-structure does not imply that c- and p-structure cannot be mutually constraining.

2.2 Syntactic determinism and mixed approaches

Syntactic determinism assumes that the interface categories are derived from their syntactic counterparts via mapping algorithms (Nespor & Vogel 1986) or Optimality-Theoretic constraints (Selkirk 2011; Truckenbrodt 1999). Selkirk (2009: 40) makes it explicit that the interface categories are "syntactically grounded, in the sense that they *owe their existence* to constraints on the syntax-phonology interface" (emphasis mine).

The two most widely adopted constraint families are ALIGN and MATCH, which serve to convert syntactic constituents into prosodic constituents (see Scheer 2012: 69 for a critical review of this interpretation). ALIGN constraints (e.g., (3a)) require alignment at either the left or right edge, while MATCH constraints mandate that both edges should coincide (3b).

(3) XP-φ correspondence under Optimality Theory (OT)

a. ALIGN-R(XP, φ) (cf. McCarthy & Prince 1993: 80)
For every XP, there is a φ such that the right edge of XP and the right edge of φ coincides.

b. MATCH(XP, φ) (adapted from Elfner 2015: 1178)
For every XP that exhaustively dominates a set of one or more terminal nodes α, there must be a φ that exhaustively dominates all and only the phonological exponents of the terminal nodes in α.

These interface constraints predict that syntax-phonology isomorphism is the default, but they can be interspersed with other phonological markedness constraints, leading to mismatches (Selkirk 2011: §3).

Recent work by Selkirk and her colleagues argues for a division of labour between syntax-to-phonology mapping and phonological readjustment (Kratzer & Selkirk 2020; Lee & Selkirk 2022).

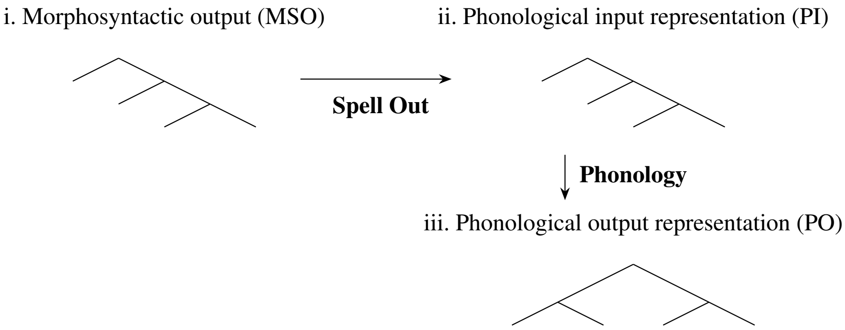


Figure 1: The MSO-PI-PO model (Kratzer & Selkirk 2020)

The model in Figure 1 is couched in a Minimalist framework. During the MSO-to-PI mapping, correspondence constraints like (3) convert surface morphosyntactic structure to hierarchical p-structure. The two structures are by and large isomorphic at this stage. Only during the PI-to-PO mapping do phonological constraints come into play; these constraints may readjust p-structures for rhythmic reasons (e.g., p-structure is optimally binary branching) and thus result in mismatches between the PO and the MSO.

The MSO-PI-PO model features a combination of syntactic determinism and rhythmic determinism. On the one hand, interface categories are derived from syntactic trees during Spell Out. On the other hand, the PI-to-PO mapping enables phonology to create prosodic constituents that lack syntactic correspondents, hence incorporating a certain degree of rhythmic determinism.

Although a mixed model usually has a derivational flavour (as exemplified in Figure 1), its non-derivational implementations can be found in, e.g., Butt & King's (1998) pioneering work that interfaces LFG with phonology. Butt & King (1998) posit a projection from c-structure to p-structure, the latter being described by annotated c-structure rules. As such, the definitions of interface categories are based on syntactic constituency, showing syntactic determinism (Dalrymple et al. 2019: 403).[3] However, as Butt & King (1998) observe, their mapping function cannot handle rebracketing, a type of mismatch where c-structure bracketing contradicts p-structure bracketing, as in (4). They propose to resolve rebracketing in the relationship between p-structure and phonology (similar to the PI-to-PO mapping above), thereby allowing phonology to create certain prosodic constituents as per rhythmic determinism.

While Kratzer & Selkirk (2020) and Butt & King (1998) permit the co-existence of rhythmic determinism and syntactic determinism, I have argued in Section 2.1 that

[3]Miriam Butt (p.c.) noted that they incorporated syntactic determinism not for conceptual reasons, but for ease of computational implementation at that time. More recent computational LFG grammars are able to take input p-structure to disambiguate syntactically ambiguous structures (Bögel & Zhao 2025), so p-structure need no longer be treated as secondary to c-structure in computational implementations.

a purely rhythmic determinist view is achievable. By contrast, a purely syntactic determinist view is untenable because not all interface categories have syntactic correspondents (noted in Butt & King 1998 and to be elaborated in Section 3). In other words, empirical evidence requires any modelling of the syntax-phonology interface to adopt some degree of rhythmic determinism. This poses a problem for the T-model, to which I now turn.

2.3 P-structure and the architecture of grammar

There are two major proposals for how linguistic modules should be organised with respect to each other. The most widely adopted one is the T-model of grammar (Chomsky 1965, 1988, 1995), which places syntax at the core of the grammatical architecture. Syntax is the only *generative* module, which can recursively build hierarchical structures out of primitive and/or derived linguistic objects (Scheer 2013, 2023). Phonology is *interpretive* but not generative, meaning that phonology does not build hierarchical structures but "freely accepts whatever syntax chooses to give it and forms a pronunciation" (Breiss & Hayes 2020: 338).

The other proposal is the parallel architecture, where linguistic structures exist in parallel and have proprietary well-formedness conditions (Bresnan 1998; Culicover & Jackendoff 2005; Jackendoff 1997; Kaplan & Bresnan 1982). Each structure is an independent generative system (Jackendoff 2011: 609), so both syntax and phonology can assemble or license their own hierarchical structures. Such independence does not rule out the possibility of mutual influence, as syntactic and phonological constituents can stand in correspondence via the interface (Kuhn 2007; Dalrymple et al. 2019).

Both the T-model and the parallel architecture can be considered *modular* in the sense that each linguistic structure is domain specific, having its own representations, rules, and/or constraints (Jackendoff 2000; Scheer 2020). However, the two architectures diverge in terms of the direction of information flow, which bears on how syntax should interface with phonology.

A parallel architecture of grammar does not impose an extrinsic ordering on linguistic modules, so information can flow between them freely (Kuhn 2007: 614). Therefore, the interface categories can in principle be either rhythmically determined or syntactically determined under a parallel architecture. In LFG, this means p-structure can be licensed by purely phonological rules like (2), which showcases rhythmic determinism. On the other hand, a non-derivational interpretation of syntactic determinism is that p-structure is described based on syntactic constituents (i.e., description by analysis; see Dalrymple et al. 2019: §7.4.1). To clarify, although pure syntactic determinism is theoretically compatible with LFG (and other parallel grammars), existing LFG works either assume pure rhythmic determinism or a mixed approach (Sections 2.1–2.2).

In the T-model, the information flow is uni-directional: syntax feeds its output as the input to phonology (cf. Reiss 2007). This, together with the assumption that only syntax is generative, entails pure syntactic determinism. Since no module other than syntax can generate hierarchical structure, any articulated structure in phonology must originate from syntax. In Minimalist terms, the syntactic operation Merge is the only way to combine smaller units into larger ones, so phonology cannot actively build hierarchical structures due to the lack of a Merge equivalent. This design feature of the

T-model requires every interface category to have a syntactic correspondent, for otherwise the relevant interface category would remain undefined. Therefore, the syntax-to-phonology mapping f can be conceived as a surjective partial function: every interface category p must be mapped to by at least one syntactic constituent s, i.e., $f^{-1}(p) \neq \emptyset$. In the MSO-PI-PO model (Figure 1), there should be an additional requirement that the PI-to-PO mapping be surjective, for otherwise phonology would be generative.

Section 3 will provide empirical evidence that not all interface categories have a syntactic correspondent, so the syntax-to-phonology mapping (or the PI-to-PO mapping) cannot be surjective. Thus, any adequate approach to the syntax-phonology interface must integrate some degree of rhythmic determinism, allowing phonology to generate a subset of prosodic categories. However, rhythmic determinism is precluded by the T-model, since phonology is assumed to be interpretive but not generative. As a result, grammars adopting the T-model face a dilemma. They must either consistently adhere to syntactic determinism and undergenerate the data, or acknowledge rhythmic determinism and deviate from one of the T-model's fundamental assumptions. The consequences of the latter option have not been addressed, as far as I am aware. In view of this, evidence for rhythmic determinism conflicts with the T-model, which leads to the conclusion that the parallel architecture more accurately reflects the nature of the syntax-phonology interface.

3 Supporting rhythmic determinism

This section presents data from Japanese (Section 3.1) and Wenzhounese (Section 3.2), showing that an interface category does not necessarily have a matching syntactic constituent. Such interface categories must be formed in phonology proper, hence invalidating pure syntactic determinism. In other words, any adequate modelling of the syntax-phonology interface must admit some degree of rhythmic determinism.

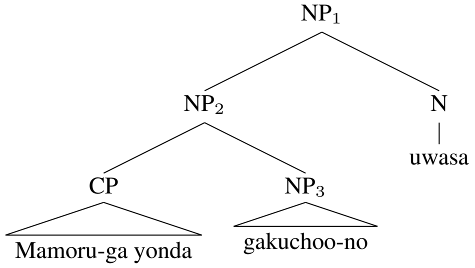
3.1 Rebracketing and category promotion in Japanese

Kubozono (1989) observes that, in Tokyo Japanese, a uniformly left-branching syntactic tree may be parsed as a symmetrically branching prosodic tree.

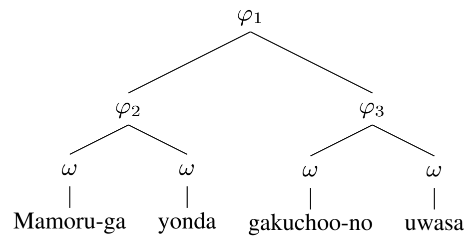
(4) Left-branching phrase with unaccented words (Kalivoda 2018: 95)

a. Mamoru-ga yonda gakuchoo-no uwasa
Mamoru-NOM invited college.president-GEN rumour
'the rumour of the college president that Mamoru invited'

b.



c.



The words in (4a) are all unaccented (accented words will be discussed shortly).[4] In (4b), *Mamoru-ga yonda* and *gakuchoo-no* form a constituent NP_2 to the exclusion of *uwasa*. In (4c), *gakuchoo-no* and *uwasa* form a constituent φ_3 to the exclusion of *Mamoru-ga yonda*, thus exhibiting a rebracketing mismatch. Crucially, φ_3 does not have a matching syntactic phrase.

Selkirk (2011: 469) attributes the mismatch in (4) to the markedness constraint BINMAX(φ, ω), which requires φ to contain no more than two ωs. In (5), "U" denotes unaccented words, square brackets mark syntactic phrases, and parentheses delimit phonological phrases.

(5)

$[[[[\mathrm{U}_1]\mathrm{U}_2]\mathrm{U}_3]\mathrm{U}_4]$	BINMAX(φ, ω)	MATCH(XP, φ)
⇒ a. $((\mathrm{U}_1\mathrm{U}_2)(\mathrm{U}_3\mathrm{U}_4))$	*	**
b. $((((\mathrm{U}_1)\mathrm{U}_2)\mathrm{U}_3)\mathrm{U}_4)$	**!	

The candidate (5a) violates BINMAX once because the maximal φ contains four ωs. It also incurs two violations of MATCH since $[\mathrm{U}_1]$ and $[[[\mathrm{U}_1]\mathrm{U}_2]\mathrm{U}_3]$ are not mapped to φ. The isomorphic candidate (5b) satisfies MATCH but violates BINMAX twice due to the oversized phonological phrases $(((\mathrm{U}_1)\mathrm{U}_2)\mathrm{U}_3)$ and $((((\mathrm{U}_1)\mathrm{U}_2)\mathrm{U}_3)\mathrm{U}_4)$. The ranking BINMAX $\gg$ MATCH selects (5a) as optimal.

Proposals distinct from (5) have been advanced by, *inter alia*, Bellik et al. (2022), Ishihara (2014), Ito & Mester (2013), and Kalivoda (2018), but they all concur that Japanese rebracketing is driven by some higher-ranking phonological markedness constraint.[5] However, one issue remains unaddressed: if prosodic phrasing violates interface constraints to satisfy a phonological markedness constraint, such phrasing must be motivated on phonological grounds. Particularly, no mapping algorithm can derive φ_3 in (4c) from a syntactic phrase, so φ_3 has to be formed in phonology as rhythmic determinism predicts.

The example in (4) contains unaccented words. Another challenge for syntactic determinism arises when we consider accented words, which are parsed as phonological phrases despite their syntactic wordhood (Ito & Mester 2013; Kubozono 1989). To il-

[4] It is usually assumed that Japanese accents are lexically specified (Kubozono 2008).

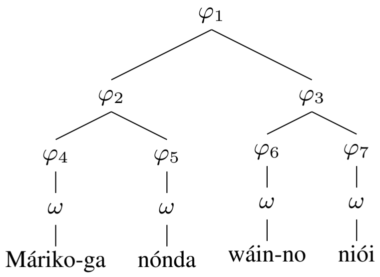
[5] An exception is Wagner (2010), who discusses the rebracketing in English relative clauses. According to Chomsky & Halle (1968: 372), a right-branching clause like *This is [the cat that caught [the rat that stole [the cheese]]]* is divided into three chunks in phonology: *This is the cat | that caught the cat | that stole the cheese*. Wagner (2010: 226) argues that the mismatch is only apparent, since the relative clause should be syntactically analysed as *[[This is the cat$_i$][~~cat~~$_i$ that t_i caught the rat$_j$][~~rat~~$_j$ that t_j stole the cheese]]*, which actually aligns with the prosodic phrasing. Applying this analysis to (4) would lead to *[[Mamoru-ga t_i yonda ~~gakuchoo~~$_i$][gakuchoo$_i$-no][uwasa]]*. Leaving aside the theoretical and empirical plausibility of this analysis, it notably fails to explain why *gakuchoo-no* and *uwasa* form a prosodic constituent, so mismatches persist.

lustrate, (6) has the same c-structure as (4), but their p-structures are different — each word in (6) projects a φ while those in (4c) only projects up to ω.

(6) Left-branching phrase with accented words (Kubozono 1989: 60)

a. Máriko-ga nónda wáin-no niói
Mariko-NOM drank wine-GEN smell
'the smell of the wine which Mariko drank'

b.



The X^0-to-ω-to-φ mapping in (6b) instantiates a *category promotion* mismatch, which occurs "when a syntactic constituent is mapped to a prosodic constituent that is too high in the [prosodic hierarchy] to satisfy MATCH" (Bellik et al. 2023: 10). Unlike rebracketing, category promotion does not create correspondentless prosodic constituents (e.g., φ_7 corresponds to the noun *niói*); however, it shares with rebracketing the property of being phonologically motivated. In the case of (6), the X^0-to-ω-to-φ mapping involves a markedness constraint (7) that outranks interface constraints, suggesting that these φs are formed in phonology due to the presence of accents. This again deviates from syntactic determinism but aligns with rhythmic determinism.

(7) ACCENT-AS-HEAD (Ito & Mester 2013: 30)
Assign one violation for each accent that is not the head of a minimal phonological phrase φ.

As Section 2.3 shows, the syntax-to-phonology mapping should be a surjective function under the T-model. The mismatches in Japanese indicate that this is not the case. On the one hand, rebracketing creates prosodic constituents that lack syntactic correspondents (i.e., $\exists p,\ f^{-1}(p) = \emptyset$). On the other hand, category promotion leads to a one-to-many mapping, such that $\exists s, f(s) = \{p_1, p_2\}$ (e.g., the N^0 *niói* maps to ω and φ_7). These mismatches can only be accounted for within a theory that adopts both rhythmic determinism and a parallel architecture.

3.2 Prosodic word expansion in Wenzhounese

Much work has demonstrated that the prosody of function words cannot be syntactically determined (e.g., Bögel 2021; Lahiri & Plank 2010; Tyler & Broadwell 2021). Using novel data from Wenzhounese, this section shows that even lexical words may display rhythmically determined mismatches. Wenzhounese is a Chinese Wu dialect with eight lexical tones (see, e.g., Rose 2004; Scholz 2012; Zhang & Mok 2020 for phonetic analyses of Wenzhounese tones). For ease of presentation, I use H(igh), M(id), and L(ow) to indicate tone heights, though nothing theoretical depends on this.

In connected speech, a syllable often surfaces with a tone distinct from its citation tone (i.e., underlying tone), depending on its position within a ω. As Figure 2 schematises, the last two syllables within a ω is governed by disyllabic tone sandhi (DTS). Synchronically, there seems to be little phonetic or phonological motivation for DTS, but as a generalisation, the final syllable typically retains its tonal contour while the penult undergoes tonal alternation. The antepenult is targeted by the polarity rule, which dissimilates its tone to H when followed by L and to L when followed by H (Chen 2000: 480). For the pre-antepenult and all the preceding syllables (if any), their tones are obligatorily neutralised, meaning that their tonal contrast is entirely lost.[6]

$$\dots \underbrace{\sigma \qquad \sigma \qquad \sigma}_{\textit{Neutralisation}} \qquad \underset{\textit{Polarity}}{\overset{\sigma}{|}} \qquad \underbrace{\sigma \qquad \sigma}_{\textit{DTS}}$$

$$\mathrm{T} \rightarrow \emptyset \qquad\qquad \begin{aligned} \mathrm{T} &\rightarrow \mathrm{H} \,/\, \_\_\, \mathrm{L} \\ &\rightarrow \mathrm{L} \,/\, \_\_\, \mathrm{H} \end{aligned}$$

Figure 2: Lexical tone sandhi processes in Wenzhounese (fast speech rate)

The examples in (8) – (10) illustrate tone sandhi processes in polysyllabic words, where square brackets mark morphological constituency and parentheses demarcate tone sandhi domains. In the trisyllabic word in (8), the last two syllables do not form a morphological constituent but form a tone sandhi domain.

(8)

[[døy	søy]	[ky]]	‘library’
ML	M	MH	*Citation tones*
ML	(HM	MH)	*DTS*
(L	(HM	MH))	*Polarity*

The word in (9), compounded from [tso.sɤu] ‘renovation’ and [koŋ.sz̩] ‘company’, displays a balanced morphological structure. However, its tone sandhi domain is right-branching.

(9)

[[tso	sɤu]	[koŋ	sz̩]]	‘renovation company’
M	M	M	M	*Citation tones*
M	M	(L	L)	*DTS*
M	(H	(L	L))	*Polarity*
(∅	(H	(L	L)))	*Neutralisation*

In (10), [ɕi.mu.lɔ.ŋo] ‘Himalaya’ form a morphological constituent to the exclusion of [sɔ] ‘mountain’. In phonology, [sɔ] and [ŋo] group together as the domain for DTS.

[6] Speech rate also affects Wenzhounese tone sandhi, leading to variation in prosodic phrasing (Xie 2024: §5.2). This paper focuses on fast-tempo tone sandhi.

(10)

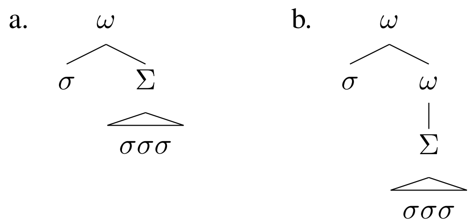
[[ɕi	mu	lɔ	ŋo]	[sɔ]]	'The Himalayas'
MH	MH	MLM	MH	M	*Citation tones*
MH	MH	MLM	(HL	L)	*DTS*
MH	MH	(L	(HL	L))	*Polarity*
MH	(∅	(L	(HL	L)))	*Neutralisation*
(∅	(∅	(L	(HL	L))))	*Neutralisation*

From these data, we can make two generalisations. First, tone sandhi domain formation disregards morphological constituency and is uniformly right-branching, i.e., $(\ldots(\sigma(\sigma(\sigma\sigma))))_{\omega}$. Second, within such a prosodic domain, only the last three syllables license tonal contrast, while all the preceding syllables undergo tonal neutralisation.

The second generalisation pertains to metrical foot. According to Duanmu (1999), Zhu (2023), and others, tonal contrast must be licensed within a foot. This suggests that the last three syllables of a Wenzhounese word form a foot, whereas all preceding syllables remain unfooted and consequently lose their tonal specifications (see Xie 2024: §5.1 for additional evidence for the foot in Wenzhounese). Grouping the final three syllables as a foot also explains why DTS and the polarity rule disregard morphological structure, since the foot is a rhythmic category that does not interface with morphosyntax (Section 1). However, I will demonstrate below that the unfooted syllables form an articulated prosodic word structure, hence bearing directly on the syntax-phonology interface.

For quadrisyllabic words like (9), there seems to be two plausible p-structures. (11a) is a weakly-layered structure (cf. Ito & Mester 2003), where ω immediately dominates Σ and σ. In (11b), σ is adjoined to ω, leading to a recursive structure.

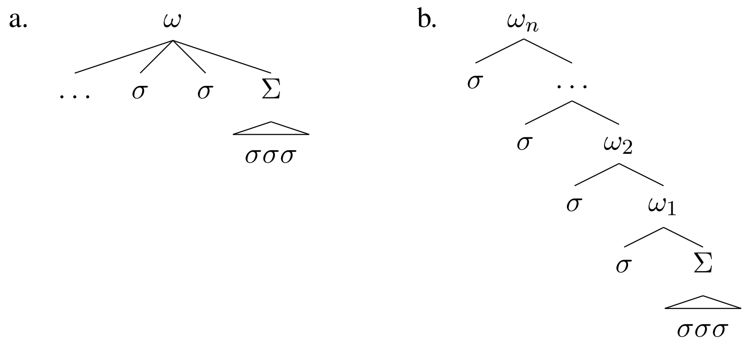
(11)



In both structures, the pre-antepenult occurs outside of the foot, thus accounting for its tonelessness. In the absence of additional empirical evidence in favour of one or the other, I tentatively adopt the more economical (11a), which contains one fewer node than (11b). The conclusion regarding rhythmic determinism does not hinge on this choice.

For pentasyllabic and longer words, I present below two general arguments and one language-particular argument in favour of (12b), where all unfooted syllables but the pre-antepenult are recursively adjoined to ω.

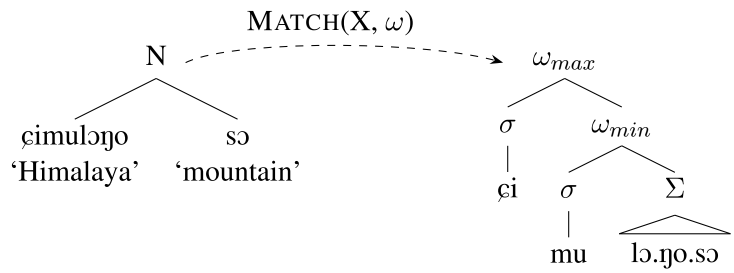
(12)



First, there is a cross-linguistic preference for prosodic representations to be binary branching (Mellesmoen & Urbanczyk 2021; Selkirk 2000). Since the ω in (12a) is n-ary branching whereas all the ωs in (12b) are binary branching, (12b) is more well-formed than (12a) with respect to binarity. Second, Bellik & Van Handel (2023: 435) observe that in analyses where structures like (12a) are possible candidates, they are never selected as optimal. This suggests that such structures are universally dispreferred. Finally, the language-particular evidence comes from constituency: (12a) fails to reflect that the last four, five, or more syllables may form a prosodic constituent corresponding to polysyllabic words such as (9) and (10). This constituency is encoded as prosodic word segments $\omega_1, \omega_2, \ldots, \omega_n$ in (12b). In other words, all the ωs in (12b) correspond to well-formed polysyllabic words in Wenzhounese, but such information is not available in (12a).

Adopting (12b) means that the p-structure for Wenzhounese polysyllabic words involve potentially unbounded ω-recursion. The corresponding c-structure, however, is a simple X^0, following the Lexical Integrity Principle (Bresnan & Mchombo 1995). This is illustrated in (13): while N^0 and the maximal ω are co-extensive, the minimal ω does not match with any morphosyntactic constituent (the internal structure of N^0 is not visible to syntax).

(13)



Recursive prosodic words as in (12b) and (13) instantiate what I term the *expansion* mismatch, which occurs when a c-structure with n-level recursion maps to a p-structure with more than n levels of recursion (Xie 2024: 174). Since each of these morphologically complex words occupies a single c-structure node, the non-maximal ωs in the p-structure have no syntactic correspondent. As such, these ωs cannot be derived via MATCH(X, ω) or be described by annotated c-structure rules. The potentially unbounded ω-recursion must be generated within phonology itself, in line with rhythmic determinism. Similar to rebracketing (Section 3.1), expansion involves correspondentless p-structures and so it invalidates the assumption that the syntax-to-phonology mapping is surjective.

4 Implications for LFG

The discussions in Sections 2 and 3 establish that an adequate model of the syntax-phonology interface must incorporate at least some degree of rhythmic determinism. This, in an LFG context, entails that p-structure cannot be fully captured by a direct c-to-p-structure projection (Section 2.2). Consequently, we are left with two options to analyse the syntax-phonology interface in LFG. The first is a purely rhythmic determinist view that rejects any c-to-p-structure projection and instead consistently defines interface categories in phonology proper (Section 4.1). The second option assumes the co-existence of rhythmic and syntactic determinism (Section 4.2). Specifically, it posits an indirect projection between c-structure and p-structure (as in Asudeh et al. 2023: 40), allowing an additional module to introduce syntax-phonology mismatches.[7] This section reviews existing LFG approaches that instantiate these views and discusses revisions necessary to accommodate the observations made in Sections 2 and 3.

4.1 A rhythmic determinist model

The double-tree model (Dalrymple & Mycock 2011; Dalrymple et al. 2019; Mycock & Lowe 2013; Mycock et al. 2021) assumes that p-structure is built independent of c-structure. It adopts the architecture in Figure 3, where there is no direct correspondence function between c-structure and p-structure.

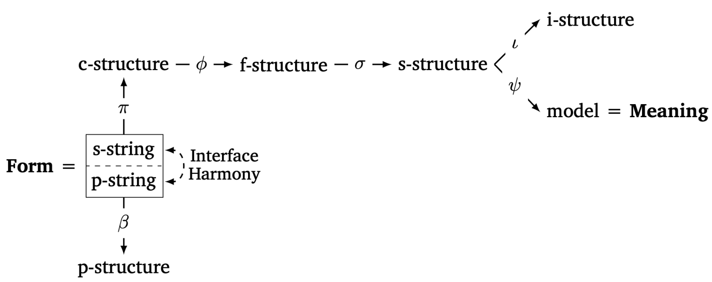


Figure 3: A projection architecture in LFG (Findlay 2023: 209)

Under this model, syntax and phonology is mediated via the lexicon and the string. The s-string stores labels that represent the left and right edges of syntactic constituents, which are obtained by applying a designated function to c-structure trees (Dalrymple et al. 2019: §11.4.2). The p-string likewise stores labels that represent the left and right edges of prosodic constituents. For example, the string information for $[_{\text{AdjP}}[_{\text{Adj}}\ \textit{happy}]]$ may look like (14).

(14) a. s-string: $\begin{bmatrix} \text{FM} & \text{happy} \\ \text{L} & \{\text{AdjP, Adj}\} \\ \text{R} & \{\text{AdjP, Adj}\} \end{bmatrix}$ b. p-string: $\begin{bmatrix} \text{FM} & \text{hæ} \\ \text{L} & \{\varphi, \omega\} \\ \text{R} & \{\} \end{bmatrix} \begin{bmatrix} \text{FM} & \text{pɪ} \\ \text{L} & \{\} \\ \text{R} & \{\varphi, \omega\} \end{bmatrix}$

[7] I thank Ash Asudeh for suggesting this to me.

Since p-structure is governed by purely phonological principles, syntax-phonology mismatches come as a default. The theory naturally predicts the rebracketing, category promotion, and expansion mismatches identified in Section 3, as these can be generated by p-structure rules such as (2).

The independence of p-structure does not rule out the possibility of isomorphism: a principle of Interface Harmony requires an s-string label to be matched with a corresponding p-string label and *vice versa*, hence enforcing the alignment of c-structure and p-structure boundaries (Dalrymple et al. 2019: 417). In (14), for example, the s-string label "AdjP" is associated with the p-string label "φ".

Importantly, Interface Harmony does not build p-structures from c-structures; instead, it evaluates independently generated p-structures and rules out those that fail to achieve correspondence with the relevant c-structure. Thus, although p-structure is built independently within phonology, information from syntax or other modules can still affect p-structure.

Given the ample cases of mismatches, Interface Harmony must be understood as a preference rather than an inviolable constraint, but the formal implementation of this preference is not fully explored, as Bögel (2023: 804–807) points out. Since preference implies constraint competition, I propose a formalisation under OT-LFG (e.g., Bresnan 2000; Mohanan & Mohanan 2003). The alignment between c-structure and p-structure can be readily captured by interface constraints like ALIGN and MATCH, defined in (3). Under rhythmic determinism, however, these interface constraints do not convert syntactic constituents to prosodic constituents. Instead, they function as *correspondence*, which "only establishes a connection between the pieces of its domain and range [...without deriving] the desired formal properties of the range" (Kaplan 1995: 15). This does not imply an implicit projection from c-structure to p-structure. For one thing, ALIGN and MATCH are relations rather than functions, because the mapping between syntax and phonology (from either direction) can be one-to-many. For another, ALIGN and MATCH establish correspondence between string labels (see (14)), not directly between c-structure and p-structure.

Against this background, Figure 4 illustrates an OT-LFG grammar for the syntax-phonology interface within the double-tree model, focusing on the mapping from syntax to phonology. SYN refers to the triple $\langle$c-structure, s-string, $\pi\rangle$ and PHON refers to $\langle$p-structure, p-string, $\beta\rangle$. For expository purposes, Figure 4 takes SYN as the input. One could equally well start from PHON; doing so does not imply any directionality between the two modules. This is because the mapping in OT-LFG is not inherently directional: given any two structures α and β, we can take α to be the input and $\alpha + \beta$ the output (Mohanan & Mohanan 2003: 313).

P-structure rules like (2) are GEN constraints, ensuring that GEN only generates phonological representations that conform to these rules — a design that reflects rhythmic determinism. In the candidate set, these generated PHONs are paired with the input SYN. These candidate pairs are then evaluated by interface constraints (which are a subset of Interface Harmony) and phonological markedness constraints. A language-particular constraint ranking decides which pair is the optimal candidate.

Admittedly, Interface Harmony cannot be reduced to interface constraints. This is because ALIGN/MATCH constraints only regulate the correspondence between constituents, but not all labels in the s/p-string concern constituents. For example, in their

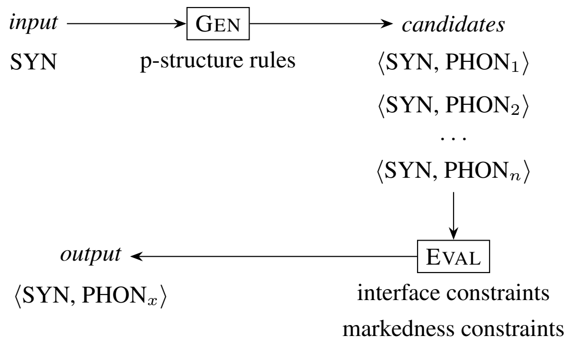


Figure 4: The input-output relation between syntax and phonology

analysis of declarative questions like *Anna was studying at the university?*, Dalrymple & Mycock (2011) contend that the right edge of the IP root node at c-structure is associated with the meaning constructor [**PolarInt**], which introduces the s-string label 'PolarIntSem'. Interface Harmony requires a corresponding label *PolarInt* to occur in the associated p-string unit, which is responsible for the interrogative intonation.

How the full range of Interface Harmony should be formalised in OT-LFG will be left for future research. However, the fact that non-constituent information may bear on the syntax-phonology interface is additional evidence for the parallel architecture, as various types of representations (trees, AVMs, etc.) can co-exist and be co-described. By contrast, a syntactocentric model might be forced to encode non-constituent information as functional categories in the tree, often without syntax-internal motivation. Along this line of reasoning, Ishihara (2022) examines the frequent lack of correspondence between syntactic clauses and intonational phrases, proposing that pragmatic information can directly affect ι-formation without the mediation of syntactic constituency.

4.2 A mixed model

Bögel's (2015) model combines rhythmic determinism and syntactic determinism. As Figure 5 shows, this model is bidirectional, incorporating the perspectives of production and comprehension. My discussion focuses on production, specifically the syntax-to-phonology mapping.[8]

According to Bögel (2015, 2021), prosodic word status is rhythmically determined and specified in a word's lexical entry. Therefore, the matching between syntactic and prosodic words (called the *transfer of vocabulary*) occurs in the lexicon. For example, (15) represents the lexical entry for the Swabian 1SgNom pronoun (Bögel 2021: 19). This pronoun may be parsed as a monosyllabic prosodic word $(\text{ˈ}\sigma)_\omega$ or an enclitic $=\sigma$. The variable prosodification cannot be determined by the invariant s-form; rather, the prosodic status is governed by metrical stress and constrained by information structure

[8]In a production system, syntax is responsible for assembling words into sequences. However, this does not entail that syntactic constituency determines prosodic constituency. For example, Wheeldon & Lahiri (1997) find that prosodic words, rather than syntactic words, predict speech production latencies. Wynne et al. (2018) also observe that prosodic words are the primary planning unit in production. If prosodic words were derived from syntax, we would expect syntactic words to drive planning latencies, but this is not what these psycholinguistic experiments show.

— the unstressed /ə/ is only available when the pronoun is not focused.

(15)

s-form			p-form		
ich	D	NUM = SG	[iː]	SEGMENTS	/i/
		PERS = 1		METRICAL FRAME	$(\text{ˈ}\sigma)_\omega$
		CASE = NOM	[ə]	SEGMENTS	/ə/
		PRON = PERS		METRICAL FRAME	$=\sigma$
		...		$\neg(\uparrow_i$ FOCUS)	

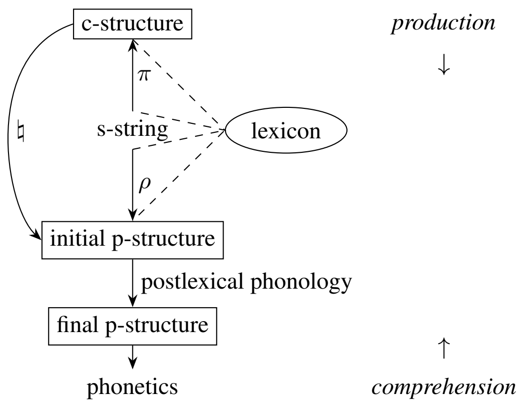


Figure 5: The syntax-phonology interface adapted from Bögel (2015: 223)

In contrast to prosodic words, higher-level prosodic constituents are assumed to be syntactically determined. A process called the *transfer of structure*, formalised as the composite function $\natural(*)$ $(\equiv \rho(\pi^{-1}(*)))$ in Figure 5, relates syntactic phrases to φs and syntactic clauses to ιs. For instance, the c-structure annotation in (16) assigns two ι boundaries in the p-structure, respectively aligning with left and right edges of the root node S (Bögel 2023: 810).

(16)
$$\begin{array}{c} \text{S} \\ (\natural(T(*))\ S_{min}\ \text{PHRASING}) = {}_\iota(\\ (\natural(T(*))\ S_{max}\ \text{PHRASING}) =)_\iota \end{array}$$

Bögel’s approach naturally captures the expansion mismatch in Wenzhounese (Section 3.2), since prosodic word structure is governed by rhythmic principles and stored in the lexicon. For example, the pentasyllabic word [ɕi.mu.lɔ.ŋo.sɔ] ‘The Himalayas’ would assume the lexical entry in (17). (See Xie 2024: §6.3 for an alternative analysis.)

(17)

s-form	p-form	
The Himalayas	SEGMENTS	/ɕ i m u l ɔ ŋ o s ɔ/
...	METRICAL STRUCTURE	$(\sigma(\sigma(\sigma\sigma\sigma)_\Sigma)_\omega)_\omega$
	TONE	...

Apart from the lexicon, postlexical phonology can also drive syntax-phonology mismatches. While the *transfer of structure* predicts a largely faithful c-to-p-structure mapping, prosodic boundaries can be rearranged for purely phonological reasons. As a result, the prosodic constituents in the final p-structure may misalign with their c-structure counterparts. Moreover, nothing in the parallel architecture prevents the final p-structure to contain correspondentless prosodic constituents, so this model can also account for rebracketing mismatches without undermining the grammatical architecture.

Notably, the postulation of two levels of p-structure appears to deviate from LFG's surface-true spirit. The other LFG modules each encode different aspects of a linguistic expression (e.g., c-structure for linear order and constituency, f-structure for GFs and grammatical features), but the two p-structures encode different stages (initial vs. final) of the same aspect (i.e., phonological information such as syllabification and prosodic boundaries). These p-structures must be extrinsically ordered, with only the final p-structure representing surface phonology.

Extrinsic ordering also characterises the p-to-p-structure mapping in Bögel (2015), who uses SPE-style rewrite rules for postlexical phonological processes. This raises the question of whether the mapping between the two p-structures in Figure 5 is monotonic. In Section 4.2.1, I show that the mapping is non-monotonic, and Section 4.2.2 discusses potential consequences of this non-monotonicity.

4.2.1 Non-monotonic mapping

Monotonicity, as defined in (18), is considered a fundamental computational constraint imposed on the design of LFG (Bresnan 1990: 637). In particular, the c-to-f-structure mapping is monotonic because adding new functional equations to the functional description yields increasingly specific f-structures (Bresnan et al. 2016: 73). The mapping from f-structure to s(emantic)-structure is also monotonic due to Glue Semantics' resource sensitivity: all and only the premises instantiated from the syntax are used in semantic composition (Asudeh 2022: 323).[9]

(18) Monotonicity (Graf 2019: 6)
Given two sets A and B, let $\leq_A \subseteq A \times A$ and $\leq_B \subseteq B \times B$. A function $f : A \to B$ is *monotonic* with respect to $\leq_A$ and $\leq_B$ iff it holds for all x and y in A that $x \leq_A y$ implies $f(x) \leq_B f(y)$.

Whether the syntax-to-phonology mapping, or the mapping between two levels of p-structure, should be monotonic in LFG remains an open question. However, in the general phonological literature, Bird & Klein (1994: 468) note that monotonic operations are "methodologically desirable," and Kálmán (1989: 134) proposes a principle of derivational monotonicity which is closely related to (18):

(19) A grammar is *derivationally monotonic* iff for any pair r_1, r_2 of representations such that r_2 can be derived from r_1 by some rule of the grammar, the information content of r_2 includes the information content of r_1.

Kálmán (1989: 134) emphasises that the formulation of (19) is independent of how rules are interpreted. That is, (19) can be applied to Figure 5 no matter if those postlexical phonological operations are construed as processes, relational rules, or constraints.

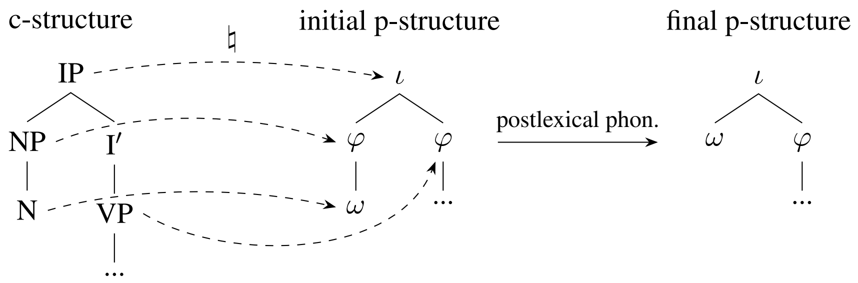
I provide two arguments showing that the mapping between the two p-structures in Figure 5 is not derivationally monotonic. First, Bögel (2015) employs extrinsic ordering for postlexical phonological rules, which is not available in a derivationally monotonic

[9]The term "monotonicity" may be used in different but related senses in the study of, for example, quantification (Geurts & van Der Slik 2005) and computational linguistics (Maxwell III & Kaplan 1993).

system (Kálmán 1989: 140). Second, even without rule ordering, the mapping deletes prosodic constituents in two types of syntax-phonology mismatches discussed below, so certain information is present in the initial p-structure but not in the final one.

The first type is *category demotion*, cases where a syntactic constituent (say, NP) is mapped to a prosodic constituent that is too low in the prosodic hierarchy to satisfy MATCH (e.g., ω) (Bellik et al. 2023: 10). A frequent motivation for category demotion is prosodic binarity, as illustrated in (20).

(20)



Suppose that φs in a given language must be minimally binary branching, but the NP subject is composed of a single word. The *transfer of structure* would first map the NP to a unary-branching φ, and postlexical phonological must then delete this φ. Consequently, the final p-structure has less information than the initial p-structure.

The second type is rebracketing (see Section 3.1 for Japanese examples). Consider (21), where a, b, c are prosodic words. The initial p-structure (21b) faithfully reflects (21a)'s constituency as per the *transfer of structure*. Rebracketing occurs postlexically during the mapping from (21b) to (21c).

(21)

a.	c-structure:	[[	a		b	$]_{XP_1}$	c	$]_{XP_2}$
b.	initial p-structure:	((	a		b	$)_{\varphi_1}$	c	$)_{\varphi_2}$
c.	final p-structure:	(	a	(	b		c	$)_{\varphi_3})_{\varphi_4}$

It is clear that the prosodic boundaries in (21b) are placed differently from those in (21c). Here, I focus on whether there is correspondence relation between φ_1 in (21b) and φ_3 in (21c). If the two φs are not correspondents, it means postlexical phonology deletes φ_1 and creates a distinct φ_3, which is not derivationally monotonic.

While a p-structure-to-p-structure mapping is postulated in Bögel's model and also the MSO-PI-PO model (Section 2.2), the mechanism for establishing correspondence between p-structures is understudied. In Xie (2024), I propose that this relationship is anchored by prosodic heads. Specifically, prosodic structures P_1 and P_2 stand in correspondence, i.e., $\mathcal{R}(P_1, P_2)$, if their heads are in correspondence (Xie 2024: 224).

Let us assume that all the prosodic words in (21b) have a unique correspondent in (21c), i.e., $\mathcal{R}(a_{initial}, a_{final})$, $\mathcal{R}(b_{initial}, b_{final})$, and $\mathcal{R}(c_{initial}, c_{final})$. The head of φ is the most prominent ω it dominates, i.e., the locus of phrasal stress. Therefore, whether $\mathcal{R}(\varphi_1, \varphi_3)$ holds boils down to whether their head ωs stand in correspondence.

As Selkirk (2011: 470–471) observes, "the location of main stress within φ would be edgemost, on a language-particular basis — falling in the rightmost ω in some languages, the leftmost ω in others." In (21), if the most prominent ω aligns with the left edge of φ, then φ_1 is headed by a and φ_3 is headed by b. Since $\mathcal{R}(a_{initial}, b_{final})$ does not hold, φ_1 and φ_3 do not stand in correspondence. On the other hand, if phrasal stress is rightmost, then φ_1 is headed by b and φ_3 is headed by c. As b and c are distinct words without correspondence, the relation $\mathcal{R}(\varphi_1, \varphi_3)$ cannot be established. The absence of correspondence between φ_1 and φ_3 indicates that the mapping from (21b) to (21c) does not simply involve reordering prosodic boundaries. Rather, postlexical phonology deletes φ_1 and creates φ_3.

The discussion above shows that category demotion and rebracketing both involve the deletion of prosodic constituents. One may ask whether this deletion is analogous to information loss in the mappings between other LFG modules. In *it is raining*, for instance, the subject is syntactically required but has no semantic content. Put differently, the expletive is the f-structure SUBJ but is absent in s-structure. Such instances of information loss are not counterexamples to monotonicity but are a desirable consequence of LFG's modularity architecture, because information that is domain-specific to syntax need not be relevant to semantics. In the case of expletives, the dummy subject introduces no meaning constructor, so it is not constrained by resource sensitivity (cf. Findlay et al. 2023: 763). Consequently, we can treat expletives as outside the domain of the f-to-s-structure mapping.

Information loss occurs naturally when the two structures have distinct theory primitives (e.g., f-structure and s-structure). In the p-to-p-structure mapping, however, the two structures have the same theory primitives and are represented by the same p-diagram notation (Bögel 2015: §3.3). Hence, one cannot motivate constituent deletion by claiming that a prosodic constituent is domain-specific to the initial p-structure but not to the final one. In other words, it is not feasible to exclude the deleted prosodic constituent from the domain of the p-to-p-structure mapping in order to maintain monotonicity.

4.2.2 Consequences of (non-)monotonicity

As Section 4.2.1 demonstrates, the mapping from the initial p-structure to the final p-structure is not monotonic. Non-monotonicity is not without precedent in LFG analyses. To illustrate, Mahowald (2011) develops a non-monotonic account of word order freezing. In early LFG, relation changes like passivisation and intransitivisation were handled by lexical rules (Bresnan 1982) that are not information-preserving (Findlay et al. 2023: 711).

Given that monotonicity is imposed on LFG as a computational constraint to prune unnecessary computation (Maxwell III & Kaplan 1993), its violation tends to have computational rather than empirical consequences. Consider the restriction operator, which removes an f-structure attribute and is therefore non-monotonic (Kaplan & Wedekind 1993). The drawback for grammars using this operator is that the generation problem becomes undecidable (Forst 2011: 7). Nevertheless, the restriction operator may be required for analysing complex predicates (e.g., Butt et al. 2003). Likewise, in Bögel's (2015) model, a non-monotonic mapping helps capture empirical data such as those discussed in Section 3. These observations suggest that monotonicity is an area where theoretical LFG analyses and computational implementations of LFG diverge (see also Findlay et al. 2023: 711 for a discussion).

Though non-monotonic analyses have been motivated on empirical grounds, monotonic alternatives are worth pursuing to narrow the gap between LFG theories and computational implementations. For the p-to-p-structure mapping, one alternative would be to reformulate postlexical phonology in OT. Bögel (2015: 131) voices concern that OT grammars would considerably increase computational complexity, but non-monotonic mappings do so as well. Another possibility would be to posit a distinct module for phonetic implementation (as in Kálmán 1989) instead of two levels for phonology, so information loss could be modelled in a manner parallel to the expletive example discussed above. The development of such a module must, of course, be left to future work.

To summarise this section, Bögel (2015) treats prosodic words as rhythmically determined and higher categories as syntactically determined. Although p-structure is largely isomorphic to c-structure during the *transfer of structure*, a subsequent p-to-p-structure mapping allows postlexical phonology to reorganise p-structure and derive syntax-phonology mismatches. This mixed model is empirically adequate to analyse the mismatches observed in Section 3, but the mapping between p-structures is non-monotonic.

5 Conclusion

Rebracketing mismatches in Japanese (Section 3.1) and expansion mismatches in Wenzhounese (Section 3.2) confirm that a subset of interface categories have no syntactic correspondents. These interface categories must be generated in phonology, in accordance with rhythmic determinism. In other words, syntactic determinism alone is empirically inadequate.

This observation implies that in LFG, a direct projection from c-structure to p-structure would undergenerate the data, which leaves us with two options to analyse the syntax-phonology interface. We either reject any c-to-p-structure projection (as in the double-tree model) or assume the co-existence of rhythmic and syntactic determinism (as in Bögel 2015). Both approaches can adequately analyse the Japanese and Wenzhounese data, but there is space for development. The principle of Interface Harmony in the double-tree model awaits full formalisation, and in Section 4.1 I proposed to formalise a subset of Interface Harmony as Optimality-Theoretic interface constraints. Bögel's (2015) model posits two levels of p-structures, but Section 4.2 shows that the mapping is non-monotonic, which may be potentially problematic for computational implementations.

Acknowledging rhythmic determinism has far-reaching theoretical consequences beyond LFG. In Section 2.3, I argued that rhythmic determinism can be accommodated in a parallel architecture but is incompatible with the T-model. Therefore, these data that attest to rhythmic determinism provide new evidence that linguistic modules should be organised in parallel.

References

Asudeh, Ash. 2022. Glue Semantics. *Annual Review of Linguistics* 8. 321–341. https://doi.org/10.1146/annurev-linguistics-032521-053835.

Asudeh, Ash, Tina Bögel & Daniel Siddiqi. 2023. Modelling exponents. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG23 conference*, 23–44. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/issue/view/2.

Bellik, Jennifer, Junko Ito, Nick Kalivoda & Armin Mester. 2022. Matching and alignment. In Haruo Kubozono, Junko Ito & Armin Mester (eds.), *Prosody and prosodic interfaces*, 457–480. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198869740.003.0015.

Bellik, Jennifer, Junko Ito, Nick Kalivoda & Armin Mester. 2023. Syntax-prosody in Optimality Theory (SPOT). In Jennifer Bellik, Junko Ito, Nick Kalivoda & Armin Mester (eds.), *Syntax-prosody interface in Optimality Theory: Theory and analyses*, 1–29. Sheffield: Equinox.

Bellik, Jennifer & Nicholas Van Handel. 2023. Size effects in prosody: Branch-counting, Leaf-counting, and uniformity. In Jennifer Bellik, Junko Ito, Nick Kalivoda & Armin Mester (eds.), *Syntax-prosody interface in Optimality Theory: Theory and analyses*, 391–441. Sheffield: Equinox.

Bird, Steven & Ewan Klein. 1994. Phonological analysis in typed feature systems. *Computational Linguistics* 20(3). 455–491. https://aclanthology.org/J94-3010/.

Bögel, Tina. 2015. *The syntax-prosody interface in Lexical Functional Grammar*. PhD thesis, Universität Konstanz.

Bögel, Tina. 2021. Function words at the interface: A two-tier approach. *Languages* 6(4). 197. https://doi.org/10.3390/languages6040197.

Bögel, Tina. 2023. Prosody and its interfaces. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 779–821. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185970.

Bögel, Tina & Tianyi Zhao. 2025. From speech signal to syntactic structure: A computational implementation. *Journal of Language Modelling* 13(1). 1–42. https://doi.org/10.15398/jlm.v13i1.397.

Breiss, Canaan & Bruce Hayes. 2020. Phonological markedness effects in sentence formation. *Language* 96(2). 338–370. https://doi.org/10.1353/lan.2020.0023.

Bresnan, Joan. 1982. The passive in lexical theory. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 3–86. Cambridge, MA: The MIT press.

Bresnan, Joan. 1990. Monotonicity and the theory of relation changes in LFG. *Language Research* 26(4). 637–652.

Bresnan, Joan. 1998. Morphology competes with syntax: Explaining typological variation in weak crossover effects. In Pilar Barbosa, Danny Fox, Paul Hagstrom, Martha McGinnis & David Pesetsky (eds.), *Is the best good enough? Optimality and competition in syntax*, 59–92. Cambridge, MA: The MIT Press.

Bresnan, Joan. 2000. Optimal Syntax. In Joost Dekkers, Frank van der Leeuw & Jeroen van de Weijer (eds.), *Optimality Theory: Phonology, syntax and acquisition*, 334–385. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198238430.003.0011.

Bresnan, Joan, Ash Asudeh, Ida Toivonen & Stephen Wechsler. 2016. *Lexical-Functional Syntax* (2nd edn.). West Sussex: Wiley Blackwell. https://doi.org/10.1002/9781119105664.

Bresnan, Joan & Sam A. Mchombo. 1995. The lexical integrity principle: Evidence from Bantu. *Natural Language & Linguistic Theory* 13. 181–254. https://doi.org/10.1007/BF00992782.

Butt, Miriam & Tracy Holloway King. 1998. Interfacing phonology with LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG98 conference*, Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG3-1998/lfg98-toc.html.

Butt, Miriam, Tracy Holloway King & John T. Maxwell III. 2003. Complex predication via restriction. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG03 conference*, 92–104. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/8/lfg03-toc.html.

Chen, Matthew Y. 2000. *Tone sandhi: Patterns across Chinese dialects*. Cambridge: Cambridge University Press.

Chomsky, Noam. 1965. *Aspects of the theory of syntax*. Cambridge, MA: MIT press.

Chomsky, Noam. 1988. *Lectures on Government and Binding: The Pisa lectures* (5th edn.). Dordrecht: Foris. https://doi.org/10.1515/9783110884166.

Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge, MA: MIT press. https://doi.org/10.7551/mitpress/9780262527347.001.0001.

Chomsky, Noam & Morris Halle. 1968. *The sound pattern of English*. Cambridge, MA: MIT Press.

Culicover, Peter W. & Ray Jackendoff. 2005. *Simpler Syntax*. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199271092.001.0001.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Dalrymple, Mary & Louise Mycock. 2011. The prosody-semantics interface. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG11 conference*, 173–193. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2011/lfg11.toc.html.

Duanmu, San. 1999. Metrical structure and tone: Evidence from Mandarin and Shanghai. *Journal of East Asian Linguistics* 8(1). 1–38. https://www.jstor.org/stable/20100753.

Elfner, Emily. 2015. Recursion in prosodic phrasing: Evidence from Connemara Irish. *Natural Language & Linguistic Theory* 33. 1169–1208. https://doi.org/10.1007/s11049-014-9281-5.

Findlay, Jamie, Roxanne Taylor & Anna Kibort. 2023. Argument structure and mapping theory. In Mary Dalrymple (ed.), *Handbook of lexical functional grammar*, 699–778. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185966.

Findlay, Jamie Y. 2023. Lexical Functional Grammar as a Construction Grammar. *Journal of Language Modelling* 11(2). 197266. https://doi.org/10.15398/jlm.v11i2.338.

Forst, Martin. 2011. Computational aspects of Lexical Functional Grammar. *Language and Linguistics Compass* 5(1). 1–18. https://doi.org/https://doi.org/10.1111/j.1749-818X.2010.00261.x.

Geurts, Bart & Frans van Der Slik. 2005. Monotonicity and processing load. *Journal of Semantics* 22(1). 97–117. https://doi.org/10.1093/jos/ffh018.

Graf, Thomas. 2019. Monotonicity as an effective theory of morphosyntactic variation. *Journal of Language Modelling* 7(2). 3–47. https://doi.org/10.15398/jlm.v7i2.211.

Ishihara, Shinichiro. 2014. Match theory and the recursivity problem. In Shigeto Kawahara & Mika Igarashi (eds.), *Proceedings of FAJL 7: Formal approaches to Japanese linguistics*, 69–88. Cambridge, MA: MIT Working Papers in Linguistics.

Ishihara, Shinichiro. 2022. On the (lack of) correspondence between syntactic clauses and intonational phrases. In Haruo Kubozono, Junko Ito & Armin Mester (eds.), *Prosody and prosodic interfaces*, 420–456. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198869740.003.0014.

Ito, Junko & Armin Mester. 2003. Weak layering and word binarity. In Takeru Honma, Masao Okazaki, Toshiyuki Tabata & Shin-ichi Tanaka (eds.), *A new century of phonology and phonological theory. A festschrift for Professor Shosuke Haraguchi on the occasion of his sixtieth birthday*, 26–65. Tokyo: Kaitakusha.

Ito, Junko & Armin Mester. 2012. Recursive prosodic phrasing in Japanese. In Toni Borowsky, Shigeto Kawahara, Takahito Shinya & Mariko Sugahara (eds.), *Prosody matters: Essays in honor of Elisabeth Selkirk*, 280–303. Sheffield: Equinox.

Ito, Junko & Armin Mester. 2013. Prosodic subcategories in Japanese. *Lingua* 124. 20–40. http://dx.doi.org/10.1016/j.lingua.2012.08.016.

Jackendoff, Ray. 1997. *The architecture of the language faculty*. Cambridge, MA: MIT Press.

Jackendoff, Ray. 2000. Fodorian modularity and representational modularity. In Yosef Grodzinsky, Lewis P Shapiro & David Swinney (eds.), *Language and the brain: Representation and processing*, 3–30. Academic Press. https://doi.org/10.1016/B978-012304260-6/50003-7.

Jackendoff, Ray. 2011. What is the human language faculty? Two views. *Language* 87(3). 586–624. https://doi.org/10.1353/lan.2011.0063.

Kalivoda, Nicholas. 2018. *Syntax-prosody mismatches in Optimality Theory*. PhD thesis, University of California, Santa Cruz.

Kálmán, László. 1989. Monotonicity in phonology. *Acta Linguistica Hungarica* 39(1/4). 133–147. https://www.jstor.org/stable/44362746.

Kaplan, Ronald M. 1995. The formal architecture of Lexical-Functional Grammar. In Mary Dalrymple, Ronald M. Kaplan, John T. Maxwell III & Annie E Zaenen (eds.), *Formal issues in Lexical-Functional Grammar*, 7–27. Stanford, CA: CSLI Publications.

Kaplan, Ronald M. & Joan Bresnan. 1982. Lexical-Functional Grammar: A formal system for grammatical representation. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 173–281. Cambridge, MA: MIT press.

Kaplan, Ronald M. & Jürgen Wedekind. 1993. Restriction and correspondence-based translation. In *Proceedings of the 6th meeting of the EACL*, 193–202. Utrecht: European Association for Computational Linguistics.

Kratzer, Angelika & Elisabeth Selkirk. 2020. Deconstructing information structure. *Glossa: a journal of general linguistics* 5(1). 113. https://doi.org/10.5334/gjgl.968.

Kubozono, Haruo. 1989. Syntactic and rhythmic effects on downstep in Japanese. *Phonology* 6(1). 39–67. https://doi.org/10.1017/S0952675700000944.

Kubozono, Haruo. 2008. Japanese accent. In Shigeru Miyagawa & Mamoru Saito (eds.), *The Oxford handbook of Japanese linguistics*, 165–191. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195307344.013.0007.

Kuhn, Jonas. 2007. Interfaces in constraint-based theories of grammar. In Gillian Ramchand & Charles Reiss (eds.), *The Oxford handbook of linguistic interfaces*, 613–650. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199247455.013.0020.

Lahiri, Aditi & Frans Plank. 2010. Phonological phrasing in Germanic: The judgement of history, confirmed through experiment. *Transactions of the Philological Society* 108(3). 370–398. https://doi.org/10.1111/j.1467-968X.2010.01246.x.

Lahiri, Aditi & Frans Plank. 2022. Phonological phrasing: Approaches to grouping at lower levels of the prosodic hierarchy. In B. Elan Dresher & Harry van der Hulst (eds.), *The Oxford history of phonology*, 134–162. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198796800.003.0007.

Lee, Seunghun J. & Elisabeth Selkirk. 2022. Xitsonga tone: The syntax-phonology interface. In Haruo Kubozono, Junko Ito & Armin Mester (eds.), *Prosody and prosodic interfaces*, 337–373. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198869740.003.0012.

Mahowald, Kyle. 2011. An LFG approach to word order freezing. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG11 conference*, 381–400. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/16/lfg11-toc.html.

Maxwell III, John T. & Ronald M. Kaplan. 1993. The interface between phrasal and functional constraints. *Computational Linguistics* 19(4). 571–590. https://aclanthology.org/J93-4001/.

McCarthy, John J. & Alan S. Prince. 1993. Generalized alignment. In Geert Booij & Jaap van Marle (eds.), *The yearbook of morphology 1993*, 79–153. Dordrecht: Springer. https://doi.org/10.1007/978-94-017-3712-8_4.

McCawley, James D. 1968. Concerning the base component of a transformational grammar. *Foundations of Language* 4(3). 243–269. http://www.jstor.org/stable/25000330.

Mellesmoen, Gloria & Suzanne Urbanczyk. 2021. Binarity in prosodic morphology and elsewhere. In Ryan Bennett, Richard Bibbs, Mykel L. Brinkerhoff, Max J. Kaplan, Stephanie Rich, Amanda Rysling, Nicholas Van Handel & Maya Wax Cavallaro (eds.), *Proceedings of the 2020 Annual Meeting on Phonology*, 1–8. Washington, DC: Linguistic Society ofAmerica. https://doi.org/10.3765/amp.v9i0.4924.

Mohanan, Tara & Karuvannur Puthanveettil Mohanan. 2003. Input, output candidates, markedness constraints, and ineffability in OT-LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG03 conference*, 307–327. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/8/lfg03-toc.html.

Mycock, Louise & John J. Lowe. 2013. The prosodic marking of discourse functions. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG13 conference*, 440–460. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/18/lfg13-toc.html.

Mycock, Louise, Chenzi Xu & Aditi Lahiri. 2021. 'Wh'-question intonation in Standard Colloquial Bengali: a Lexical-Functional Grammar analysis. In I Wayan Arka, Ash Asudeh & Tracy Holloway King (eds.), *Modular design of grammar: Linguistics on the edge*, 282–302. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780192844842.003.0017.

Nespor, Marina & Irene Vogel. 1986. *Prosodic phonology*. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110977790.

Reiss, Charles. 2007. Modularity in the "sound" domain: Implicationsfor the purview of Universal Grammar. In Gillian Ramchand & Charles Reiss (eds.), *The Oxford handbook of linguistic interfaces*, 53–79. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199247455.013.0003.

Rose, Phil. 2004. "Defying explanation"? – Accounting for tones in Wenzhou dialect disyllabic lexical tone sandhi. In S. Cassidy (ed.), *Proceedings of the 10th*

Australian international conference on speech science & technology, 237–242. Australian Speech Science and Technology Association. http://philjohnrose.net/pubs/Tone_pubs/index.html.

Scheer, Tobias. 2012. *Direct interface and one-channel translation: A non-diacritic theory of the morphosyntax-phonology interface*. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9781614511113.

Scheer, Tobias. 2013. Why phonology is flat: the role of concatenation and linearity. *Language Sciences* 39. 54–74. http://dx.doi.org/10.1016/j.langsci.2013.02.004.

Scheer, Tobias. 2020. On the lexical character of intermodular communication. *Radical: A Journal of Phonology* 1. 183–239.

Scheer, Tobias. 2023. Recursion in phonology: Anatomy of a misunderstanding. In Jeroen van de Weijer (ed.), *Representing phonological detail (Part I): Segmental structure and representations*, 265–287. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110730098.

Scholz, Franziska. 2012. *Tone sandhi, prosodic phrasing, and focus marking in Wenzhou Chinese*. PhD thesis, Leiden University.

Selkirk, Elisabeth. 2000. The interaction of constraints on prosodic phrasing. In Merle Horne (ed.), *Prosody: Theory and experiment*, 231–261. Dordrecht: Kluwer. https://doi.org/10.1007/978-94-015-9413-4_9.

Selkirk, Elisabeth. 2009. On clause and intonational phrase in Japanese: The syntactic grounding of prosodic constituent structure. *Gengo Kenkyu* 136. 35–73. https://doi.org/10.11435/gengo.136.0_35.

Selkirk, Elisabeth. 2011. The syntax-phonology interface. In John Goldsmith, Jason Riggle & Alan C. L. Yu (eds.), *The handbook of phonological theory* (2nd edn.), 435–484. West Sussex: Wiley Blackwell. https://doi.org/10.1002/9781444343069.ch14.

Sweet, Henry. 1885. *Elementarbuch des gesprochenen Englisch*. Oxford: Clarendon Press.

Truckenbrodt, Hubert. 1999. On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30(2). 219–255. https://www.jstor.org/stable/4179060.

Tyler, Matthew & George Aaron Broadwell. 2021. Prosodic words across large domains in Choctaw. In Marianne Huijsmans, D. K. E. Reisinger & Rose Underhill (eds.), *Proceedings of WSCLA 25*, 146–160. Vancouver: UBCWPL. https://lingbuzz.net/lingbuzz/006240.

Wagner, Michael. 2010. Prosody and recursion in coordinate structures and beyond. *Natural Language & Linguistic Theory* 28. 183–237. https://doi.org/10.1007/s11049-009-9086-0.

Wheeldon, Linda R. & Aditi Lahiri. 1997. Prosodic units in speech production. *Journal of Memory and Language* 37(3). 356–381. https://doi.org/10.1006/jmla.1997.2517.

Wynne, Hilary, Linda R. Wheeldon & Aditi Lahiri. 2018. Compounds, phrases and clitics in connected speech. *Journal of Memory and Language* 98. 45–58. https://doi.org/10.1016/j.jml.2017.08.001.

Xie, Chen. 2023. The syllabicity constraint in Mandarin and Wenzhounese: An OT-LFG account. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG23 conference*, 241–266. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/issue/view/2.

Xie, Chen. 2024. *Syntax-phonology (mis)matches in Wenzhounese: An LFG perspective*. PhD thesis, University of Oxford.

Zhang, Weijun & Peggy Pik Ki Mok. 2020. A potential new sound change after tonogenesis: A preliminary perceptual study on the tonal contrast of Wenzhou Wu Chinese. In *Proceedings of the 10th international conference on speech prosody*, 499–502. https://doi.org/10.21437/SpeechProsody.2020-102.

Zhu, Yuhong. 2023. A metrical analysis of light-initial tone sandhi in Suzhou Wu. *Natural Language & Linguistic Theory* 41. 1629–1678. https://doi.org/10.1007/s11049-023-09572-7.

Event structure and argument realisation in Mandarin V-V compounds

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Abstract

This paper analyses different types of resultative V-V compounds in Mandarin Chinese, including those previously claimed to show inverse argument-function linking. We propose a simplified and novel LFG account of V-V compounds by providing a systematic approach to argument realisation and event structures using only standard mapping principles and a constructional approach that imposes just two event structure frames for different resultative compounds: either a change-of-state frame or a causative frame. The main claim is that V-V compounding creates a change-of-state predicate, which may optionally undergo causativisation. By treating the second verb that denotes the result state as the semantic head, and by formalising the suppression of the first verb's highest argument, the present analysis captures the full range of interpretations found in Mandarin resultative compounds.

1 Introduction

Resultative V-V compounds (RVCs) in Mandarin Chinese are composed of two verbs which we will refer to as V1-V2.[†] V1 typically denotes an activity or state and V2 denotes a state, a change of state (COS), or, in exceptional cases, an activity, with a causal relation holding between V1 and V2, as shown in the examples in (1).[1]

(1) a. *ta* *ca-ganjing-le* *zhuo zi*
he wipe-clean-PFV table
'He wiped the table clean.'

b. *ta* *ti-po-le* *qiuxie*
he kick-broken-PFV sneakers
'He kicked (something) and, as a result, his sneakers got torn.'

These RVCs are indivisible because no aspect markers, adverbials, modals, negation markers nor objects may occur between the two verbs, except for two infixes, which yield the so-called potential form, expressing 'be able to' and 'be unable to'.[2] This contrasts with serial verb constructions, where such syntactic insertions are permitted in Mandarin (see more discussions in Zhuang et el. 2021). Moreover, V-V compounds are a type of complex predicates, given that the two component predicates form a unit from the point of view of argument structure and grammatical functions (GFs) (see e.g., Butt 1995, 1997, Alsina 1993, 1996), as we shall see.

This paper aims to provide a unified analysis of different types of RVCs. Section 2 classifies major RVC types and examines the complex thematic relations they encode. Section 3 reviews two previous analyses within the LFG framework and identifies unresolved issues. In Section 4, we present our proposal that V-V compounding creates a COS predicate, which can be optionally causativised, thereby accounting for both intransitive and transitive patterns in a principled manner.

† We thank the two anonymous reviewers and the audience at LFG 2025 Conference at Pompeu Fabra University for their comments.

[1] Given that both adjectives and verbs can function as predicates in a clause without a copular verb, we do not distinguish these two categories in this paper, but refer to them as verbs.

[2] The potential form is highly productive and can be derived by a lexical derivation rule as proposed by Thompson (1973). However, it is not addressed in this paper due to space limitations.

2 Complex thematic relations

RVCs exhibit considerable flexibility in argument realisation, depending on the semantic roles of both component verbs and their causal dependencies. More specifically, RVCs are often classified into several types and their variants.

First, **canonical transitive RVCs**, as exemplified in (1), are typically composed of an activity V1, either transitive or intransitive, such as *ku* 'cry' or *ca* 'wipe', and a stative or COS verb V2, which expresses the result state of the object. These RVCs can also be referred to as object-oriented RVCs, since the result predicate denoted by V2 is predicated of the object. Likewise, the term subject-oriented reading will be used for cases where the result predicate is predicated of the subject.

We refer to the argument that denotes the result state of V2 as the affectee. For example, the object in (1a) is both the patient of V1 and the affectee of V2. However, note that in certain cases, the affectee is not necessarily interpreted as the patient or theme argument of V1, as the object of RVCs may bear no thematic relation to V1. In an example like (1b), the object, i.e., the sneakers, is not selected by V1, as it is not the entity to which the kicking is directed, but just happens to be involved in the event.[3]

Second, canonical transitive RVCs have **pseudo-passive counterparts**, a term proposed by Cheng and Huang (1994), in which the agent of V1 is unexpressed, unlike those in (1). In this type of RVCs, the affectee is the only expressed argument, which maps onto the subject function; thus, they have a subject-oriented reading. These RVCs lack overt passive morphology (unlike the English translation), as shown in (2), where the passive morpheme *bei* is absent.

(2) a. *zhuo zi* *ca-ganjing-le*
table wipe-clean-PFV
'The table was wiped clean.' (Lit. 'The table wiped clean.')

b. *qiuxie* *ti-po-le*
sneaker kick-broken-PFV
'The sneaker was kicked broken.' (Lit. 'The sneaker kicked broken')

These RVCs denote a COS, though neither of the two component verbs encodes a COS in isolation.[4] The examples in (2) express a COS in which the result state is denoted by V2, without specifying the agent of the causing event. In particular, in (2b), the agent and the patient/goal arguments of V1 are both unexpressed.

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[3] *qiuxie* 'sneaker' in examples (1b) and (2b) is not the patient argument of V1 *ti* 'kick', as it is not the entity that receives the impact. Following Jackendoff (1990), the entity in motion is the kicker's foot, which also serves as the default instrument. Although whether the sneaker qualifies as a legitimate instrument remains to be determined, this uncertainty does not affect the conclusion that it is not an argument of the verb.

[4] Mandarin Chinese is a state/COS labile language lacking overt inchoative morphology. We follow Smith et al. (2025) in attributing the systematic availability of COS interpretations for stative predicates to aspectual coercion, which triggers an inchoative shift. In this view, V2 adjectival predicates are basically stative, but the compounding environment gives rise to a COS interpretation, analogous to the perfective marker *le*, which systematically patterns with RVC constructions. For more discussion, see Tham (2010, 2013), Zhang (2023) and Koontz-Garboden et al. (2025).

Moreover, the agent of V1 in pseudo-passives cannot be expressed in the absence of the passive marker *bei*. These pseudo-passives are also incompatible with agent-oriented adverbs, such as *zixi de* 'carefully' and *guyi* 'deliberately'.

(3) a. **zhuo zi* *zixi de* *ca-ganjing-le*
table carefully wipe-clean-PFV
'The table was carefully wiped clean.'

b. **qiuxie* *guyi* *ti-po-le*
sneaker deliberately kick-broken-PFV
'The sneaker was deliberately kicked broken.'

The third type of RVCs consists of **COS RVCs**, which are intransitive and express a COS without the presence of a causer. Unlike pseudo-passive RVCs, both V1 and V2 of COS RVCs are predicated of the subject.

(4) a. *Zhangsan* *zui-dao-le*
Zhangsan drunk-fall-PFV
'Zhangsan got so drunk that he fell.'

b. *Zhangsan* *chang-ku-le*
Zhangsan sing-cry-PFV
'Zhangsan got to cry by singing.'

Example (4a) illustrates an RVC with a state verb *zui* 'drunk' as V1 and the COS verb *dao* 'fall' as V2 and it means that the subject *Zhangsan* became so drunk that he fell down. As in (4b), COS RVCs can also be composed of two activity verbs, *chang* 'sing' and *ku* 'cry', which means that the singer *Zhangsan* was singing and ended up crying.

In COS RVCs, all activity verbs, either intransitive or used intransitively, can function as V1, without requiring an object, such as *tiao* 'jump; dance', *da* 'hit', *ti* 'kick', *he* 'drink', *zou* 'walk', etc. Besides, only a few COS verbs (e.g., *dong* 'freeze') can occur as V1 in COS RVCs, in which a stative V2 specifies the result of the COS of the compound, as in (5b).

(5) a. *Zhangsan* *zou-lei-le*
Zhangsan walk-tired-PFV
'Zhangsan got tired from walking.'

b. *shou jiao* *dong-jiang-le*
hand foot freeze-stiff-PFV
'Both hands and feet have become stiff from the cold.'

Given that both pseudo-passive RVCs and intransitive COS RVCs denote a COS, a close examination of the predicate classes that can appear as V1 and V2 in these two types of compounds reveals an interesting pattern. Even when neither V1 nor V2 denotes a COS, the compound as a whole, such as *ca-ganjing* 'wipe-clean' in (2a) and *sing-cry* 'chang-ku' in (4b), expresses a COS meaning. Similar examples include *ku-lei* 'cry-tired', *lei-bing* 'tired-sick', *zhan-ma* 'stand-numb', *qie-sui* 'cut-mashed', etc.

We claim that all these cases indicate that it is V-V compounding itself that creates a COS predicate and that the COS meaning is not derived from either component verb.

Finally, the fourth type involves the causativisation of COS RVCs. The examples in (4) have causative counterparts, shown in (6), where the subject of a COS RVC becomes the object of the causative form, and a causer takes the subject position.

(6) a. *na ping jiu zui-dao-le Zhangsan*
that CLF alcohol drunk-fall-PFV Zhangsan
'That bottle of liquor got Zhangsan so drunk that he fell down.'

b. *na shou ge chang-ku-le pingwei*
that CLF song sing-cry-PFV judge
'That song made judges cry.'

As Yao (2022) observes, intransitive COS RVCs systematically participate in the causative alternation. NPs such as *na-ping jiu* 'that bottle of alcohol' serve as pragmatically plausible causers that trigger causing subevents denoted by V1, as in example (6a). In (6), neither of the causer subjects bears any thematic relation to either component verb of the two RVCs. An important point worth mentioning with respect to (6b) is that the agent of V1, the singer, remains unknown, as it is unlikely that the judges are the ones singing.

In sum, RVCs can be divided into two major classes, with transitive and intransitive variants: canonical transitive RVCs and their intransitive counterparts, so-called pseudo-passive RVCs, on the one hand; intransitive COS RVCs and their causativised counterparts, on the other hand. All of these RVCs involve complex thematic relations.

3 Previous analyses

In this section, we present two previous LFG analyses: Her (2007) and Lee (2013).

3.1 Her (2007)

Her (2007) focuses on argument-function mismatches and revises the Lexical Mapping Theory (LMT) by replacing the different mapping principles with a unified Mapping Principle, which closely parallels the Mapping Principle proposed by Kibort (2001, 2004, 2006). According to this principle, each argument role, listed from left to right in order of prominence, is mapped onto the most prominent compatible function available.

With respect to Mandarin RVCs, Her assumes a set of lexical operations of resultative compounding that bind the single role of V2 with one of the two roles of V1, in the case of transitive V1s, creating a 'composite role', as in (7), notated by hyphenating the two roles. Moreover, Her adheres to Function-Argument Biuniqueness, proposed by Bresnan (1982) (see also Bresnan & Kanerva 1989, Dalrymple et al. 2019), and thus assumes that one of the component roles must be suppressed, indicated by a cross-out below, which implies that it receives no mapping to GF.

(7) Lexical rules for resultative compounding (Her 2007: 237)

a. When V_{caus} is transitive:

$V_{caus}\langle x\ y\rangle + V_{res}\ \langle z\rangle \rightarrow$

$V_{caus}\mathrm{Vres}\ \langle \alpha\ \beta\rangle$, where $\langle \alpha\ \beta\rangle$ = (i) $\langle x\ \ y\text{-}\cancel{z}\rangle$

(ii) $\langle x[\mathrm{caus}]\ \ \cancel{y}\text{-}z[\mathrm{af}]\rangle$

(iii) $\langle x\text{-}\cancel{z}\ \ y\rangle$

(iv) $\langle y[\mathrm{caus}]\ \ \cancel{x}\text{-}z[\mathrm{af}]\rangle$

b. When V_{caus} is intransitive

$V_{caus}\langle \mathrm{x}\rangle + V_{res}\langle \mathrm{z}\rangle \rightarrow$

$V_{caus}V_{res}\ \langle \alpha\ (\beta)\rangle$, where $\langle \alpha\ (\beta)\rangle$ = (i) $\langle x\text{-}\cancel{z}\rangle$

(ii) $\langle \cancel{x}\text{-}\mathrm{z}\rangle$

(iii) $\langle x[\mathrm{caus}]\ \ z[\mathrm{af}]\rangle$

In addition, the Causativity Assignment Hypothesis in resultative compounding is given in (8), where V_{res} refers to our V2, V_{caus} to V1, [af] to the Affectee role and [caus] to the Cause role (cf. Li 1995).

(8) Causativity assignment hypothesis in resultative compounding (Her 2007: 234)

An unsuppressed role from V_{res} receives [af] iff an unsuppressed role from V_{caus} exists to receive [caus].

Furthermore, following Dowty's (1991) Proto-Role classification, Her assumes that [caus] is more prominent than [af]. This, in turn, affects further argument-function mapping, such that the argument bearing [caus] takes precedence in mapping onto the highest compatible function.

To illustrate how these representations capture the relevant patterns, (9) provides a classic example of a transitive RVC, which allows three possible readings.[5]

(9) *Zhangsan* *zhui-lei-le* *Lisi*

Zhangsan chase-tired-PFV Lisi

a. 'Zhangsan chased Lisi and as a result Zhangsan got tired.' (Subject-oriented)

b. 'Zhangsan chased Lisi and as a result Lisi got tired.' (Object-oriented)

c. 'Lisi chased Zhangsan and Zhangsan got Lisi tired.' (Inverse linking)

For the subject-oriented reading, where the result is predicated of the subject, the corresponding a-structure is as in (7a[iii]), where the *x* and the *z* roles form a composite role, as shown in (10). The interpretation is not causative because the *z* role is suppressed, and consequently no causativity is assigned under the Causativity Assignment Hypothesis. This is further supported by the fact that the subject-oriented reading lacks a *ba* construction counterpart, which has been widely argued to be a diagnostic of causativity, given that the NP that follows *ba* is the affected argument (see also Huang 1992, Li 1995, Zou 1995, among others). It is worth noting that both the

[5] Ambiguity involving three readings is extremely rare in RVCs. This rarity is likely related to the affectedness of V1 and its compatibility with the result predicate contributed by V2, which is an issue that lies beyond the scope of the present paper.

object-oriented reading and the inverse linking reading have *ba* construction counterparts. In the case of the subject-oriented reading, the *x* and the *y* roles are mapped onto SUBJ and OBJ, respectively.

(10) 'Zhangsan chased Lisi and as a result Zhangsan got tired.' (Subject-oriented)

< *x*-~~*z*~~ *y* > (7a[iii]) (x=ag, y=pt/th) (non-causative)
SUBJ OBJ

For the object-oriented reading, Her proposes that the two a-structures in (7a[i]) and (7a[ii]) share the same linking, yielding the same interpretation, as in (11).

(11) 'Zhangsan chased Lisi and as a result Lisi got tired.' (Object-oriented)

a. < *x* *y*-~~*z*~~ > (7a[i]) (x=ag, y=pt/th) (non-causative)
SUBJ OBJ

b. < *x*[caus] ~~*y*~~-*z*[af] > (7a[ii]) (x=ag, y=pt/th) (causative)
SUBJ OBJ

The *z* role from V2 is suppressed in (11a), thus no causativity is assigned in the sense that it does not receive a causative interpretation. In contrast, in the a-structure in (11b), the *z* role from V2 is not suppressed, which triggers causativity assignment, so that the *x* role and the *z* role are assigned [caus] and [af], respectively. Thus, (11b) is causative and Her (2007: 235) claims that "our account correctly predicts that the reading of (11) is still causative."

Finally, the third reading in (9c), where the subject *Zhangsan* is understood as the one being chased, while the object *Lisi* is both the chaser and the one that undergoes a COS (i.e., the argument of which V2 is predicated), corresponds to the a-structure in (7a[iv]).

(12) 'Lisi chased Zhangsan and Zhangsan got Lisi tired.' (Inverse linking)

< *y*[caus] ~~*x*~~-*z*[af] > (7a[iv]) (x=ag, y=pt/th) (causative)
SUBJ OBJ

In (12), the most prominent role, namely the *x* role, is suppressed. This reading is causative because the *z* role from V2 remains unsuppressed, the unsuppressed *y* role from V1 can be assigned [caus], as required. Therefore, the *y* role is mapped onto SUBJ and the *z* role mapped onto OBJ, which results in an inversion of linking.[6]

Though Her provides an analysis of the unexpected inverse linking pattern, there are several problems in his account. First of all, causativity is a stipulation in the a-structure motivated solely by the facts of Chinese RVCs. Second, the assumption that the subject-oriented reading in (11) corresponds to two distinct a-structures, one causative and the other one non-causative, is not independently motivated: there is no evidence that the sentence is ambiguous in terms of causativity and thus there is no clear motivation for positing two a-structures for one interpretation. Third, Her

[6] This is termed *inverse linking* reading because the agent and the patient/goal argument of V1 are mapped to object and subject, respectively, which is the reverse assignment of GFs that occurs when V1 is the sole verb of a clause.

discusses examples of passivised RVCs like (13a), where the passive marker *bei* triggers the suppression of the agent role of V1. However, he does not address pseudo-passive RVCs, such as (13b), where there is no overt passive marker *bei* and the agent role of V1 is not realised in the syntax. Theoretically speaking, suppression in the case of passivisation would not be expected to occur in the case of pseudo-passives, so additional mechanisms and conditions on suppression need to be proposed.

(13) a. *shou pa* *bei* *ku-shi-le*
handkerchief PASS cry-wet-PFV
'The handkerchief got wet, caused by someone's crying.'

b. *shou pa* *ku-shi-le*
handkerchief cry-wet-PFV
'The handkerchief got wet from someone's crying.'

Fourth, the notion of suppression used here is different from the kind of suppression found in passivisation or unspecified object deletion (see Bresnan et al. 2016). In fact, it is used to satisfy Argument-Function Biuniqueness: only one of the two composing roles is mapped onto a GF, while the other one is left unavailable for linking. This is quite similar to Alsina's (1995, 1996) proposal, who challenges the Argument-Function Biuniqueness by arguing that two arguments are mapped onto a single GF. Finally, Her fails to cover all RVCs, especially those involving a non-subcategorised object as in (1b) and causative RVCs as in (6), where argument roles of V1 do not necessarily all need to be syntactically realised.

3.2 Lee (2013)

A more recent account of Mandarin RVCs within the LFG framework is provided by Lee and Ackerman (2011) and Lee (2013). They follow Goldberg and Jackendoff's (2004) analysis of English resultatives and propose that RVCs in Mandarin form a family of related constructions, similar to the proposals of Li (2008) and Shibagaki (2011). Adapting Rappaport and Levin's (1998) event structure templates, Lee (2013) assumes that the following simple event structures and schematic templates are used for Chinese verbs:[7]

(14) Simple event structures:
a. [x <*STATE*>] (State)
b. [BECOME [x <*STATE*>]] (COS)
c. [x ACT<*MANNER*> (y)] (Activity)

(15) Schematic templates:
a. [[ACT…] CAUSE [COS…]][8]
b. [[COS…] CAUSE [COS…]]

[7] Conventionally, event structure templates consist of semantic primitives (expressed in plain uppercase, e.g. ACT for activity, CAUSE, BECOME), roots (indicated in italics and in angled brackets) and variables, e.g. x, y, z.
[8] [ACT…] and [COS…] represent an activity event and an event denoting COS, respectively.

c. [[COS…] BY [ACT…]]
d. [[COS…] BY [COS…]]

(15a) and (15b) represent schematic templates involving the CAUSE predicate, relating either an activity event or a COS event to a COS event. In (15c) and (15d), in the presence of the BY predicate, the COS event is specified as arising by means of an activity event or a COS event. Lee points out that the latter two schemas can also be interpreted as a culmination, in which the activity or the COS culminates in a COS, as discussed by Parson (1990) and Tham (2012). In addition, Lee (2013) posits that certain RVCs, such as *zui-dao* 'drunk-fall', *lei-si* 'tired-die', *qi-si* 'annoy-die', in which neither component verb is an activity predicate, consist of two COS verbs, which motivates the schema in (15d).

Furthermore, as Lee observes that only COS verbs have an alternative use as causatives, he proposes the Causative Formation Hypothesis in (16a), which can be formalised as in (16b). According to this hypothesis, an external causer argument, namely an individual or an entity, is introduced by the CAUSE predicate, which takes a COS event as its complement.

(16) a. Causative formation hypothesis:
Only event structures that are headed by a COS predicate can be causativised.
b. Causative template:
[x CAUSE [BECOME …]]

In light of the above templates, eleven event structures are proposed to account for the different readings of RVCs (see Lee 2013: 191 for details). On the one hand, subject-oriented readings are represented by two schemas involving the BY predicate in (15c) and (15d), which captures the fact that RVCs with a subject-oriented reading lack a *ba* construction counterpart, as they are not causative. The specific choice between them depends on whether the event denoted by V1 is a COS or an activity. On the other hand, Lee distinguishes various sources for the formation of causative RVCs. Object-oriented readings like those in (1), in which V1 is an activity, are represented by the schema involving the CAUSE predicate in (15a), whereas inverse linking readings like those in (6) involve the interaction between the causative template in (16b) and the two templates in (15c) and (15d). Within the second option, a further distinction is made. When one of the two verbs can be used causatively on its own, which is the case with *lei* 'tire', *zui* 'intoxicate' and *fan* 'annoy', as Lee claims, the causative interpretation of RVCs involving these three verbs is derived from their independent causative use. More specifically, depending on whether those verbs occur as V1 or V2, the corresponding subevent is reformulated by the causative template in (16b), resulting in the introduction of a causer argument to that subevent. By contrast, when neither V1 nor V2 is one of these three verbs, causative interpretations arise from causativising the entire RVC. In this case, according to the causative template in (16b), a causer argument is introduced by the CAUSE predicate, which takes a complex event structure in (15c) as a complement.

To make the discussion concrete, the corresponding event structure representations for the classic example with three possible readings in (9), repeated here as (17), are shown in (18).

(17) *Zhangsan* *zhui-lei-le* *Lisi*
Zhangsan chase-tired-PFV Lisi
a. 'Zhangsan chased Lisi and as a result Zhangsan got tired.' (Subject-oriented)
b. 'Zhangsan chased Lisi and as a result Lisi got tired.' (Object-oriented)
c. 'Lisi chased Zhangsan and Zhangsan got Lisi tired.' (Inverse linking)

(18) a. Event structure for the subject-oriented reading of *zhui-lei* 'chase-tired'
[[BECOME [x <*TIRED*>]] BY [x ACT$_{<CHASE>}$ y]]

b. Event structure for the object-oriented reading of *zhui-lei* 'chase-tired'
[[x ACT$_{<MANNER>}$ y] CAUSE [BECOME [y <*TIRED*>]]]

c. Event structure for the inverse linking reading of *zhui-lei* 'chase-tired'
[[x CAUSE [BECOME [y <*TIRED*>]]] BY [y ACT$_{<CHASE>}$ x]]

With respect to the subject-oriented reading, the schema involving the BY predicate in (15c) is used, as it lacks a *ba* construction counterpart, as illustrated in (18a). By contrast, the object-oriented reading has a *ba* construction counterpart and is therefore associated with the schema containing the CAUSE predicate in (15a), as in (18b). As for the inverse linking reading, since V2 *lei* 'tired' has an independent causative use, as Lee claims, the causative template in (16b) is used. Additionally, the causative event and an activity event are related by the BY predicate in the sense that the activity event culminates in an externally caused COS, namely *lei* 'tired', as shown in (18c).

Although Lee's analysis covers the majority of RVCs, it still faces several issues. First, the claim that *zui* 'drunk' and *lei* 'tired' have a causative use as independent predicates is not convincingly supported, as it goes against previous research on RVCs (Tay 2024) and the judgment of most native speakers consulted. In addition, this approach allows multiple schematic templates and a wide range of options, giving rise to a strikingly large number of event structures, namely eleven types in total. This, in turn, requires imposing additional restrictions on the structures, based on whether the RVC involves one of the three verbs that can supposedly be used causatively on their own. Such complexity suggests the need for a simpler and more unified account that captures the full range of RVC properties without resorting to *ad hoc* stipulations.

Second, Lee (2013) does not address pseudo-passive RVCs. He assumes that the syntax of RVCs only allows a maximum of two argument NPs and appeals to the Argument-per-Subevent condition proposed by Levin and Rappaport (2004), which states that "there must be at least one argument XP in the syntax per subevent in the event structure." However, it is unclear how this condition could be satisfied in the case of pseudo-passive RVCs, particularly when V1 is monadic, as in (13b), repeated below as (19).

(19) *shou pa* *ku-shi-le*
handkerchief cry-wet-PFV
'The handkerchief got wet from someone's crying.'

There are two subevents, i.e., the crying activity and the COS, but the subject is only an argument of V2 and has no thematic relation to V1. Since the agent of V1 *ku* 'cry' is not overtly realised, Lee would need to invoke additional stipulations to account for such cases in order to satisfy the Argument-per-Subevent Condition.

Third, Lee represents the subject-oriented reading of RVC *zui-dao* 'drunk-fall' and *lei-si* 'tired-die' with the event structure in (15d), where two COS events are related by the BY predicate. However, this reading is better understood as a state-to-COS culmination 'he was drunk to such an extent that he fell', rather than a COS-to-COS culmination, in which the COS 'become drunk' itself culminates in a second COS 'fall', as Li (2008) also points out. In fact, RVCs such as *zuo-lei* 'sit-tired' with a subject-oriented reading, where *zuo* 'sit' clearly denotes a state rather than a COS, as shown in (20), provide direct counterexamples to this treatment.

(20) *ta* *zuo-lei-le*
he sit-tired-PFV
'As a result of his sitting, he became tired.'

Thus, an additional event structure is needed, one that replaces the COS event in the "means" position with a state event, as shown below, to be incorporated into the set of event structure templates.

(21) [[COS…] BY [STATE…]]

Finally, in some subject-oriented readings, the theme of a V1 cannot be realised, as shown by the contrast between (22a) and (22b). Nevertheless, this argument can be realised as the subject under certain conditions, namely causativisation, as shown in (22c).

(22) a. **ni* *hui* *chi-si* *zhe* *zhong* *yao* (Shibagaki 2009)
you will eat-die this kind drug
Intended: 'You will die from eating this kind of drug.'

b. *Taotao* *chi-si-le* (Lee & Ackerman 2011)
Taotao eat-die-PFV
'Taotao died from eating.'

c. *zhe* *zhong* *yao* *hui* *chi-si* *ni* (Her 2007)
this kind drug will eat-die you
'Eating this kind of drug will kill you.'

Lee argues that it is the intransitive variant of the verb *chi* 'eat' that participates in the resultative compounding of *chi-si* 'eat-die' in (22), causing the RVC itself to be intransitive, as represented in the event structure he proposes for (22b) in (23a).

(23) a. [[BECOME [Taotao <*DEAD*>]] BY [Taotao ACT <*EAT*>]]
b. [drug CAUSE [[BECOME [Taotao <*DEAD*>]] BY [Taotao ACT <*EAT*>]]]

The inverse linking reading in (22c) is analysed as resulting from the causativisation of the subject-oriented reading, with the subject NP *zhe zhong yao* 'this kind of drug' serving as an external cause, as shown in (23b). However, he does not explicitly explain why V1 must function as an intransitive verb in these cases, leaving his analysis somewhat stipulative rather than principled. Moreover, this RVC is not strictly intransitive, as it also allows canonical transitive readings, as illustrated below, an option entirely absent from Lee's analysis.

(24) *haizi* *chi-si-le* *yuanli* *de* *yushu* (CCL corpus)[9]
child eat-die-PFV yard-inside DET elm tree
'The children ate up the elm trees, causing the elm trees to die.'

Given the context of the Great Famine, when food was severely scarce and people were forced to survive by eating tree bark, it is unsurprising that this RVC could also have a canonical transitive use. A comparison of (22c) and (24) reveals a clear contrast: in the former, the subject is a cause, whereas in the latter it is an agent. This split strongly suggests that a single uniform analysis is insufficient. Unless Lee distinguishes between two distinct variants of this RVC, one intransitive and one transitive, each subject to different formation conditions, the full range of alternations in *chi-si* 'eat-die' cannot be satisfactorily explained.

4 The present proposal

Unlike Her's (2007) analysis, which involves extensive modifications to LMT and introduces an *ad hoc* causativity assignment hypothesis, the present approach builds directly on event structure to capture the properties of RVCs, in particular, their complex thematic relations, but makes no modification to the classic LMT. In contrast to Lee's (2013) account, which allows for interaction among multiple event structure templates and thereby predicts an overly wide range of structural possibilities, we aim to provide a unified account for different types of RVCs.

We argue that RVCs can express meanings that are not compositionally derived from either verb alone but instead emerge from the compound as a whole. Specifically, we propose that it is the compounding that creates a COS predicate, yielding a COS meaning that does not come directly from either component of RVCs. Furthermore, all COS RVCs can be causativised when pragmatically plausible. The causer can but is not required to be interpreted as an argument of V1 by pragmatic inference.

4.1 Basically stative verbs

It is worth noting that in RVCs, many adjectival predicates appear as V1 or V2, but their properties remain controversial. We depart from Tham's (2013) claim that stative adjectives systematically have COS counterparts and it is the COS counterpart that participate in the resultative compounding. Following Smith et al. (2025), we assume that adjectival predicates in Mandarin are basically stative, and that their COS interpretations arise only in the presence of some event-selecting elements, such as the perfective aspect marker *le*, modals, such as *neng* 'can' and *hui* 'can', and the negation marker *mei* 'not', which has been argued to negate the occurrence of an event (Lin 2003), as illustrated in (25).

[9] Example from the Center for Chinese Linguistics PKU corpus of Modern Chinese (hereafter CCL corpus). http://ccl.pku.edu.cn:8080/ccl_corpus/index.jsp?dir=xiandai

(25) a.

bing ren	*xue ya*	*gao-le*	(Tham 2013)
patient	blood pressure	high-PFV	

‘The patient’s blood pressure has risen.’

b.

ta	*neng*	*gao*	(Tham 2013)
he	can	tall	

‘He can become tall.’

c.

ta	*hui*	*pang*	(Tham 2013)
he	can	fat	

‘He may become fat.’

d.

ta	*yi*	*dian*	*dou*	*mei*	*lao*
he	one	little	all	NEG	old

‘He hasn’t become old at all.’

The view that these adjectival predicates are basically stative is further supported by the incompatibility between the progressive marker and them, as noted by Zhang (2023). For instance, the adjectival predicate *kuan* ‘wide’ cannot co-occur with the progressive marker *zai*, unless it is combined with the verb *bian* ‘change’, as in (26).

(26)

he dao	*zai*	**(bian)*	*kuan*	(Zhang 2023)
river-course	PROG	*(change)	wide	

‘The river course is widening.’

This distribution strongly suggests that adjectival predicates in Mandarin Chinese are statives and their COS interpretations arise only when event-selecting elements are introduced.

Therefore, we argue against Lee (2013), Lu et al. (2023), Tham (2013) and Tay (2024), who posit that it is the COS variant of stative predicates that appears in RVCs. Instead, we maintain that it is the compounding itself that creates the COS interpretation, rather than its being derived from either component verb individually, in particular given that many of these verbs denote states, as we argue.

More specifically, even when neither V1 nor V2 denotes a COS, the compound as a whole, such as the pseudo-passive RVCs in (2), repeated below as (27), expresses a COS meaning.

(27) a.

zhuo zi	*ca-ganjing-le*
table	wipe-clean-PRF

‘The table was wiped clean.’ (Lit. ‘The table wiped clean.’)

b.

qiuxie	*ti-po-le*
sneaker	kick-broken-PRF

‘The sneaker was kicked broken.’ (Lit. ‘The sneaker kicked broken’)

We argue that all RVCs encode a COS created by the compounding, yielding the COS frame, and it may undergo causativisation, introducing a causer, thus giving rise to the causative frame.

4.2 Evidence for V2 as the head of the compound

Before turning to the two event structure frames in detail, it is important to establish the role of V2 in the event structure. In line with a number of researchers, e.g., Chief (2007), Tai (2003), Tham (2012) and Tay (2024), we claim that V2 of RVCs, which denotes the result state, functions as the main predicate in the event structure.

A crucial piece of evidence comes from argument realisation patterns of V2. All the examples discussed above, along with our observations and previous findings in the literature (Li 2007, 2009, 2013, Sybesma 1997, 2013), show that the argument of V2 must be realised in the overt syntax, regardless of the transitivity of V1 and of the RVC as a whole.

In transitive RVCs, as shown by the contrast between (28a) and (28b), omission of the V2 argument, namely *caidao* 'the knife', results in ungrammaticality, even when both the agent and the theme arguments of V1 are realised. Moreover, (28c) illustrates that even when the most prominent argument of V1, i.e., the agent, is suppressed, the overt realisation of the argument of V2 is still obligatory in a causative RVC.

(28) a. *ta* *qie-dun-le* *caidao* (Tay 2024)
he cut-dull-PFV knife
'He cut (the bone) and as a result the knife became dull.'

b. **ta* *qie-dun-le* *na* *gen* *gutou*
he cut-dull-PFV that CLF bone
Intended: 'He cut the bone with the knife, and the knife became dull.'

c. *na* *gen* *gutou* *qie-dun-le* *caidao* (Williams 2015)
that CLF bone cut-dull-PFV knife
'That bone made the knife dull from cutting.'

Similarly, in pseudo-passive RVCs such as in (29a), neither the agent nor the theme of V1 is realised in the syntax, but the argument of V2 is realised as the subject, yielding a grammatical sentence. In contrast, omitting the argument of V2 makes the sentence ungrammatical, as in (29b).

(29) a. *ta* *de* *caidao* *qie-dun-le*
he DET knife cut-dull-PFV
'His knife got dull from cutting.'

b. **na* *gen* *gutou* *qie-dun-le*
that CLF bone cut-dull-PFV
Intended: 'His knife got dull from cutting that bone.'

Taken together, these facts reveal a systematic asymmetry: the argument of V2 is obligatorily expressed, whereas the arguments of V1, which denote the causing event in RVCs, may be suppressed. This distribution would be unexpected if V1 were the head of the event structure, since we would then expect its argument to be always realised. Instead, it is the argument of V2 that must be expressed, which provides strong evidence that V2 serves as the semantic head of RVCs.

Additional evidence comes from the interaction between RVCs and the negation *mei* 'not', which has been shown to negate the occurrence of a dynamic event, as illustrated in (30a). In contrast, in RVCs, *mei* 'not' takes scope exclusively over the result state denoted by V2, while the causing event denoted by V1 cannot be negated, as shown in (30b).

(30) a.

ta	*mei*	*qie*	*gutou*
he	NEG	cut	bone

'He didn't cut the bone.'

b.

ta	*qie-le*	*gutou,*	*dan*	*mei*	*qie-duan*	*ta*
he	cut-PFV	bone	but	NEG	cut-broken	it

'He cut the bone, but didn't break it.'

Therefore, the scope restriction of negation indicates that the result state denoted by V2 forms the core part of the compound, supporting the claim that V2 functions as the head in the event structure.

We now turn to adverbial modification properties of RVCs (see Liu 2021 for a full discussion). As shown in (31a), in a simple activity clause, adverbs, such as *kuai* 'fast', can freely modify the activity verb *zou* 'walk'. However, when the same verb appears as V1 in a COS RVC, as in (31b), it can no longer be modified by such adverbs.

(31) a.

Zhangsan	*zhengzai*	*kuai*	*zou*	(Liu 2021)
Zhangsan	PROG	fast	walk	

'Zhangsan is walking fast.'

b.

Zhangsan	*(*kuai)*	*zou-lei-le*	(Liu 2021)
Zhangsan	quickly	walk-tired-PFV	

Intended: 'Zhangsan got tired by walking fast.'

This contrast shows that, in COS RVCs, V1 is unavailable for adverbial modification, suggesting that the event denoted by V1 is subordinated and not independently accessible for adverbial modification.

In transitive RVCs, adverbs that modify activities, such as *manmande* 'slowly' and *mashang* 'immediately', cannot modify V1 alone; instead, they necessarily take scope over both the causing event and the result state. The example in (32) illustrates a canonical transitive RVC modified by the adverb *manmande* 'slowly'.

(32)

Zhangsan	*manmande*	*tui-kai-le*	*men*
Zhangsan	slowly	push-open-PFV	door

a. 'Zhangsan slowly pushed the door and the door opened slowly.'
b. *'Zhangsan pushed the door slowly and the door opened (quickly).'

In such a case, the only plausible interpretation is that Zhangsan caused the door to open, in a slow manner, by pushing it, rather than that Zhangsan's action of pushing was slow, yet the door opened quickly. Under our analysis, this follows straightforwardly if V2 functions as the head of the compound in the event structure.

Furthermore, adverbs such as *you* ‘again’, *chayidian* ‘almost’, *zhongyu* ‘finally’ can either modify both V1 and V2 or modify just V2, as shown below.

(33)	*Zhangsan*	*you*	*zhuang-dao-le*	*pingzi*
	Zhangsan	again	hit-fall-PFV	bottle

a. ‘Zhangsan previously knocked the bottle over. He did it again.’
b. ‘The bottle had fallen over before. Zhangsan caused it to be in the same state again.’

With *you* ‘again’ in (33), two interpretations arise: one repetitive, which involves a complex cause-result event, and the other one restitutive, which targets the result state denoted by V2. In the latter case, the bottle had been in a fallen state before and has now returned to that same result state. However, the adverb *you* ‘again’ never modifies V1 alone. These facts about adverbial modification further indicate that V2 is the head of the compound.

Given the above evidence from the obligatoriness of V2 argument realisation, interaction with negation and adverbial modification, we conclude that V2 functions as the main predicate in the event structure of RVCs.

4.3 Event structure representations

Building on this assumption, the next step is to formalise the two event frames proposed for RVCs, namely the COS and causative frames. We begin with the COS frame, which represents the core event structure underlying all RVCs. Following Lee (2013), who adapts the event structure templates of Rappaport Hovav and Levin (1998), we adopt the predicate BY to capture the semantic relation between the two subevents. As formulated in (34), this BY predicate encodes a *means* relation, indicating that the event denoted by V1 serves as the means through which the result state denoted by V2 comes about. As Lee notes, this relation may also be interpreted as *culmination* (Parsons 1990, Tham 2012), whereby an activity or a state culminates in a result event. In this representation, PRED2 denotes the predicate contributed by V2, typically a stative or COS verb, and PRED1, contributed by V1, denotes an activity or a state.

(34) COS frame:
[[BECOME PRED2 <x>] [BY [PRED1 <$\underline{w}$>]]]
SUBJ

The event structure involves a result state encoded by PRED2, and a BECOME predicate, which takes this PRED2 as its argument. Furthermore, the event introduced by PRED1 is embedded within a BY adjunct, subordinate to the result event headed by PRED2, involving the sole argument *x*, namely the affectee.

Furthermore, we assume the Highest V1 Argument Suppression Principle in (35), which states that V-V compounding systematically suppresses the highest argument of V1, preventing it from being mapped onto a GF as an independent argument. The suppression of V1’s highest argument is represented by the underlining of *w* in (34).

(35) Highest V1 argument suppression principle:
V-V compounding requires that the highest argument of V1 is always suppressed and not mapped onto a GF as an independent argument.

This systematic suppression of V1's highest argument can be regarded as a direct consequence of V1's non-head status within the compound. Conversely, since V2 functions as the head, its argument must be overtly realised in the syntax. Moreover, this principle does not entail that all arguments of V1 are suppressed. In other words, lower arguments may still be available for mapping in certain cases.

Given this asymmetry in argument suppression, the mapping of arguments to GFs follows directly from the event structure. In the COS frame in (34), the argument of V2, as the unsuppressed argument, is mapped onto SUBJ in accordance with the general mapping principles.

Furthermore, this hypothesis straightforwardly accounts for the pseudo-passive pattern, as in (13b), repeated below as (36a), where the subject bears no thematic relation to V1 and V1 is monadic.

(36) a. *shou pa* *ku-shi-le*
handkerchief cry-wet-PFV
'The handkerchief got wet from someone's crying.'

b. [[BECOME WET <x>] [BY [CRY <w>]]]
SUBJ

The corresponding event structure of (36a) is given in (36b), where PRED1 and PRED2 are instantiated by *ku* 'cry' and *shi* 'wet', respectively, with V2 *shi* 'wet' functioning as the head. In addition, the argument of V1 *ku* 'cry' is suppressed, thus not syntactically realised. According to the mapping principles, the argument of V2 *x*, namely the affectee, is mapped onto SUBJ. This sentence can be interpreted as "the handkerchief undergoes a COS in the sense that it becomes wet by means of someone's crying." Importantly, although the single argument of V1 is not syntactically realised, it remains recoverable from the context. This individual can be typically inferred from the immediate discourse context.

In the case of COS RVCs, however, the situation is somewhat different. Specifically, the compound expresses a spontaneous COS, in which no external causer is conceptually involved. Although the argument of V1 is suppressed, it is co-indexed (at the level of event structure) with the argument of V2. Note that the principle in (35) only requires V1's highest argument be suppressed but does not further prohibit the possibility of its co-indexation with a structurally higher argument. It should be emphasized that such a co-indexation, while allowed, is not obligatory in the sense that the highest argument of V1 can be co-indexed with the argument of V2, but does not have to, as in the example of (36).

Consider the example from (4a), repeated below as (37a):

(37) a. *Zhangsan* *zui-dao-le*
Zhangsan drunk-fall-PFV
'Zhangsan got so drunk that he fell.'

b. [[BECOME FALL <x_i>] [BY [DRUNK <$\underline{w}_i$>]]]
SUBJ

The corresponding event structure of (37a) is shown in (37b), where PRED1 and PRED2 are instantiated by *zui* 'drunk' and *dao* 'fall', respectively. According to the Highest V1 Argument Suppression Principle in (35), the sole argument of V1 is suppressed. However, in this case, the argument of V1 is co-indexed with the sole argument of V2. This co-indexation allows the two subevents, namely the state denoted by V1 and the result state denoted by V2, to share a single participant.

Building on the COS frame introduced above, we now turn to cases where the causative meaning is involved, or in other words, those that have a *ba* construction counterpart. Following the literature, we assume that causatives are characterised by the presence of the predicate CAUSE. Therefore, for RVCs with a causative meaning, such as canonical transitive RVCs in (1) and causativisation of COS RVCs (6), we assume that a layer of causation that introduces a causer *y* is added. The event structure in (34) is embedded as the second argument of the CAUSE predicate, as shown in (38).

(38) Causative frame:
[CAUSE <y [[BECOME PRED2 <x>] [BY [PRED1 <$\underline{w}$>]]]>]
SUBJ OBJ

We assume that an argument of a more prominent predicate in event structure takes precedence over an argument of a more embedded predicate in the assignment of the SUBJ function. Note that we do not make any modification to the classic LMT (see Findlay et al. 2023 for details); our proposal can be implemented in different versions of LMT. Specifically, the causer *y*, as the most prominent argument and [-o], always maps onto SUBJ and the argument of V2 *x*, a less prominent [-r] argument, is mapped onto OBJ. Though the argument of V1 is suppressed as stated in the Highest V1 Argument Suppression Principle in (35), the causer *y* can still be interpreted as the argument of V1 by pragmatic inference.

To illustrate how the causative frame operates, consider the causative counterpart of pseudo-passives in (36a), as shown below, with its corresponding event structure in (39b). The causer argument *y* is syntactically realised as the SUBJ, while the argument of V2, *x*, representing the affectee, is mapped onto the OBJ. The interpretation corresponds to a causative event, in which a causer brings about the COS event by means of the activity denoted by V1.

(39) a. *ta* *ku-shi-le* *shou pa*
he cry-wet-PFV handkerchief
'He cried and as a result the handkerchief got wet.'

b. [CAUSE <y [[BECOME WET <x>] [BY [CRY <$\underline{w}$>]]]>]
SUBJ OBJ

In this event structure, the argument of V1, namely *w*, the agent of *ku* 'cry' is suppressed, thus unavailable for syntactic expression. In this case, the causer is interpreted as the agent of *ku* 'cry' through pragmatic inference.

Another example comes from the causative counterpart of the COS RVC in (37a), from (6a), repeated as (40a). The corresponding event structure representation is shown in (40b), which builds directed on the COS frame in (37b), with an additional causative predicate, which licenses the causer argument.

(40) a.

na	*ping*	*jiu*	*zui-dao-le*	*Zhangsan*
that	CLF	alcohol	drunk-fall-PFV	Zhangsan

'That bottle of liquor got Zhangsan so drunk that he fell down.'

b. [CAUSE <y [[BECOME FALL <x_i>] [BY [DRUNK <$\underline{w}_i$>]]]>]

SUBJ (linked to y) OBJ (linked to x_i)

The NP *na ping jiu* 'that bottle of liquor' is introduced as the causer, which brings about a COS in the affectee *Zhangsan*, and it is mapped onto SUBJ, as the most prominent argument. Importantly, the addition of the causative layer does not interfere with the co-indexation between the argument of V2 *x* and that of V1 *w*, even though *w* is suppressed.

4.4 Some puzzles

Now we consider the puzzle of *chi-si* 'chi-die', which displays an interesting argument-structure restriction. We take examples from (22), repeated as (41). As shown in (41a) and (41b), when the agent of the eating event is also the affectee of the COS *si* 'die', the potential causer that brings about the death, namely the drug, cannot be overtly expressed as the OBJ. In such cases, *chi-si* 'eat-die' is obligatorily intransitive, denoting an event in which a single participant both performs the action of eating and undergoes the COS. However, if the drug is to be overtly expressed, the intransitive compound must undergo causativisation, whereby the causer is realised as the SUBJ and the affectee as the OBJ, as illustrated in (41c).

(41) a. (Shibagaki 2009)

*ni	*hui*	*chi-si*	*zhe*	*zhong*	*yao*
you	will	eat-die	this	kind	drug

Intended: 'You will die from eating this kind of drug.'

b. (Lee & Ackerman 2011)

Taotao	*chi-si-le*
Taotao	eat-die-PFV

'Taotao died from eating.'

c. (Her 2007)

zhe	*zhong*	*yao*	*hui*	*chi-si*	*ni*
this	kind	drug	will	eat-die	you

'Eating this kind of drug will kill you.'

First, let us examine the event structure of *chi-si* 'eat-die' in (41a-b). Since these examples instantiate a COS reading, only the COS frame is relevant here.

(42) * [[BECOME DIE <x>] [BY [EAT <$\underline{w}$, z>]]]

SUBJ OBJ

As shown in (42), V1 *chi* ‘eat’ takes two arguments, *w* and *z*. According to the Highest V1 Argument Suppression Principle in (35), *w* as the highest argument of V1, must be suppressed, while *z* remains available for syntactic expression. In principle, then (41a) should be grammatical. Then, what blocks it? To account for this restriction, we propose the Semantic Identity Condition for RVCs in (43), which requires the co-indexation of semantically identical arguments across the two subevents:

(43) Semantic identity condition for RVCs:
The affectee role denoted by the result predicate V2 must be co-indexed with the affected argument of V1, if there exists an affected argument of V1.

Since *chi* ‘eat’ is an incremental theme verb, the drug serves as its affected argument. According to the Semantic Identity Condition for RVCs, the affected argument of *chi* ‘eat’, namely the drug, must co-index with the affectee of V2 *si* ‘die’. This yields the only grammatically possible reading of (41a), ‘I ate the drug and as a result the drug died’, which is pragmatically impossible, as the drug itself cannot undergo death. Unless one invokes personification of the drug, which is a highly exceptional case that we set aside here, such co-indexation results in a pragmatically implausible interpretation that violates real-world knowledge.

In order to avoid violating this condition and to prevent a pragmatically implausible interpretation, only one strategy is available: make *chi* ‘eat’ intransitive by omitting its theme argument. The corresponding event structure is illustrated in (44), where *x* and *w* are co-indexed. The highest argument of V1 *w* is suppressed, while *x* is mapped onto the SUBJ, yielding the grammatical form attested in (41b).

(44) [[BECOME DIE <x_i>] [BY [EAT <$\underline{w_i}$>]]]

SUBJ

Furthermore, when the compound in (41b) undergoes causativisation, we obtain (41c), whose event structure is represented in (45). The drug is introduced as a causer at the causative layer and is therefore mapped onto SUBJ, while the argument that undergoes the COS is mapped onto OBJ.

(45) [CAUSE <y [[BECOME DIE <x_i>] [BY [EAT <$\underline{w_i}$>]]]>]

SUBJ OBJ

Moreover, *chi-si* ‘eat-die’ also has canonical transitive variants, as shown in (24), repeated below as (46). In this type, the RVC expresses a causative meaning.

(46) *haizi* *chi-si-le* *yuanli* *de* *yushu* (CCL corpus)
child eat-die-PFV yard-inside DET elm tree
‘The children ate up the elm trees, causing the elm trees to die.’

Its event structure representation is illustrated below. According to the condition in (43), the theme argument of V1 *chi* 'eat' is co-indexed with the affectee. Furthermore, the highest argument of V1 is suppressed, therefore, the causer, which is co-indexed with the agent, is mapped onto SUBJ and the affectee maps onto OBJ.

(47) $[\text{CAUSE} \langle y_j\ [[\text{BECOME DIE} \langle x_i\rangle]\ [\text{BY}\ [\text{EAT} \langle \underline{w_j}\, z_i\rangle]]]\rangle]$

SUBJ OBJ

Finally we discuss *zhui-lei* 'chase-tired', which exhibits three readings. The example in (9) is repeated below as (48), with their corresponding event structures in (49).

(48) *Zhangsan* *zhui-lei-le* *Lisi*
Zhangsan chase-tired-PFV Lisi
a. 'Zhangsan chased Lisi and as a result Zhangsan got tired.' (Subject-oriented)
b. 'Zhangsan chased Lisi and as a result Lisi got tired.' (Object-oriented)
c. 'Lisi chased Zhangsan and Zhangsan got Lisi tired.' (Inverse linking)

(49) a. $[[\text{BECOME TIRED} \langle x_i\rangle]\ [\text{BY}\ [\text{CHASE} \langle \underline{w_i}\, z\rangle]]]$

(Subject-oriented) SUBJ OBJ

b. $[\text{CAUSE} \langle y_j\ [[\text{BECOME TIRED} \langle x_i\rangle]\ [\text{BY}\ [\text{CHASE} \langle \underline{w_j}\, z_i\rangle]]]\rangle]$

(Object-oriented) SUBJ OBJ

c. $[\text{CAUSE} \langle y_j\ [[\text{BECOME TIRED} \langle x_i\rangle]\ [\text{BY}\ [\text{CHASE} \langle \underline{w_i}\, z_j\rangle]]]\rangle]$

(Inverse linking) SUBJ OBJ

Unlike *chi* 'eat', *zhui* 'chase' denotes an activity, without involving an affected argument. Its internal argument serves as the target or goal of the chasing event, but is not affected, in the sense that it does not undergo a change. Thus, the Semantic Identity Condition does not apply to it, and so it is not forced into a one-argument use, unlike *chi-si* 'eat-die' in (41b) in the subject-oriented reading.

More specifically, the COS frame is used for the subject-oriented reading, as in (49a), where the agent of V1, although suppressed, is co-indexed with the argument of V2. Thus, *x* as the highest role in the structure is mapped on to SUBJ, while *z* as an argument of a more embedded structure is mapped onto OBJ. The causative meaning of the compound gives rise to only two readings, shown in (49b) and (49c); in both cases, the causer *y* is mapped onto SUBJ and the affectee onto OBJ. The difference lies in the co-indexation of the two arguments of V1 *zhui* 'chase'. If the affectee is co-indexed with the chasee *z*, we get the object-oriented reading, as in (49b); if it is co-indexed with the agent *w*, we get the inverse linking reading, as in (49c).

5 Conclusions

We propose that V-V compounding creates a COS predicate, yielding a COS frame of event structure. The compounding can optionally causativise this COS predicate by adding a CAUSE layer to the COS frame, yielding a causative frame. In both frames, V2 is the head of the structure and the highest argument of V1 is always suppressed. The same argument-mapping principles that operate on simple (non-compound) structures are also the ones we need for V-V compounds. The structurally most prominent argument in a frame is mapped onto SUBJ and the next argument if there is one maps onto OBJ. Therefore, the current approach achieves a simple analysis by making use of only two types of event structures to represent different types of RVCs.

References

Alsina, Alex. 1993. *Predicate composition: A theory of syntactic function alternations*. Ph.D. thesis, Stanford University.

Alsina, Alex. 1995. The fall of Function-Argument Biuniqueness. In Glyn Morrill & Richard Oehrle (eds.), *Proceedings of the First Conference on Formal Grammar*, 1–16. Barcelona: ESSLLI.

Alsina, Alex. 1996. *The role of argument structure in grammar: Evidence from Romance*. Stanford: CSLI Publications.

Bresnan, Joan. 1980. Polyadicity: Part I of a theory of lexical rules and representations. In Teun Hoekstra, Harry van der Hulst & Michael Moortgat (eds.), *Lexical grammar*, 97–121. Dordrecht: Foris Publications.

Bresnan, Joan & Jonni M. Kanerva. 1989. Locative inversion in Chicheŵa: A case study of factorization in grammar. *Linguistic Inquiry* 20(1). 1–50.

Bresnan, Joan, Ash Asudeh, Ida Toivonen & Stephen Wechsler. 2016. *Lexical-functional syntax*. (2nd edn.). Chichester, UK: Wiley-Blackwell. DOI: 10.1002/9781119105664

Butt, Miriam. 1995. *The structure of complex predicates in Urdu* (Dissertations in Linguistics). Stanford: CSLI Publications.

Butt, Miriam. 1997. Complex predicates in Urdu. In Alex Alsina, Joan Bresnan & Peter Sells (eds.), *Complex predicates*, 107–150. Stanford: CSLI Publications.

Cheng, Lisa Lai-Shen & C.-T. James Huang. 1994. On the argument structure of resultative compounds. In Matthew Chen & Ovid Tzeng (eds.), *Interdisciplinary studies on language and language change*, 187–221. Taipei: Pyramid Press.

Chief, Liancheng. 2007. *Scalarity and incomplete event descriptions in Mandarin Chinese*. Ph.D. thesis, State University of New York at Buffalo.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press. DOI: 10.1093/oso/9780198733300.001.0001

Dowty, David. 1991. Thematic proto-roles and argument selection. *Language 67*(3), 547–619.

Findlay, Jamie Y., Roxanne Taylor & Anna Kibort. 2023. Argument structure and mapping theory. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 699–778. CSLI Publications. DOI: 10.5281/zenodo.10037797

Goldberg, Adele E. & Ray Jackendoff. 2004. The English resultative as a family of constructions. *Language* 80(3), 532–568. DOI: 10.1353/lan.2004.0129

Her, One-Soon. 2007. Argument-function mismatches in Mandarin resultatives: A lexical mapping account. *Lingua* 117(1), 221–246. DOI: 10.1016/j.lingua.2006.01.002

Huang, C. -T. James. 1992. Complex predicates in control. In Richard K. Larson, Sabine Iatridou, Utpal Lahiri, James Higginbotham (eds.), *Control and grammar. Studies in Linguistics and Philosophy,* 109–147. Dordrecht: Springer. DOI: 10.1007/978-94-015-7959-9_4

Kibort, Anna. 2001. The Polish passive and impersonal in Lexical Mapping Theory. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'01 Conference*, 163–183. CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/6/pdfs/lfg01kibort.pdf

Kibort, Anna. 2004. *Passive and passive-like constructions in English and Polish*. Ph.D. thesis, University of Cambridge.

Kibort, Anna. 2006. On three different types of subjectlessness and how to model them in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'06 Conference*, 289–309. CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/11/pdfs/lfg06kibort.pdf

Koontz-Garboden, Andrew, Emily Hanink, Jens Hopperdietzel, Colin Bannard, Margit Bowler, Michael Everdell, Itamar Francez, Kyle Jerro, Elise LeBovidge & Stephen Nichols. 2025. Verbhood and state/change of state lability across languages. *Glossa: A Journal of General Linguistics* 10(1). DOI: 10.16995/glossa.10003

Lee, Leslie. 2013. *Event structure and grammatical patterns: Resultative constructions*. Ph.D. thesis, University of California.

Lee, Leslie & Farrell Ackerman. 2011. Mandarin resultative compounds: A family of lexical constructions. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'11 Conference*, 320–338. CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/16/papers/lfg11leeackerman.pdf

Levin, Beth & Malka Rappaport Hovav. 2004. The semantic determinants of argument expression: A view from the English resultative construction. In Jacqueline Guéron & Jacqueline Lecarme (eds.), *The Syntax of Time*, 477–494. Cambridge, MA: The MIT Press. DOI: 10.7551/mitpress/6598.003.0020

Li, Chao. 2008. *Mandarin resultative verb compounds: Where syntax, semantics, and pragmatics meet*. Ph.D. thesis, Yale University.

Li, Chao. 2013. Mandarin resultative verb compounds: Simple syntax and complex thematic relations. *Language Sciences* 37, 99–121. DOI: 10.1016/j.langsci.2012.11.001

Li, Yafei. 1995. The thematic hierarchy and causativity. *Natural Language & Linguistic Theory* 13(2), 255–282.

Lin, Jo-Wang. 2003. Aspectual selection and negation in Mandarin Chinese. *Linguistics* 41(3), 425–459.

Liu, Jianxun. 2021. *The syntax of V-V resultatives in Mandarin Chinese*. Singapore: Springer. DOI: 10.1007/978-981-33-6846-0

Lu, Yanru, Chenyuan Deng & Jian Ma. 2023. How things become red in Mandarin Chinese? A case study of deadjectival change of state predicates. In Stefan Müller

& Elodie Winckel (eds.), *Proceedings of the 30th International Conference on Head-Driven Phrase Structure Grammar*, 59–79. CSLI Publications. DOI: 10.21248/hpsg.2023.4

Parsons, Terence. 1990. *Events in the semantics of English: A study in subatomic semantics*. Cambridge, MA: The MIT Press.

Rappaport Hovav, Malka & Beth Levin. 1998. Building verb meanings. In Miriam Butt & Wihelm Geuder (eds.), *The projection of arguments: Lexical and compositional factors*, 97–134. CSLI Publications.

Shibagaki, Ryosuke. 2009. Affected roles and linking in Mandarin resultatives. In Julian Brooke, Gregory Coppola, Emrah Görgülü, Morgan Mameni, Emma Mileva, Susan Morton & Anne Rimrott (eds.), *Proceedings of the 2nd International Conference on East Asian Linguistics.*

Smith, Ryan Walter, Jens Hopperdietzel & Andrew Koontz-Garboden. 2025. From state to change of state by type-shift. *Natural Language Semantics* 33, 329–361. DOI: 10.1007/s11050-025-09234-x

Sybesma, Rint. 1999. *The Mandarin VP*. Dordrecht: Springer. DOI: 10.1007/978-94-015-9163-8

Tai, James H-Y. 2003. Cognitive relativism: Resultative construction in Chinese. *Language and Linguistics* 4(2), 301–316.

Tay, Wenkai. 2024. *Resultative expressions in Mandarin Chinese.* Ph.D. thesis, University College London.

Tham, Shiao Wei. 2010. Intransitive change of state predicates and the notion of acquired state in Mandarin. In *Pre-conference Proceedings of the 12th International Symposium on Chinese Languages and Linguistics*, 257–286.

Tham, Shiao Wei. 2012. Result in Mandarin verb compounds. In Ana Aguilar Guevara, Anna Chernilovskaya & Rick Nouwen (eds.), *Proceedings of Sinn und Bedeutung* 16, 599–612.

Tham, Shiao Wei. 2013. Change of state verbs and result state adjectives in Mandarin Chinese. *Journal of Linguistics* 49(3), 647–701.

Thompson, Sandra Annear. 1973. Resultative verb compounds in Mandarin Chinese: A case for lexical rules. *Language* 49(2), 361–379. DOI: 10.2307/412459

Williams, Alexander. 2015. Agents in Mandarin and Igbo resultatives. In Audrey Li, Andrew Simpson & Wei-Tian Dylan Tsai (eds.), *Chinese Syntax in a Cross-Linguistic Perspective*, 270-299. New York: Oxford University Press. DOI: 10.1093/acprof:oso/9780199945658.003.0011

Yao, Jiaojiao. 2022. *Chinese causative resultative V-Vs and their acquisition by L1 European Portuguese learners*. Ph.D. thesis, Universidade de Lisboa.

Zhang, Anqi. 2023. Mandarin de-adjectival degree achievements as inchoative statives. *Language and Linguistics* 24(1), 147–181. DOI: 10.1075/lali.00128.zha

Zhuang, Huibin, Peicui Zhang & Baopeng Ma. 2021. V-V compounds in Chinese: Syntactic perspective revisited. *SAGE Open* 11(1), 1–17. DOI: 10.1177/2158244020988681

Zou, Ke. 1995. *The syntax of the Chinese BA-constructions and verb compounds: A morphosyntactic analysis*. Ph.D. thesis, University of Southern California.

Polish and English specificational copular clauses: An LFG approach

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Abstract

The aim of this paper is to provide an LFG+Glue analysis of specificational copular clauses in Polish and English (e.g., *The winner is John*). In the proposed account, the English construction is related to its predicational counterpart (*John is the winner*) at the level of s-structure: it represents an alternative mapping of s-structural arguments to grammatical functions, contributing a presupposition about the current Question Under Discussion. In Polish, the same effect arises through simple inversion at the level of c-structure, possible due to flexible word order. The second part of the paper examines the so-called pronominal copula in Polish, aiming to formalise its nuanced syntax and semantics.

1 Introduction

1.1 Specificational copular clauses

The classification of copular clauses most widely assumed in generative grammar, tracing back to Higgins (1973/1979), distinguishes between predicational and specificational copular clauses (among others).[†,1] Predicational copular clauses (PCCs), such as (1a), have a referential subject on the left and a non-verbal predicate on the right, expressing a property assigned to the subject. Specificational copular clauses (SCCs), such as (1b), have the more referential phrase (a proper name in (1b)) on the right. Pragmatically, such sentences "[do] not tell us something **about** the referent of the subject NP", but instead they say "**who** or **what** the referent is" (Mikkelsen 2005: 1, emphasis original).

(1) a. John is a doctor / nice / the winner.
    b. The winner is John.

The syntax and semantics of SCCs remain a widely debated problem, with no settled consensus – see den Dikken & O'Neill (2017) and Heycock (2021) for survey papers, Barros (2016) and Arregi et al. (2021) for recent semantic analyses, and Mikkelsen (2005), den Dikken (2006) and Bondaruk (2013) for monographs. Despite this extensive debate, a thorough discussion of SCCs from an LFG perspective is notably absent.[2]

The aim of this paper is to offer a first syntactico-semantic analysis of specificational copular clauses in Polish and English. As will be shown, the modular architecture of LFG allows for an insightful account of language-specific properties of such sentences. The central idea is that, to achieve the same pragmatic effect, Polish and English make use of operations at different levels of the LFG architecture. Whereas Polish exploits its flexible word order to topicalise the predicate, English employs two distinct argument mappings. Additionally, the paper discusses the Polish pronominal copula, which seems

[†]I would like to thank the two anonymous reviewers of LFG'25 proceedings for their insightful and detailed comments, and Jamie Y. Findlay and Adam Przepiórkowski for helpful feedback on earlier drafts. I am also grateful to the reviewers and audience of the LFG'25 conference for their valuable suggestions. All remaining errors are, of course, my own. This research was supported by the National Center of Science, Poland (Project No. 2022/45/N/HS2/03109).

[1]The two other types are identificational and equative clauses, to which I return in §4.

[2]While analyses of data falling under the SCC label exist within the LFG framework (e.g., Dalrymple et al. 2004 and Alsina et al. 2014), these studies do not involve the theoretical issues central to the aforementioned literature on SCCs.

to duplicate the function of standard Polish copular clauses (with instrumental predicates). The analysis aims to shed light on the subtle differences between these constructions.

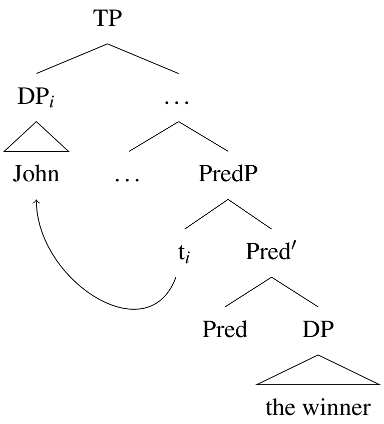
1.2 Brief overview and adopted assumptions

Although it has been the subject of persistent inquiry, the semantic type of the left-hand NP in SCCs is far from being established, with two prevailing analyses. The first treats the left-hand NP in sentences like (1b) as an (inverted) predicate: *the winner* denotes a property ascribed to the referent of the right-hand NP, and the specific character of the sentence arises pragmatically. The second analysis assumes that *the winner* denotes an intensional object of type $\langle s, e\rangle$ – a function from worlds to entities (an individual concept). In the process of semantic composition, the world argument is supplied, and sentence (1b) expresses that the particular winner in a given world is identical to John.

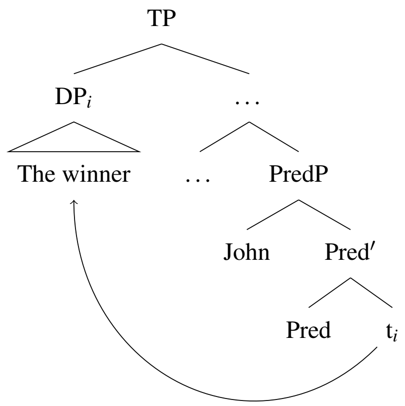
In this work, I adopt the view that specificational copular clauses such as (1b) involve inverted $\langle e, t\rangle$-type predicates as their left-hand NPs (following, for instance, Mikkelsen 2005; den Dikken 2006; Barros 2016). Barros (2016) demonstrates that existing objections to predicate inversion are confounded and derives key pragmatic properties of SCCs from predicate inversion driven by information-structural principles. In the present work, I adopt his approach, modifying and extending it to capture key generalisations in Polish and reformulating it in the LFG+Glue framework.[3]

The idea that the left-hand NP in SCCs denotes a predicate is typically coupled with the claim that such sentences are structurally related to predicational clauses, with the predicate undergoing movement to the pre-verbal position, instead of the subject of predication. Within the derivational approach, both PCCs and SCCs are derived from the same kind of small clause (Mikkelsen 2005; den Dikken 2006; Barros 2016), typically mediated by a functional head called Pred (Bowers 1993). In PCCs, the specifier of PredP moves to the subject position, whereas in SCCs it is the complement that undergoes this movement, as shown schematically in (2)–(3), respectively.

(2) Predicational copular clause



(3) Specificational copular clause



[3] An important limitation of the current proposal is that it does not discuss Arregi et al. (2021), who claim to offer "decisive" arguments for the individual concept analysis of SCCs. A detailed assessment of Arregi et al.'s (2021) arguments is left for future work.

As is well known, SCCs – in contrast to PCCs – have fixed information structure. Namely, the left-hand NP in SCCs cannot be focused, whereas no such restriction applies in PCCs (see Hartmann 2019 for an experimental confirmation). This is illustrated in (4)–(5) (from Mikkelsen 2005: 133).

(4) Who is the winner?
  a. The winner is JOHN.
  b. JOHN is the winner.

(5) What is John?
  a. #THE WINNER is John.
  b. John is THE WINNER.

Mikkelsen (2005) argues that it is a syntactically available topic feature that licenses the specificational word order. This idea is later adopted and developed in Barros (2016): due to being linked to the topic feature, SCCs presuppose that they are an answer to a particular Question Under Discussion (QUD, Roberts 2012). That is, the structure in (4a) and (5a) is inherently linked to the QUD *Who is the winner?* For this reason, (5a) is infelicitous, as its inherent QUD conflicts with the actual one, overtly expressed (*What is John?*). PCCs are not intrinsically linked to a particular QUD, allowing for greater flexibility in matching the QUD via prosodic means.

Having outlined the relevant facts, I now turn to the structure of the paper. In §2, I show that an LFG analysis can elegantly capture the underlying sameness of PCCs and SCCs, albeit at different levels of the grammar architecture. In Polish, PCCs and SCCs share the same f-structure, whereas in English, they map to distinct f-structures, but are "derived" from the same s-structure by different mappings to grammatical functions. In §3, I focus on the pragmatics of inversion, formalising the QUD associated with the specificational mapping in English and c-structural inversion in Polish. In §4, I analyse the syntax and semantics of the Polish pronominal copula. §5 concludes the paper, Appendix A formalises the agreement mechanism discussed in §4, and Appendix B contains Glue semantics proofs of some constructions.

2 An LFG perspective on the syntax of inversion

2.1 Polish: c-structural reordering

A natural question is whether a unification analysis, analogous to two surface structures derived from the same PredP, can be formulated in non-derivational terms. In this section, I show that both Polish and English exhibit such an underlying level, although it is distinct for each language, reflecting the workings of each language's grammatical system.

Let us begin with the Polish data, for which there is an obvious candidate as for what remains constant between PCCs and SCCs: it is the f-structure. Consider (6a) and (6b).[4]

(6) a. [Włóczykij]$_{\text{SUBJ}}$ był [moją ulubioną postacią]$_{\text{PREDLINK}}$.
   Snufkin.SG.M.NOM was.SG.M my.INS favourite.INS character.SG.F.INS
   'Snufkin was my favourite character.' (Google)
  b. [Moją ulubioną postacią]$_{\text{PREDLINK}}$ był [Włóczykij]$_{\text{SUBJ}}$.
   my.INS favourite.INS character.SG.F.INS was.SG.M Snufkin.SG.M.NOM
   'My favourite character was Snufkin.' (Google)

[4]Throughout §2–§3, *Polish copular clauses* refer to constructions with instrumental predicates, such as (6a)–(6b). Sentences with the pronominal copula are introduced and taken into consideration only in §4.

Although these two sentences differ with regard to linear order, the relevant phrases retain their grammatical functions, as evidenced by their case marking.[5] Thus, the instrumental phrase *moją ulubioną postacią* 'my favourite character.INS' must be analysed as a predicative complement in both (PREDLINK), and *Włóczykij* 'Snufkin.NOM' as the SUBJ.[6] Both sentences map to the same f-structure represented in (7) (ignoring the internal structure of the complex NP and some morphosyntactic information).

(7)
$$\begin{bmatrix} \text{PRED} & \text{'BE'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'SNUFKIN'} \\ \text{CASE} & \text{NOM} \end{bmatrix} \\ \text{PREDLINK} & \begin{bmatrix} \text{PRED} & \text{'MY-FAVOURITE-CHARACTER'} \\ \text{CASE} & \text{INS} \end{bmatrix} \end{bmatrix}$$

Modelling this type of inversion in LFG terms is straightforward: phrase structure rules (by default) do not link syntactic positions in c-structure to grammatical functions. The two word orders exhibited in (6a) and (6b) are constructed by general phrase structure rules presented in (8).[7] Note that these are not special rules for copular constructions: the inversion observed in (6a)–(6b) is pervasive in Polish (and in Slavic more general, see Titov 2024), and is usually referred to as OVS word order. The same default rule will be employed, for instance, in (9a)–(9b), where the instrumental phrase happens to be an object of the verb ZARZĄDZAĆ 'to manage'.

(8)
$$\begin{array}{llcc} \text{IP} & \rightarrow & \text{NP} & \text{I}' \\ & & (\uparrow \text{GF}) = \downarrow & \uparrow = \downarrow \\ \text{I}' & \rightarrow & \text{I} & \text{NP} \\ & & \uparrow = \downarrow & (\uparrow \text{GF}) = \downarrow \end{array}$$

(9) a. [Janek]$_{\text{SUBJ}}$ zarządza [najlepszym zespołem]$_{\text{OBJ}}$.
John.NOM manage.3SG best.INS team.INS

b. [Najlepszym zespołem]$_{\text{OBJ}}$ zarządza [Janek]$_{\text{SUBJ}}$.
best.INS team.INS manage.3SG John.NOM
'John manages the best team.'

Under the analysis in which BYĆ 'to be' and ZARZĄDZAĆ 'to manage' require two arguments – the former a SUBJ and a PREDLINK, and the latter a SUBJ and an OBJ – (8) will generate the expected two word orders. The GFs must satisfy the verb's subcategorisation requirements, which can be derived from s-structures via mapping constraints, as in Findlay (2016). An application of this mechanism to copular clauses forms a crucial part of the analysis and will be discussed below. Also, (8) will be modified in §3, to associate the marked word order (as in (6b) and (9b)) with particular pragmatic conditions.

[5]Agreement is not mentioned, as it is not treated here as an unequivocal diagnostic test of subjecthood; see §4 and Appendix A.

[6]I follow Butt et al. (1999) and Attia (2008) in assuming that nominal predicates bear the grammatical function of PREDLINK.

[7]For the purposes of this paper, I focus only on the c-structural representation of the examples discussed. I therefore leave aside important issues related to c-structures in Slavic such as *pro*-drop or the possibility of flat structures (see Hristov 2023 for an overview).

2.2 English: alternative mapping

Interestingly, the English counterparts of (6a)–(6b), presented in (10a)–(10b), involve two distinct f-structures.

(10) a. [Snufkin]$_{\text{SUBJ}}$ was [my favourite character]$_{\text{PREDLINK}}$.
b. [My favourite character]$_{\text{SUBJ}}$ was [Snufkin]$_{\text{PREDLINK}}$.

While the SUBJ status of *Snufkin* in (10a) is indisputable, the left-hand NP in (10b) can also be shown to function as the subject (Hartmann & Heycock 2020). For instance, it permits subject-auxiliary inversion:

(11) Is your favourite character Snufkin?

Given that, (10a) will be mapped to f-structure (12), whereas (10b) to its "inversion", presented in (13) (again, assuming that the non-SUBJ grammatical function in binominal copular clauses is uniformly PREDLINK).

(12) $\begin{bmatrix} \text{PRED} & \text{`BE'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`SNUFKIN'} \end{bmatrix} \\ \text{PREDLINK} & \begin{bmatrix} \text{PRED} & \text{`MY-FAV-CH...'} \end{bmatrix} \end{bmatrix}$ (13) $\begin{bmatrix} \text{PRED} & \text{`BE'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`MY-FAV-CH...'} \end{bmatrix} \\ \text{PREDLINK} & \begin{bmatrix} \text{PRED} & \text{`SNUFKIN'} \end{bmatrix} \end{bmatrix}$

Does this mean that English PCCs and SCCs must be treated as entirely separate? Not necessarily. The modular architecture of LFG provides the means to capture their unified status, but at a level deeper than f-structure. Namely, the English case can be seen as involving two distinct argument-mapping configurations, an issue extensively discussed in the LFG tradition (Bresnan & Kanerva 1989; Butt et al. 1997; Kibort 2007; Findlay 2016; Findlay et al. 2023, a.o.). The idea is particularly appealing as it aligns SCCs with English locative inversion, also typically analysed via two different mappings. Intriguingly, locative inversion also exhibits fixed information structure, as shown in (14)–(15) from Bresnan (1994: 86–87).

(14) a. CANVASSES hung on the wall, but not PAINTINGS.
b. Canvasses hung ON THE WALL, but not ON THE EASELS.

(15) a. On the wall hung CANVASSES, but not PAINTINGS.
b. ??ON THE WALL hung canvasses, but not ON THE EASELS.

Indeed, the current proposal is that English PCCs and SCCs arise from two distinct mappings from the level where arguments are represented, that is, from s-structure. Findlay (2016), building on Asudeh & Giorgolo (2012), provides a theory of argument mapping which avoids postulating a separate a(rgument)-structure. On this account, the mapping restrictions determine which s-structural arguments – linked to Glue meaning constructors – can be mapped to which grammatical functions.

The approach presented in Findlay (2016) is couched in the neo-Davidsonian event semantics (Parsons 1990), and it can easily be extended to account for copular clauses. Chierchia (2024) offers a proposal of how to treat copular clauses within this semantic framework.[8] On his approach, nouns denote properties of entities ($\langle e,t \rangle$), but they can

[8] Here, I simplify Chierchia's analysis by omitting the world argument (he provides intensional formulae), and also diverge from it by treating definite descriptions in predicative positions as $\langle e,t \rangle$-type predicates, following Mikkelsen (2005) and Barros (2016) (see also Coppock & Beaver 2015).

be shifted to properties of states ($\langle v, t\rangle$). Chierchia (2024) encodes this shift using an operator $^{\Sigma}$ (and the operation I will call Σ-shift). For example, the noun *dog* denotes a function which is true of *entities* being dogs ($\lambda x.dog(x)$), and its Σ-shifted analogue is a function true of *states* of being a dog: $\lambda s.^{\Sigma}dog(s)$.

Consequently, the semantic formula for *Snufkin is my favourite character* is as follows:

(16) $\exists s.^{\Sigma}myFavouriteCharacter(s) \wedge theme(s, Snufkin)$
'There exists a state of being my favourite character and the theme of this state is Snufkin.'

To compose such a meaning in Glue, an s-structure must be postulated with a STATE argument, analogous to the EVENT argument assumed in Asudeh & Giorgolo (2012) and Findlay (2016) (a.o.). The s-structure of a property-ascribing copular clause will also have THEME and PROPERTY arguments; see (17).[9]

(17) A minimal s-structure of a property-ascriptional copular clause

$$\begin{bmatrix} \text{STATE} & [\ ] \\ \text{THEME} & [\ ] \\ \text{PROPERTY} & \begin{bmatrix} \text{V} & [\ ] \\ \text{R} & [\ ] \end{bmatrix} \end{bmatrix}$$

The equations defining such an s-structure (through linking the s-structural attributes to grammatical functions), as well as the meaning constructor referring to it, are contributed in the lexical entry for the copula, presented in (18) (ignoring TAM and other morphosyntactic information):

(18) *is* I ($\uparrow$ PRED) = 'BE'
@PROPERTY-ASCRIPTION (semantics)
@DEFAULT-MAPPING $\vee$ @SPECIFICATIONAL (mappings)

On the proposal assumed here, both PCCs and SCCs have the same core semantics, provided by @PROPERTY-ASCRIPTION, defined in (19).

(19) PROPERTY-ASCRIPTION := $\lambda P \lambda x \lambda s.^{\Sigma}P(s) \wedge theme(s, x)$:
$[(\uparrow_{\sigma}\ \text{PROPERTY V}) \multimap (\uparrow_{\sigma}\ \text{PROPERTY R})] \multimap$
$(\uparrow_{\sigma}\ \text{THEME}) \multimap (\uparrow_{\sigma}\ \text{STATE}) \multimap \uparrow_{\sigma}$

According to the meaning constructor above, *is* takes an $\langle e, t\rangle$-type PROPERTY, takes an *e*-type theme, and expresses a function of type $\langle v, t\rangle$, which is true of states in which the PROPERTY holds of the THEME (existentially closed in the final representation).

[9] The names of the attributes in (17) are intended to facilitate the presentation and do not carry much theoretical significance. They could just as well be called EV(entuality), ARG_1 and ARG_2, as usual. Note also that the non-verbal predicate is treated here as an attribute at the s-structure of the copula (and its projections). Given that copulas are often analysed as raising verbs, having only *one* semantic argument, this treatment may seem questionable. However, on the approach advocated here, the copula genuinely *mediates* the predication: it establishes a relation between the property and the theme and introduces a state argument, as in Chierchia (2024). Crucially, the ability to refer to the s-structure of the property, distinct from that of the copula, is required to derive the argument mappings.

The predicate-internal attributes V and R are abbreviated versions of the common VAR(iable) and RESTR(iction) attributes (see, e.g, Dalrymple et al. 2019: 310).

The English copula allows for two argument mappings, which is expressed by the disjunctive expression @DEFAULT-MAPPING ∨ @SPECIFICATIONAL. The former maps the theme of the state to the SUBJect, and the property to the predicative complement (PCC), whereas the latter does it the other way round; see (20)–(21).

(20) DEFAULT-MAPPING : $(\uparrow \text{SUBJ})_\sigma = (\uparrow_\sigma \text{THEME})$
$(\uparrow \text{PREDLINK})_\sigma = (\uparrow_\sigma \text{PROPERTY})$

(21) SPECIFICATIONAL : $(\uparrow \text{SUBJ})_\sigma = (\uparrow_\sigma \text{PROPERTY})$
$(\uparrow \text{PREDLINK})_\sigma = (\uparrow_\sigma \text{THEME})$
@FOCUS((↑ PREDLINK))

The last line of @SPECIFICATIONAL, freezing the information structure of such clauses, will be discussed in §3. Let us now focus on the syntax and semantics of English clauses.

The phrase structure rules forming English PCCs and SCCs are given in (22). They differ from the Polish ones (shown in (8)) in having particular GFs mapped to c-structural positions.

(22)
$$\text{IP} \rightarrow \underset{(\uparrow \text{SUBJ}) = \downarrow}{\text{NP}} \quad \underset{\uparrow = \downarrow}{\text{I}'}$$
$$\text{I}' \rightarrow \underset{\uparrow = \downarrow}{\text{I}} \quad \underset{(\uparrow \text{PREDLINK}) = \downarrow}{\text{NP}}$$

A few words are needed about the predicate *my favourite character*. As Coppock & Beaver (2015) convincingly argue, possessives – just like definite descriptions – are "fundamentally predicative" (p. 417), that is, of type $\langle e, t \rangle$. They can be shifted to type *e* via a generally available ι-shift (crucially, this shift is not contributed by determiners such as *the* or *my*). This approach can be readily incorporated into an LFG grammar: we need to postulate an optional ι-shift (defined in (23)), available, for instance, in the phrase structure rules forming NPs, as in (24).[10]

(23) IOTA-SHIFT :=
$\lambda P.\iota x.P(x)$:
$[(\downarrow_\sigma \text{V}) \multimap (\downarrow_\sigma \text{R})] \multimap \downarrow_\sigma$

(24)
$$\text{NP} \rightarrow \ \dots \quad \underset{\substack{\uparrow = \downarrow \\ (\text{@IOTA-SHIFT})}}{\text{N}'} \quad \dots$$

Whether the optional @IOTA-SHIFT provided in (24) will be used depends on the semantic type of N coming from the lexicon (it is blocked for items inherently of type *e*, such as proper names) and the selectional requirement of the predicate to which the NP serves as an argument. For instance, in *I met my favourite character*, @IOTA-SHIFT must be used, because *met* requires an *e*-type object. In contrast, in *Snufkin is my favourite character*, @IOTA-SHIFT cannot be used, because the PREDLINK here must be of type $\langle e, t \rangle$ (via @PROPERTY-ASCRIPTION and @DEFAULT-MAPPING).

Setting aside the formal details of how the predicative NP is composed,[11] the lexical

[10]In (24), "…" stands for any material an NP can – or must – contain in a given language. On Coppock & Beaver's account, the fact that @IOTA-SHIFT cannot apply to an NP with *a(n)* is modelled pragmatically, and the obligatory presence of a determiner in English follows from syntactic rules (although they do not provide a full syntactic analysis, including plural or mass nouns).

[11]I will rely on the schematic representation of the meaning side of *my favourite character* (i.e., *λx.myFavouriteCharacter(x)*), since providing an adequate compositional semantics for an NP consisting of a predicational noun, a non-intersective adjective, and a possessive expressing not actual possession but rather an evaluative perspective is far from trivial.

entry given in (18) and the phrase-structure rules in (22) are sufficient to generate the c- and f-structures for English copular clauses such as (10a) and (10b), as well as to derive the semantic representation in (16). The subject must be to the left of the copula, and can provide a semantic resource for the THEME (an entity of type *e*). In such a case, the PREDLINK must be of type $\langle e, t \rangle$, for the semantic formula to compose. @SPECIFICATIONAL allows for mapping an $\langle e, t \rangle$-type phrase to the subject, and a theme to the PREDLINK. Crucially, both assert that there exists a state which – in the case of (10a)–(10b) – is a state of being the speaker's favourite character and that the theme of this state is Snufkin (see Figure 1 in Appendix B for the proof). Importantly, the two differ pragmatically, as will be discussed in §3.

By now, it should be clear how the Polish copula differs from the English one. Its lexical entry – ignoring morphosyntactic details – is presented below:

(25)	*jest*	I	($\uparrow$ PRED) = 'BE'	
			@PROPERTY-ASCRIPTION	(semantics)
			@DEFAULT-MAPPING	(mapping)
			@NOMINAL-PREDLINK-CASE	(case assignment)

It employs only one mapping, linking the THEME to SUBJ and the PROPERTY to PREDLINK. The last template, pertaining to case assignment, will be important in §4.

3 Pragmatics of inversion

As noted above, specificational copular clauses exhibit a fixed information structure: the left-hand NP cannot bear focus. Following Mikkelsen (2005) and Barros (2016), I assume that information structure is strictly tied to inversion. In English, an information-structural constraint is associated with the specificational mapping (see (21)), whereas in Polish, it is linked to word order. The content of this constraint will be discussed below.

On Barros's (2016) account, a definite NP, such as *the president* in *The president is Jack*, presupposes that the Question Under Discussion (QUD; Roberts 2012) is *Who is the president?* This accounts for the fact that the dialogue (26) is infelicitous: the presupposed QUD conflicts with the overtly expressed question.

(26) A: What is Jack?
B: #THE PRESIDENT is Jack.

Here, however, I would like to show that it is not the obligatorily *topical* status of the left-hand NP that is responsible for the presupposition, but the obligatorily *focal* status of the right-hand NP. The first argument for that is conceptual, and is related to the workings of the QUD theory. In short, according to Roberts (2012), the focal part of a sentence must correspond to the *wh*-part of a (possibly implicit) QUD for a discourse to be congruent. By assuming that the right-hand NP in SCCs must be focused, we naturally derive the required QUD. It seems to be less stipulative than assuming that a topical phrase X in such clauses presupposes a QUD of the form *Who is X?*

However, there is another argument for postulating that the inherent presupposition in SCCs is related to the *focal* status of the right-hand NP, which is based on Polish inversions. Above, I analyse inverted instrumental predicates on par with simple OVS sentences, such as (9b), repeated below as (27). I argue that the structural mechanisms underlying these inversions are the same – in fact, both can be labelled under the broader term “XVS word order”.

(27) [Najlepszym zespołem]$_{\text{OBJ}}$ zarządza [Janek]$_{\text{SUBJ}}$.
best.INS team.INS manage.3SG John.NOM
‘John manages the best team.’

Note that the pragmatic analysis proposed in Barros (2016) cannot be applied to such sentences. When applied to (27), it predicts that the topical phrase – *Najlepszym zespołem* – presupposes the QUD *Who/What is the best team?*, which is obviously not the case: the presupposed QUD in (27) is *Who manages the best team?*

However, given that the XVS word order has received a unified syntactic treatment (in §2.1), we can attempt to model its pragmatic interpretation in a unified way. In fact, the correct QUD presupposition follows in inverted copular clauses and OVS sentences such as (27) alike when linked to the *obligatorily* focal status of the right-hand NP.

The @FOCUS(X) template (to be defined below), in English associated with the @SPECIFICATIONAL mapping, can be incorporated into phrase-structure rules for Polish. The rules in (8) need to be modified as in (28), presented in the form of a tree:

(28) IP
NP $(\uparrow \text{GF}) = \downarrow$ — I′
I′ → I — NP $(\uparrow \text{GF}) = \downarrow$ $((\uparrow \text{SUBJ}) = \downarrow) \Rightarrow @\text{FOCUS}(\downarrow)$

According to (28), when the subject appears in the final position, it must be interpreted as focal. As shown below, this yields the correct presupposed QUD for both SCCs and run-of-the-mill OVS.[12]

Now we can get back to the template @FOCUS(X), called in (21) and (28):

(29) $\text{FOCUS}(\text{X}) := \lambda Q_{\langle e,\, vt\rangle}.Q : \forall H.[\text{X}_\sigma \multimap H] \multimap [\text{X}_\sigma \multimap H]$
Presupposition: the current QUD is $\{\exists s'.Q(z)(s') \mid z \in D_e\}$

(29) is a modifier taking an $\langle e, vt\rangle$-type function and returning a function of the same type: an identity function at the level of assertion, but introducing a presupposition.

Let us illustrate how this presupposition works by analysing (10b), repeated as (30a), step by step.[13] The core semantic formula of this sentence – without the QUD presupposition – is shown in (30b). The meaning of the copula is repeated in (30c).

[12]This is an idealisation that neglects some Polish psych verbs which naturally occur with final subjects, and do not have fixed information structure. For instance, the unmarked word order of sentences with BOLEĆ ‘hurt’ places the non-subject argument (expressing the experiencer) in the pre-verbal position, and the nominative subject (expressing the theme) in the final position.

[13]The full proof is presented in Figure 2. By convention, in the full proof, the presupposition is encoded between the lambda operator (or the existential quantifier) on the left side, and the dot on the right side. Importantly, because the colon has its own important function in Glue, I use three vertical dots to separate the presupposition on the left side instead of the usual colon.

(30) a. [My favourite character]$_{\text{SUBJ}}$ is [Snufkin]$_{\text{PREDLINK}}$.

b. $[\![(30a)]\!] = \exists s.^{\Sigma}\textit{myFavouriteCharacter}(s) \wedge \textit{theme}(s, \textit{Snufkin})$

c. $\lambda P \lambda x \lambda s.^{\Sigma}P(s) \wedge \textit{theme}(s, x) : [(\uparrow_\sigma \text{ PROPERTY V}) \multimap (\uparrow_\sigma \text{ PROPERTY R})]$
$\multimap (\uparrow_\sigma \text{ THEME}) \multimap (\uparrow_\sigma \text{ STATE}) \multimap \uparrow_\sigma$

Recall that the template @SPECIFICATIONAL (see (21)) contributed by the copula includes the template @FOCUS(($\uparrow$ PREDLINK)) and links the PREDLINK to the THEME argument at s-structure. Consequently, (29) is instantiated as (31a) and, via the mapping specified by @SPECIFICATIONAL, as (31b) (still ignoring the presupposition for now).

(31) a. $\lambda Q.Q : \forall H.[(\uparrow \text{ PREDLINK})_\sigma \multimap H] \multimap [(\uparrow \text{ PREDLINK})_\sigma \multimap H]$

b. $\lambda Q.Q : \forall H.[(\uparrow_\sigma \text{ THEME}) \multimap H] \multimap [(\uparrow_\sigma \text{ THEME}) \multimap H]$

The meaning constructor that can be consumed by (31b) (i.e., that is of type $\langle e, vt \rangle$ and has the correct Glue part) is shown in (32): it is generated by the copula consuming the semantics contributed by the property.

(32) $\lambda x \lambda s.^{\Sigma}\textit{myFavouriteCharacter}(s) \wedge \textit{theme}(s, x)$:
$(\uparrow_\sigma \text{ THEME}) \multimap (\uparrow_\sigma \text{ STATE}) \multimap \uparrow_\sigma$

By consuming (32), the meaning constructor provided in (29) yields (33) (now presented *with* the presupposition).

(33) $\lambda x \lambda s.^{\Sigma}\textit{myFavouriteCharacter}(s) \wedge \textit{theme}(s, x)$:
$(\uparrow_\sigma \text{ THEME}) \multimap (\uparrow_\sigma \text{ STATE}) \multimap \uparrow_\sigma$
Presupposition: the current QUD is:
$\{\exists s'.^{\Sigma}\textit{myFavouriteCharacter}(s') \wedge \textit{theme}(s', z) \mid z \in D_e\}$

Assuming that the denotation of a question is the set of possible answers (Hamblin 1973; Karttunen 1977), we derive the correct QUD: a set of propositions of the form *z is my favourite character*. In a model in which the only characters in the domain are Snufkin, the Groke and Little My, the QUD presupposed in (33) is explicitly presented below:

(34) **Presupposition**: the current QUD is:
$\{\exists s'.^{\Sigma}\textit{myFavouriteCharacter}(s') \wedge \textit{theme}(s', \textit{Snufkin}),$
$\exists s'.^{\Sigma}\textit{myFavouriteCharacter}(s') \wedge \textit{theme}(s', \textit{TheGroke}),$
$\exists s'.^{\Sigma}\textit{myFavouriteCharacter}(s') \wedge \textit{theme}(s', \textit{LittleMy})\}$

Let us now move to the Polish case. Recall that the Polish copula always links THEME to SUBJ, and when SUBJ appears in the final position, it calls @FOCUS($\downarrow$). This effectively yields the same result as in English SCCs.

Regarding the XVS word order beyond copular clauses, let us examine (27). The meaning constructor contributed by *zarządza* 'manage.3SG.M' is given in (35a). Although not presented here, its ARG$_1$ is mapped to SUBJ, as formalised in Findlay (2016), with the crucial part being $(\uparrow \text{ SUBJ})_\sigma = (\uparrow_\sigma \text{ ARG}_1)$. Consequently, the meaning constructor introducing the focal presupposition consumes (35b) and returns the same formula, now equipped with the presupposition (35c).[14] The latter is the expected semantics of the QUD: a set of propositions of the form *z manages the best team*.

[14]I assume that the verb ZARZĄDZAĆ 'manage', in the aspectual version considered here, denotes a set of states rather than events. However, nothing important depends on that, since both events and states fall under the general category of eventualities (type v). The only potential issue with applying (29) to event-denoting verbs is cosmetic: it introduces the variable s' (implicitly suggesting a state) instead of e'.

(35) a. $\lambda x \lambda y \lambda s.\mathit{manage}(s) \wedge \mathit{agent}(s,y) \wedge \mathit{theme}(s,x)$:
$(\uparrow_\sigma \text{ ARG}_2) \multimap (\uparrow_\sigma \text{ ARG}_1) \multimap (\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma$

b. $\lambda y \lambda s.\mathit{manage}(s) \wedge \mathit{agent}(s,y) \wedge \mathit{theme}(s, \iota x.\mathit{bestTeam}(x))$:
$(\uparrow_\sigma \text{ ARG}_1) \multimap (\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma$

c. $\{\exists s'.\mathit{manage}(s') \wedge \mathit{agent}(s',z) \wedge \mathit{theme}(s', \iota x.\mathit{bestTeam}(x))\} \mid z \in D_e\}$

As we have shown, what Polish achieves through a marked word order (which we can call *shallow reorganisation*), English does with an f-structural recomposition (that is, alternative mapping – *deep reorganisation*). Both, however, are related to the same pragmatic interpretation, forcing the right-hand NP to be focused. In Polish, it is induced by the phrase-structure rules, whereas in English, it is a restriction linked to the marked mapping. In fact, utilising this kind of language-specific strategy to obtain the same effect is exactly in line with Bresnan (1994: 92), who, in discussing locative inversion, notes that "in languages where syntactic functions are less rigidly linked to specific word order and phrase structure configurations, the effects of presentational focus could be accomplished by simple reorderings, without altering the syntactic functions of the theme and locative."

4 Pronominal copula

Polish has another structure that can be considered a translational equivalent of the English examples recurring in this paper (see (36)–(37) and their translations). These constructions employ the so-called pronominal copula *to*.[15] Note that the right-hand NP in (36)–(37) controls agreement, regardless of its function in the sentence.

(36) Włóczykij to była moja ulubiona postać.
Snufkin.SG.M.NOM TO was.SG.F my favourite character.SG.F.NOM
'Snufkin was my favourite character.'

(37) Moja ulubiona postać to był Włóczykij.
my favourite character.SG.F.NOM TO was.SG.M Snufkin.SG.M.NOM
'My favourite character was Snufkin.'

Primarily, the word *to* is a proximal demonstrative, but it also serves multiple discourse functions (e.g., acting as a topic or focus marker). The analysis presented here, which focuses on its use in copular clauses, aims to account for the full range of uses of *to* in constructions such as (36)–(37) and to capture a subtle difference between SCCs with the instrumental predicate (analysed in §2–§3) and constructions like (37).

One of the core assumptions related to the syntax of (36) and (37), which I adopt from previous work and cannot justify further here, is that the left-hand NP in such sentences is dislocated, anaphorically bound by *to* (Hentschel 2001; Rutkowski 2006). Note that the relevant structure can be used without the left-hand NP, where *to* contributes referential meaning (through anaphora or deixis), as in (38)–(39).

(38) To był Włóczykij.
TO was.M Snufkin.M.NOM
'It was Snufkin.'

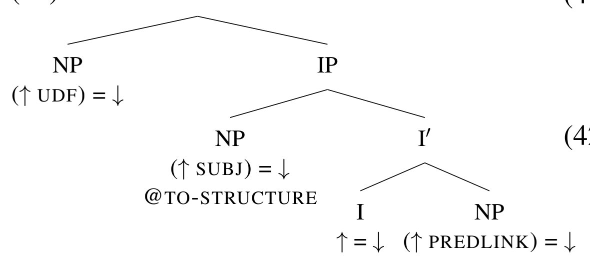
(39) To była moja ulubiona postać.
TO was.F my favourite character.F.NOM
'{She / He / It} was my favourite character.'

[15]Polish does have another copula construction linking two nominative NPs without *to*, but this construction is rare and restricted to expressive predicates (e.g., *Janek jest cham!* 'John is a jerk!') and so will not be discussed further here.

It seems uncontroversial that sentences such as (38)–(39) gave rise to the emergence of the pronominal copula (that is, structures like (36)–(37)), since such items often grammaticalise from structures in which a pronoun refers to a hanging topic (Li & Thompson 1977; Diessel 1999). Although the left-hand NP is no longer a hanging topic (e.g., in (36), *Włóczykij* can receive prosodic prominence and function as a focus), it retains its dislocated status and, for this reason, cannot control agreement. I further assume that in (36)–(39), the demonstrative functions as SUBJ, while the right-hand NP is PREDLINK. Of course, this raises the question of how agreement operates. The analysis presented here follows Bobaljik (2008) (and Bresnan 1994: 118) in assuming that agreement is controlled by the highest accessible phrase in the domain of agreement. This means that SUBJ – the highest grammatical function – controls agreement only if it is "accessible" (that is, if it bears the nominative case). In (36)–(37), the subject is *caseless* (as will be discussed below), and hence is inaccessible. Consequently, the highest accessible phrase is the nominative PREDLINK – see Appendix A for a formalisation.[16]

Let me first present the c-structure and f-structures of (36)–(37), and then discuss the analysis step by step.[17] (40) is a schematic c-structure of (36) and (37), and (41) and (42) are simplified f-structures for (36) and (37), respectively.

(40)



(41) $\left[\begin{array}{ll} \textsc{pred} & \text{`BE'} \\ \textsc{udf} & \left[\textsc{pred}\ \ \text{`SNUFKIN'}\right] \\ \textsc{subj} & \left[\textsc{pred}\ \ \text{`}\textit{pro}\text{'}\right] \\ \textsc{predlink} & \left[\textsc{pred}\ \ \text{`MY-FAV-CH...'}\right] \end{array}\right]$

(42) $\left[\begin{array}{ll} \textsc{pred} & \text{`BE'} \\ \textsc{udf} & \left[\textsc{pred}\ \ \text{`MY-FAV-CH...'}\right] \\ \textsc{subj} & \left[\textsc{pred}\ \ \text{`}\textit{pro}\text{'}\right] \\ \textsc{predlink} & \left[\textsc{pred}\ \ \text{`SNUFKIN'}\right] \end{array}\right]$

[16]Treating *to* as the SUBJ even when another phrase clearly controls agreement is compatible with the case-driven theory of agreement adopted here (see Appendix A; Bobaljik 2008), but it may nonetheless appear unconventional to the LFG community. An anonymous reviewer asks for further motivation for this choice, which I provide here by pointing to binding facts (although a fuller discussion would of course be desirable). The right-hand predicate can contain a reflexive pronoun, like in (i). If a dislocated (UDF) status of the left-hand NP is warranted (as argued in Hentschel 2001 and Rutkowski 2006), then this NP can bind the pronoun only indirectly: *to*, as the SUBJ, binds the reflexive, and the left-hand NP merely does so by virtue of being co-indexed with *to*. Note that if we were to try to avoid treating *to* as the subject by assuming the left-hand NP in these constructions is the subject instead (directly binding the reflexive), this will do nothing to avoid dissociating subjecthood and agreement, since in such clauses it is the right-hand NP that controls agreement. Moreover, one can readily construct sentences in which *to* unambiguously binds the reflexives, such as (ii), although such examples are slightly less natural than those with an NP to the left.

(i) Premier$_i$ to$_i$ jest swój$_i$ najlepszy rzecznik prasowy.
PM TO is REFL best spokesman press
'The Prime Minister is his own best spokesman.' (Bondaruk 2013: 227)

(ii) To jest swój najlepszy terapeuta.
TO is REFL best therapeutist
'{He / She} is {his / her} own best therapeutist.'

On the other hand, if we treat the right-hand predicate as SUBJ, analogous non-trivial decisions arise concerning the grammatical functions of *to* and the left-hand NP. Although various mappings could be considered (e.g., with *to* being a PREDLINK and the left-hand NP a UDF), the binding facts support the analysis proposed in the main text.

[17]One syntactic fact that I ignore here is that in the structure with *to*, the verbal copula can be ellided in the present tense (but not in the past and future). This can be captured with the ϵ rule (Dalrymple et al. 2004), providing the content of the copula to the f-structure without having a c-structural representation.

Zawada (2024) argues that *to* in sentences such as (38)–(39) is *not* a noun, and postulates a separate category of demonstrative identifiers (following Diessel 1999: Ch. 4.3). However, as argued in Zawada & Przepiórkowski (2025), a more insightful option is available, capturing the relevant properties of *to* discussed in Zawada (2024). It treats *to* in such sentences as a *caseless* noun. This approach, also adopted here, makes it possible to elegantly capture the agreement pattern: a caseless item is unable to control agreement, which makes the nominative PREDLINK the highest accessible phrase.

Importantly, in contrast to what is typically observed in Polish at the clausal level, the word order of the sequence TO-V-NP is fixed (**Włóczykij był to*).[18] Various idiosyncratic properties of this structure justify a correspondingly specialised analytical treatment. The idiosyncratic elements that we need are (i) a phrase structure rule – annotated in a way accounting for the peculiarities of this structure, including binding of the left-hand NP (if present) – and (ii) the ability of the noun *to* to appear *without* case. The relevant phrase structure rule (see (43)) provides a SUBJ in Spec,IP (and thus fixes the word order), which is annotated with the template @TO-STRUCTURE, defined in (44).

(43) $$\text{IP} \rightarrow \begin{array}{cc} \text{NP} & \text{I}' \\ (\uparrow \textsc{subj}) = \downarrow & \uparrow = \downarrow \\ @\textsc{to-structure} & \end{array}$$

(44) $$\textsc{to-structure} := \begin{array}{l} \neg(\downarrow \textsc{case}) \\ (@\textsc{equative}) \\ (@\textsc{ant-binding}) \end{array}$$

The first equation in (44) specifies that only a caseless noun can occur in that position. There is one such item in Polish (*to*), whose lexical entry is provided in (45).[19] It provides the pronominal PRED and carries pronominal semantics (see (46), an extremely simplified, variable-free treatment, sufficient for our purposes).[20]

(45) $$\textit{to} \quad \text{N} \quad \begin{array}{l} (\uparrow \textsc{pred}) = \text{`}\textit{pro}\text{'} \\ @\textsc{pronominal} \end{array}$$

(46) $$\textsc{pronominal} := \quad \lambda x.x : (\uparrow_\sigma \textsc{antecedent}) \multimap \uparrow_\sigma$$

Note that in contrast to standard copular clauses with nominal predicates, the structure with *to* requires a nominative (and not instrumental) PREDLINK. This is included in the lexical entry for the copula, repeated below as (47). The previously ignored template @NOMINAL-PREDLINK-CASE, defined in (48), assigns INS to the PREDLINK and NOM to the SUBJ; if this assignment is not possible, the PREDLINK is nominative, and the SUBJ remains caseless.[21] Note that nouns other than *to* require case. Hence, if they are subjects, the first disjunct in (48) must apply.

[18]Being a pronoun, *to* can appear as an enclitic attached to the verb (*Był to Włóczykij*), similarly to personal pronouns. This word order will not be addressed here.

[19]This suggests that other nouns *require* case, which can be modelled by equipping them with the existential ($\uparrow$ CASE) constraint.

[20]For more detailed analyses of pronouns in Glue, see Asudeh (2012); Dalrymple et al. (2018); Dalrymple et al. (2019: Ch. 14).

[21]@NOMINAL-PREDLINK-CASE also captures case assignment in understudied copular clauses with prepositional subjects of predication and nominative PREDLINKs, such as (i). Given that the PP is not able to receive case, (48) correctly assigns the nominative case to the PREDLINK.

(47) *jest* I (↑ PRED) = ‘BE’
@PROPERTY-ASCRIPTION (semantics)
@DEFAULT-MAPPING (mapping)
@NOMINAL-PREDLINK-CASE (case assignment)

(48) NOMINAL-PREDLINK-CASE :=
CAT((↑ PREDLINK), {NP}) ⇒
$\left\{ \begin{array}{c|c} (\uparrow \text{SUBJ CASE}) = \text{NOM} & (\uparrow \text{PREDLINK CASE}) = \text{NOM} \\ (\uparrow \text{PREDLINK CASE}) = \text{INS} & \end{array} \right\}$

Before turning to semantics, consider Table 1, intended to guide the reader through the analysis by previewing the templates used for each type of copular clause with *to* (the third type – equative – will be introduced).

Type	Example	Templates (besides @PROPERTY-ASCRIPTION)
predicational	*Włóczykij to była moja ulubiona postać* ‘Snufkin was my favourite character’	@ANT-BINDING
specificational	*Moja ulubiona postać to był Włóczykij* ‘My favourite character was Snufkin’	@ANT-BINDING @SPECIFICATION @EQUATIVE
equative	*Cyceron to jest Tulliusz* ‘Cicero is Tullius’	@ANT-BINDING @EQUATIVE

Table 1: Copular constructions with *to*

It is known that Polish *necessarily* employs *to* to express equative semantics – that is, to indicate that two NPs denote the same object. As shown in (49) (from Bondaruk 2013: 313–314), the instrumental structure cannot be used in such contexts.

(49) a. Dr Jekyll to (jest) pan Hyde.
Dr. Jekyll.NOM TO is Mr.NOM Hyde
‘Dr. Jekyll is Mr. Hyde’
b. #Dr Jekyll jest panem Hyde.
Dr. Jekyll.NOM is Mr.INS Hyde

Since *to* must be used in equative clauses (as shown in (49)), equative semantics can be directly linked to the structure at hand, as defined in (50) and invoked in (44) (see Geist 2008 for an analogous analysis of Russian *èto*).

(50) EQUATIVE :=
$\lambda x \lambda y . y = x : (\uparrow_\sigma \text{ PREDLINK}) \multimap [(\uparrow_\sigma \text{ PREDLINK V}) \multimap (\uparrow_\sigma \text{ PREDLINK R})]$

The template above represents the IDENT shift from Partee (1987). It takes a PREDLINK of type *e* (an individual) and shifts it into a property of being equal to that individual.

(i) … [z Pauliny]$_{PP}$ był [niezły gagatek]$_{NP}$.
of Paulina.SG.F.GEN was.3SG.M not.bad.SG.M.NOM rascal.SG.M.NOM
‘Paulina (lit. of Paulina) was quite a rascal.’ (Polish Web 2019)
Note also that (48) is restricted to *nominal* PREDLINKs. Case assignment in adjectival predicates is considerably more complex and requires a separate analysis (see, e.g., Przepiórkowski & Patejuk 2012).

This allows the verbal copula to consume the semantic resource of the PREDLINK, now of the expected $\langle e, t\rangle$-type. Importantly, this template is optional, which accounts for the fact that predicational clauses with *to* – such as (36) – are also possible. If @EQUATIVE is not used, a predicative PREDLINK (that is, carrying an $\langle e, t\rangle$-type semantics by itself, from the lexicon) is required for the verbal copula to compose.[22]

Polish and Russian allow for an NP to the left of the demonstrative. If this NP is taken to be co-referential with the demonstrative (Hentschel 2001; Rutkowski 2006, as well as Geist 2008; Seres & Espinal 2019 for Russian), a natural conclusion is that these languages have developed a binding constraint licensing this left-peripheral NP and thereby satisfying the Extended Coherence Condition (Bresnan et al. 2016: 62–63); see (51). It is optional, since structures without an NP – like (38)–(39) – are also acceptable.

(51) ANT-BINDING := $(\downarrow_\sigma$ ANTECEDENT$) = (\uparrow$ UDF$)_\sigma$ $\vee$ @SPECIFICATION

As shown in (51), the pronoun can either inherit the semantics of its antecedent (if the latter is of type *e*) or invoke the @SPECIFICATION template, defined in (52) (not to be confused with the mapping constraint on the English copula, @SPECIFICATIONAL).

(52) SPECIFICATION : = $\lambda P.\iota x.P(x) : [((\uparrow \text{UDF})_\sigma\ \text{V}) \multimap ((\uparrow \text{UDF})_\sigma\ \text{R})] \multimap (\downarrow_\sigma \text{ANTECEDENT})$

Presupposition: the current QUD is
$\{\exists s'.^{\Sigma}\lambda y.[y = z](s') \wedge theme(s', \iota x.P(x)) \mid z \in D_e\}$

Recall that *to* can be used with the pragmatics of a specificational copular clause (see (37)). Similarly to English SCCs and Polish SCCs with an instrumental predicate, (37) has fixed information structure. As I argue below, this structure arises through the combination of the @EQUATIVE semantics and @SPECIFICATION: the ability to take an $\langle e, t\rangle$-type property on the left and shift it into an entity (ι-shift). It consumes the semantics of the UDF, e.g., $\lambda x.dog(x)$, and returns the unique entity satisfying this predicate (in a given context, which is ignored here), e.g., $\iota x.dog(x)$, as ANTECEDENT.

Importantly, the presupposition responsible for the fixed information structure is contributed in (52). If the simpler disjunct of @ANT-BINDING is used – which happens when the UDF is of type *e* – no QUD presupposition is present: the pre-verbal item in equatives can be focused, as illustrated in (53) with the classic example *Cicero is Tully*. By contrast, a structure with *to* and specificational pragmatics does not permit pre-verbal focus, as shown in (54).

(53) A: I have read Cicero's works for the exam, and now I still have Tullius left.

B: Ale właśnie CYCERON to jest Tulliusz... (@EQUATIVE)
but precisely Cicero TO is Tullius
'But it is precisely Cicero who is Tullius...'

(54) A: How is Janek related to you?

B: #MÓJ BRAT to jest Janek. (@EQUATIVE + @SPECIFICATION)
my brother TO is John
Intended: 'John is my brother.'

[22]According to Geist (2008), the analogous Russian item (*èto*) is used *exclusively* in equative contexts. If so, the @EQUATIVE template is not optional in Russian, but obligatory.

The application of the templates in various types of copular clauses with *to* (as listed in Table 1) is determined by semantic types of the UDF and PREDLINK. In predicational copular clauses, *to* must bind its antecedent, with all other aspects following from the semantics of the verbal copula (@PROPERTY-ASCRIPTION). In equative clauses, the @EQUATIVE template shifts the denotation of the PREDLINK (*Tullius*) into a property (*a property of being equal to Tullius*). An additional step is needed in the third type (specificational clauses with *to*): the property-denoting UDF is shifted into an entity. For these most complex clauses, the proof is presented in Figures 3a and 3b in Appendix B.

Under the presented analysis, sentences (6b) and (37) – repeated below as (55) and (56) – have distinct semantics, presented in (57a) and (57b), respectively.

(55) [Moją ulubioną postacią]$_{\text{PREDLINK}}$ był [Włóczykij]$_{\text{SUBJ}}$.
my.INS favourite.INS character.SG.F.INS was.SG.M Snufkin.SG.M.NOM

(56) [Moja ulubiona postać]$_{\text{UDF}}$ [to]$_{\text{SUBJ}}$ był [Włóczykij]$_{\text{PREDLINK}}$.
my favourite character.SG.F.NOM TO was.SG.M Snufkin.SG.M.NOM
'My favourite character was Snufkin.'

(57) a. $\exists s.^{\Sigma}\mathit{myFavouriteCharacter}(s) \wedge \mathit{theme}(s, \mathit{Snufkin})$
b. $\exists s.^{\Sigma}\lambda y.[y = \mathit{Snufkin}](s) \wedge \mathit{theme}(s, \iota x.\mathit{myFavouriteCharacter}(x))$

Needless to say, this semantic difference requires justification, since both can be used to say *My favourite character was Snufkin*. To begin with, note that whenever there is a unique object satisfying the property of being someone's favourite character, (57a) and (57b) are truth-conditionally equivalent, and hence both can be used to convey the relevant meaning. However, there is a semantico-pragmatic factor that differentiates the structure with an instrumental predicate from the structure with *to*. Specifically, there are contexts in which only one structure can be used. For example, to express *The price of milk is 3.99* or *The current temperature is 30 degrees*, the structure with *to* must be used (examples based on Arregi et al. 2021):[23]

(58) a. #Ceną mleka jest 3.99.
price.INS milk.GEN is 3.99
b. Cena mleka to (jest) 3.99.
price milk TO is 3.99
Intended: 'The price of milk is 3.99.'

(59) a. #Obecną temperaturą jest 30 stopni.
current.INS temperature.INS is 30 degrees
b. Obecna temperatura to (jest) 30 stopni.
current temperature TO is 30 degrees
Intended: 'The current temperature is 30 degrees.'

If the two structures had identical representations, there would be no way to account for (58)–(59). But can the unacceptability of instrumental predicates in these contexts follow from the fact that these contexts require an equality relation (and instrumental predicates do not contribute it)? This connection is not immediately obvious. Note, however, that contexts such as stating a price or reporting the temperature permit verbs

[23] In the structure with *to*, the verbal copula is optional in the present tense, as mentioned in fn. 17.

whose meaning is 'be equal to', unlike contexts involving identifying one's favourite character (see (60)–(61)). This suggests that such "numerical" environments are indeed more deeply connected to equative semantics.[24]

(60) a. Cena testu równa się 800 PLN.
price.NOM test.GEN equals REFL 800 PLN
'The price of the test equals 800 PLN.'(Polish Web 2019)

b. Średnia roczna temperatura równa się 8°C.
average year temperature.NOM equals REFL 8°C
'The average annual temperature equals 8°C.'(Polish Web 2019)

(61) #Moja ulubiona postać równa się Włóczykij.
my favourite character.NOM equals REFL Snufkin.NOM
Intended: 'My favourite character equals Snufkin.'

To summarise, the rationale for postulating the difference illustrated in (57a)–(57b) is as follows: there is independent evidence that *to* is associated with equative semantics (see (49)). Accordingly, it is a reasonable and parsimonius hypothesis to assume that whenever the right-hand NP in constructions with *to* is of type *e* (e.g., a proper name or a number), the equative meaning is invoked. Furthermore, some sentences that look like SCCs (analogous to English *The price of milk is 3.99*) can be expressed *only* with *to*, indicating that such specificational clauses with *to* are different in some respect from those with inverted instrumental predicates. This suggests postulating two distinct semantico-pragmatic strategies, which are sometimes indistinguishable: *specification by inverted predication* (as in (55)/(57a)) and *specification by equation* (as in (56)/(57b)).

5 Conclusion

The present paper is the first attempt to account for predicational and specificational copular clauses within LFG, taking advantage of the LFG modular architecture to capture language-specific differences between English and Polish. The syntactic analysis is connected to a compositional semantico-pragmatic account of SCCs within Glue semantics, drawing extensively on Barros (2016) and Chierchia (2024). English predicate inversion is modelled as an alternative mapping, associated with a particular QUD presupposition. In Polish, the same effect is achieved through c-structural inversion, with SCCs (with instrumental predicates) representing an instance of the pervasive Slavic XVS word order. Additionally, the paper examines Polish copular clauses with *to*, offering an intricate analysis deriving various readings of such constructions.

Hopefully, this paper will stimulate further research on copular clauses in LFG. Many issues related to SCCs (leaving aside other copular clauses) are not addressed here at all, such as connectivity effects or the structure of pseudo-clefts (see den Dikken & O'Neill 2017 and Heycock 2021 for an overview of such intriguing problems). Also, the paper positions itself within a particular strand of research in which the left-hand NPs in SCCs are treated as $\langle e,t \rangle$-type predicates. The other strand – arguing that the left-hand NP is an individual concept (e.g., Arregi et al. 2021) – is not considered here. Of course, a more

[24]Importantly, this observation is not meant to imply that sentences which *cannot* occur with *równa się* – like (61) – are consequently blocked with *to*. As a comparison of (61) and (56) shows, they are not.

comprehensive analysis must carefully consider the arguments for each approach and, hopefully, provide conclusive evidence in favour of one of them.

A Case-driven agreement

In this short appendix, I provide an LFG formalisation of an agremeent mechanism operating in line with Bobaljik (2008), postulating that agreement is controlled by the highest accessible phrase in the domain of agreement, not necessarily by the SUBJect.

On that account, verbal forms are accompanied by the template @AGREE, defined in (62). For instance, the Polish form *był* 'was.3SG.M' is accompanied by the following template: @AGREE(3, SG, M). This template states that one of its grammatical functions is its agreement controller (using the local name %GOAL) and assigns the values of person, number and gender to that goal.

(62) AGREE(PV, NV, GV) := $(\uparrow$ GF$)$ = %GOAL
@HIGHEST-ACCESSIBLE(%GOAL)
(%GOAL PERS) = PV
(%GOAL NUMB) = NV
(%GOAL GEND) = GV

Crucially, the %GOAL must satisfy the set of constraints invoked in the template @HIGHEST-ACCESSIBLE:

(63) HIGHEST-ACCESSIBLE(X) := @ACCESSIBLE(X)
$\neg\{(\uparrow$ GF$)$ = %RUNNER-UP $\wedge$
@ACCESSIBLE(%RUNNER-UP) $\wedge$
@GF-OUTRANKS(%RUNNER-UP, X)$\}$

The first template in (63) requires the %GOAL to be accessible. For Polish, this means that the controller of agreement must be nominative:[25]

(64) ACCESSIBLE(X) := (X CASE) $=_c$ NOM

The second restriction in (63) – a negated conjunction – states that there cannot be another phrase (call it %RUNNER-UP) which is also accessible and outranks %GOAL in the hierarchy of grammatical functions (according to a typically assumed hierarchy – see Bresnan et al. 2016: 217 – but augmented with PREDLINK). Consequently, if there is more than one accessible phrase in a clause, the highest one controls agreement.

A similar approach to agreement, but within the LFG+OT framework, is presented in Alsina & Vigo (2017). See also Belyaev (2013) and Sadler (2016) for analyses of agreement in this vein, but postulating a separate grammatical function for the agreement controller: the PIVOT.

[25]The accessible case is the unmarked case; hence, in ergative-absolutive languages, the absolutive is accessible. It has also been shown that two cases – the unmarked and the dependent – can be accessible, as in Nepali (Bobaljik 2008: 309–312), but the theory makes the prediction that there should be no language where the dependent case is accessible while the unmarked case is not.

B Proofs

In Figures 1 and 2, the linear logic parts in the meaning constructors refer to mnemonically labeled s-structures (with *c* for the *c*lausal s-structure). For the proofs in Figures 3a and 3b, the s-structure with labels – as well as the corresponding f-structure and c-structure – is explicitly provided.

$$\dfrac{\dfrac{\dfrac{\begin{array}{l}[\textbf{be}]\\ \lambda P\lambda x\lambda s.^{\Sigma}P(s)\wedge \mathit{theme}(s,x):\\ [\mathit{mfc\text{-}v}\multimap \mathit{mfc\text{-}r}]\multimap \mathit{sn}\multimap \mathit{st}\multimap c\end{array}\qquad \begin{array}{l}[\textbf{my-favourite-character}]\\ \lambda x.\mathit{myFavouriteCharacter}(x):\\ \mathit{mfc\text{-}v}\multimap \mathit{mfc\text{-}r}\end{array}}{\begin{array}{l}\lambda x\lambda s.^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,x):\\ \mathit{sn}\multimap \mathit{st}\multimap c\end{array}}\qquad \begin{array}{l}[\textbf{Snufkin}]\\ \mathit{Snufkin}:\mathit{sn}\end{array}}{\lambda s.^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,\mathit{Snufkin}):\mathit{st}\multimap c}\qquad \begin{array}{l}[\textsc{closure}]\\ \lambda P.\exists s.P(s):[\mathit{st}\multimap c]\multimap c\end{array}}{\exists s.^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,\mathit{Snufkin}):c}$$

Figure 1: Proof of *Snufkin is my favourite character* and *My favourite character is Snufkin* (ignoring the QUD presupposition)

$$\dfrac{\dfrac{\dfrac{\dfrac{\begin{array}{l}[\textbf{be}]\\ \lambda P\lambda x\lambda s.^{\Sigma}P(s)\wedge \mathit{theme}(s,x):\\ [\mathit{mfc\text{-}v}\multimap \mathit{mfc\text{-}r}]\multimap \mathit{sn}\multimap \mathit{st}\multimap c\end{array}\qquad \begin{array}{l}[\textbf{my-favourite-character}]\\ \lambda x.\mathit{myFavouriteCharacter}(x):\\ \mathit{mfc\text{-}v}\multimap \mathit{mfc\text{-}r}\end{array}}{\begin{array}{l}\lambda x\lambda s.^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,x):\\ \mathit{sn}\multimap \mathit{st}\multimap c\end{array}}\qquad \begin{array}{l}[\text{QUD-}\textsc{presupposition}]\\ \lambda Q\vdots\,\text{QUD}=\{\exists s'.Q(z)(s')\mid z\in D_e\}.Q:\\ \forall H.[\mathit{sn}\multimap H]\multimap[\mathit{sn}\multimap H]\end{array}}{\begin{array}{l}\lambda x\lambda s\vdots\,\text{QUD}=\{\exists s'.^{\Sigma}\mathit{myFavouriteCharacter}(s')\wedge \mathit{theme}(s',z)\mid z\in D_e\}.\\ ^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,x):\\ \mathit{sn}\multimap \mathit{st}\multimap c\end{array}}\qquad \begin{array}{l}[\textbf{Snufkin}]\\ \mathit{Snufkin}:\mathit{sn}\end{array}}{\lambda s\vdots\,\text{QUD}=\{\dots\}.^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,\mathit{Snufkin}):\mathit{st}\multimap c}\qquad \begin{array}{l}[\textsc{closure}]\\ \lambda P.\exists s.P(s):[\mathit{st}\multimap c]\multimap c\end{array}}{\exists s\vdots\,\text{QUD}=\{\exists s'.^{\Sigma}\mathit{myFavouriteCharacter}(s')\wedge \mathit{theme}(s',z)\mid z\in D_e\}.^{\Sigma}\mathit{myFavouriteCharacter}(s)\wedge \mathit{theme}(s,\mathit{Snufkin}):c}$$

Figure 2: Proof of *My favourite character is Snufkin* (with the QUD presupposition)

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(65) Moja ulubiona postać to był Włóczykij.
my favourite character.SG.F.NOM TO was.SG.M Snufkin.SG.M.NOM
'Snufkin was my favourite character.'

F-structure of (65):

$$\begin{bmatrix} \text{PRED} & \text{`BE'} \\ \text{UDF} & \begin{bmatrix}\text{PRED} & \text{`MY-FAVOURITE-CH...'}\end{bmatrix} \\ \text{SUBJ} & \begin{bmatrix}\text{PRED} & \text{`}\textit{pro}\text{'}\end{bmatrix} \\ \text{PREDLINK} & \begin{bmatrix}\text{PRED} & \text{`SNUFKIN'}\end{bmatrix} \end{bmatrix}$$

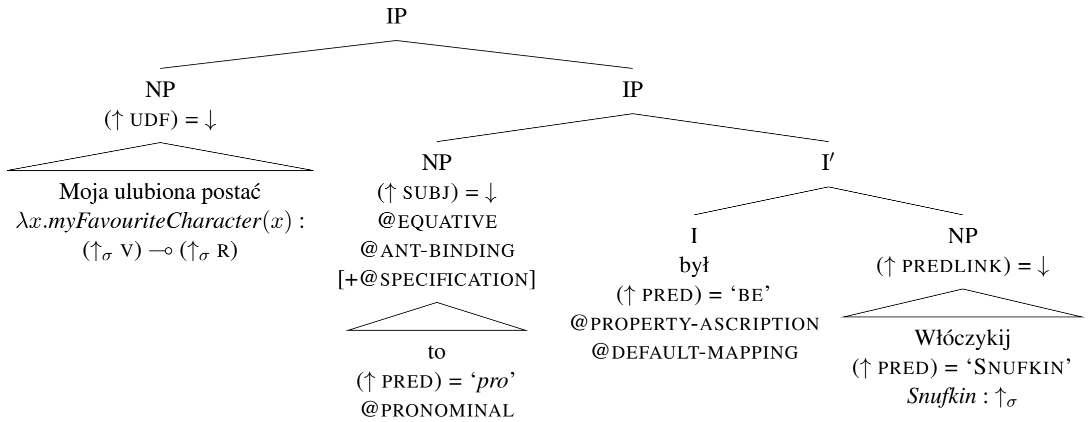
Corresponding s-structure:

$$_{c}\begin{bmatrix} \text{STATE} & _{st}[\;] \\ \text{THEME} & _{p}\begin{bmatrix}\text{ANTECEDENT} & _{ant}[\;]\end{bmatrix} \\ \text{PROPERTY} & _{sn}[\;] \end{bmatrix}$$

S-structure of the UDF:

$$\begin{bmatrix} \text{V} & _{mfc\text{-}v}[\;] \\ \text{R} & _{mfc\text{-}r}[\;] \end{bmatrix}$$

C-structure of (65):



$$\dfrac{\dfrac{\begin{array}{l}[\text{@SPECIFICATION}]\\ \lambda P \iota x.P(x) : [\textit{mfc-v} \multimap \textit{mfc-r}] \multimap \textit{ant}\end{array} \qquad \begin{array}{l}[\textbf{my-favourite-character}]\\ \lambda x.\textit{myFavouriteCharacter}.(x) : \textit{mfc-v} \multimap \textit{mfc-r}\end{array}}{\iota x.\textit{myFavouriteCharacter}(x) : \textit{ant}} \qquad \begin{array}{l}[\text{@PRONOMINAL}]\\ \lambda x.x : \textit{ant} \multimap p\end{array}}{\iota x.\textit{myFavouriteCharacter}(x) : p}$$

Figure 3a: The first part of the proof for (65): the pronoun binds its ι-shifted antecedent

$$\dfrac{\dfrac{\dfrac{\dfrac{\begin{array}{l}[\text{@EQUATIVE}]\\ \lambda x \lambda y.y = x :\\ \textit{sn} \multimap [\textit{sn-v} \multimap \textit{sn-r}]\end{array} \qquad \begin{array}{l}[\textbf{Snufkin}]\\ \textit{Snufkin} : \textit{sn}\end{array}}{\lambda y.y = \textit{Snufkin} : \textit{sn-v} \multimap \textit{sn-r}} \qquad \begin{array}{l}[\textbf{be}]\\ \lambda P \lambda x \lambda s.^{\Sigma} P(s) \wedge \textit{theme}(s,x) :\\ [\textit{sn-v} \multimap \textit{sn-r}] \multimap p \multimap \textit{st} \multimap c\end{array}}{\begin{array}{l}\lambda x \lambda s.^{\Sigma}[\lambda y.y = \textit{Snufkin}](s) \wedge \textit{theme}(s,x) :\\ p \multimap \textit{st} \multimap c\end{array}} \qquad \begin{array}{l}[\text{from Fig. 3a}]\\ \iota x.\textit{myFavouriteCharacter}(x) : p\end{array}}{\begin{array}{l}\lambda s.^{\Sigma}[\lambda y.y = \textit{Snufkin}](s) \wedge \textit{theme}(s, \iota x.\textit{myFavouriteCharacter}(x)) :\\ \textit{st} \multimap c\end{array}} \qquad \begin{array}{l}[\text{CLOSURE}]\\ \lambda P.\exists s.P(s) :\\ [\textit{st} \multimap c] \multimap c\end{array}}{\exists s.^{\Sigma}[\lambda y.y = \textit{Snufkin}](s) \wedge \textit{theme}(s, \iota x.\textit{myFavouriteCharacter}(x)) : c}$$

Figure 3b: The second part of the proof for (65) (ignoring the QUD presupposition)

References

Alsina, Alex, & Eugenio M. Vigo. 2014. Copular inversion and non-subject agreement. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'14 Conference*, 5–25. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2014/papers/lfg14alsinavigo.pdf.

Alsina, Alex & Eugenio M. Vigo. 2017. Agreement: Interactions with case and raising. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'17 Conference*, 3–23. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2017/lfg2017-alsina-vigo.pdf.

Arregi, Karlos, Itamar Francez & Martina Martinović. 2021. Three arguments for an individual concept analysis of specificational sentences. *Natural Language & Linguistic Theory* 39. 687–708. https://doi.org/10.1007/s11049-020-09491-x.

Asudeh, Ash. 2012. *The logic of pronominal resumption*. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199206421.001.0001.

Asudeh, Ash & Gianluca Giorgolo. 2012. Flexible composition for optional and derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'12 Conference*, 64–84. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2012/papers/lfg12asudehgiorgolo.pdf.

Attia, Mohammed. 2008. A unified analysis of copula constructions in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'08 Conference*, Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2008/papers/lfg08attia.pdf.

Barros, Matthew. 2016. Specification as an inter-taxonomic phenomenon. Yale Linguistics Department. Manuscript. https://ling.auf.net/lingbuzz/003117.

Belyaev, Oleg. 2013. Optimal agreement at m-structure: Person in Dargwa. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'13 Conference*, 90–110. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2013/papers/lfg13belyaev.pdf.

Bobaljik, Jonathan David. 2008. Where's Phi? Agreement as a postsyntactic operation. In Daniel Harbour, David Adger & Susana Béjar (eds.), *Phi Theory: Phi-features across modules and interfaces*, Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780199213764.003.0010.

Bondaruk, Anna. 2013. *Copular clauses in English and Polish. Structure, derivation and interpretation*. Lublin: Wydawnictwo KUL.

Bowers, John. 1993. The syntax of predication. *Linguistic Inquiry* 24(4). 591–656. https://www.jstor.org/stable/4178835.

Bresnan, Joan. 1994. Locative inversion and the architecture of Universal Grammar. *Language* 70(1). 72–131. https://doi.org/10.2307/416741.

Bresnan, Joan, Ash Asudeh, Ida Toivonen & Stephen Wechsler (eds.). 2016. *Lexical-functional syntax* (2nd edn.). Chichester: Wiley-Blackwell. https://doi.org/10.1002/9781119105664.

Bresnan, Joan & Jonni M. Kanerva. 1989. Locative inversion in Chicheŵa: A case study of factorization in grammar. *Linguistic Inquiry* 20(1). 1–50. https://www.jstor.org/stable/4178612.

Butt, Miriam, Mary Dalrymple & Anette Frank. 1997. An architecture for Linking Theory in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'97 Conference*, 1–16. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG1997/lfg97butt-dalrymple-frank.pdf.

Butt, Miriam, Tracy Holloway King, María-Eugenia Niño & Frédérique Segond. 1999. *A grammar writer's cookbook*. Stanford, CA: CSLI Publications.

Chierchia, Gennaro. 2024. Brief notes on the semantics of copular sentences. In Matteo Greco & Davide Mocci (eds.), *A Cartesian dream: A geometrical account of syntax. In honor of Andrea Moro*, 149–160. Lingbuzz Press.

Coppock, Elizabeth & David Beaver. 2015. Definiteness and determinacy. *Linguistics and Philosophy* 38(5). 377–435. https://doi.org/10.1007/s10988-015-9178-8.

Dalrymple, Mary, Helge Dyvik & Tracy Holloway King. 2004. Copular complements: Closed or open? In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG '04 Conference*, 188–198. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2004/pdfs/lfg04ddk.pdf.

Dalrymple, Mary, Dag T. T. Haug & John J. Lowe. 2018. Integrating LFG's binding theory with PCDRT. *Journal of Language Modelling* 6(1). 87–129. https://doi.org/10.15398/jlm.v6i1.204.

Dalrymple, Mary, John J. Lowe & Louise Mycock. 2019. *The Oxford reference guide to Lexical Functional Grammar*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198733300.001.0001.

Diessel, Holger. 1999. *Demonstratives: Form, function and grammaticalization*. Amsterdam: Benjamins. https://doi.org/10.1075/tsl.42.

den Dikken, Marcel. 2006. *Relators and linkers: The syntax of predication, predicate inversion, and copulas*. Cambridge, MA: The MIT Press.

den Dikken, Marcel & Teresa O'Neill. 2017. Copular constructions in syntax. In *Oxford research encyclopedia of linguistics*, Oxford: Oxford University Press. https://doi.org/10.1093/acrefore/9780199384655.013.137.

Findlay, Jamie Y. 2016. Mapping theory without argument structure. *Journal of Language Modelling* 4(2). 293–338. https://doi.org/10.15398/jlm.v4i2.171.

Findlay, Jamie Y., Roxanne Taylor & Anna Kibort. 2023. Argument structure and mapping theory. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 699–778. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10185966.

Geist, Ljudmila. 2008. Predication and equation in copular sentences: Russian vs. English. In Ileana Comorovski & Klaus von Heusinger (eds.), *Existence: Semantics and syntax*, 79–105. Dordrecht: Springer. https://doi.org/10.1007/978-1-4020-6197-4_3.

Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10. 41–53. https://www.jstor.org/stable/25000703.

Hartmann, Jutta M. 2019. Focus and prosody in nominal copular clauses. In Sam Featherston, Robin Hörnig, Sophie von Wietersheim & Susanne Winkler (eds.), *Experiments in focus*, 71–104. Berlin: De Gruyter. https://doi.org/10.1515/9783110623093-004.

Hartmann, Jutta M. & Caroline Heycock. 2020. (Morpho)syntactic variation in agreement: Specificational copular clauses across Germanic. *Frontiers in Psychology* 10. https://doi.org/10.3389/fpsyg.2019.02994.

Hentschel, Gerd. 2001. On the perspectivisation of noun phrases in copula sentences, mainly in Polish: *(Y) to (jest) X* and similar phenomena. In Viktor S. Chrakovskij, Maciej Grochowski & Gerd Hentschel (eds.), *Studies on the syntax and semantics of Slavonic languages*, 161–213. Oldenburg: Bibliotheks- und Informationssystem der Universität Oldenburg.

Heycock, Caroline. 2021. Copular sentences. In Daniel Gutzmann, Lisa Matthewson, Cécile Meier, Hotze Rullmann & Thomas Zimmermann (eds.), *The Wiley Blackwell companion to semantics*, London: Wiley. https://doi.org/10.1002/9781118788516.sem055.

Higgins, Francis Roger. 1973. *The pseudo-cleft construction in English*. Bloomington, IN: Indiana University Linguistics Club.

Higgins, Francis Roger. 1979. *The pseudo-cleft construction in English*. New York, NY: Garland.

Hristov, Bozhil. 2023. LFG and Slavic languages. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, 1753–1804. Berlin: Language Science Press. https://doi.org/10.5281/zenodo.10186030.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1. 3–44. https://www.jstor.org/stable/25000027.

Kibort, Anna. 2007. Extending the applicability of Lexical Mapping Theory. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'07 Conference*, 250–271. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2007/papers/lfg07kibort.pdf.

Li, Charles N. & Sandra A. Thompson. 1977. A mechanism for the development of copula morphemes. In Charles N. Li (ed.), *Mechanisms of syntactic change*, 419–444. Austin, TX: University of Texas Press. https://doi.org/10.7560/750357-012.

Mikkelsen, Line. 2005. *Copular clauses: Specification, predication, and equation*. Amsterdam: John Benjamins.

Parsons, Terence. 1990. *Events in the semantics of English*. Cambridge, MA: MIT Press.

Partee, Barbara H. 1987. Noun phrase interpretation and type-shifting principles. In Jeroen Groenendijk, Dick de Jongh & Martin Stokhof (eds.), *Studies in Discourse Representation Theory and the theory of generalized quantifiers*, 115–143. Dordrecht: Reidel.

Przepiórkowski, Adam & Agnieszka Patejuk. 2012. The puzzle of case agreement between numeral phrases and predicative adjectives in Polish. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'12 Conference*, 490–502. Stanford, CA: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2012/papers/lfg12przpat2.pdf.

Roberts, Craige. 2012. Information structure in discourse: Towards an integrated formal theory of pragmatics. *Semantics and Pragmatics* 5. https://doi.org/10.3765/sp.5.6.

Rutkowski, Paweł. 2006. From demonstratives to copulas: A cross-linguistic perspective and the case of Polish. *Journal of Universal Language* 7. 147–175. https://doi.org/10.22425/jul.2006.7.2.147.

Sadler, Louisa. 2016. Agreement in Archi: An LFG perspective. In Oliver Bond, Greville G. Corbett, Marina Chumakina & Dunstan Brown (eds.), *Archi: Complexities of agreement in cross-theoretical perspective*, 150–183. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198747291.003.0006.

Seres, Daria & M.Teresa Espinal. 2019. Russian definitional generic sentences. *Glossa: a journal of general linguistics* 4(1). https://doi.org/10.5334/gjgl.760.

Titov, Elena. 2024. Morphosyntactic reflexes of information structure. In Danko Šipka & Wayles Browne (eds.), *The Cambridge handbook of Slavic linguistics*, 477–498. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108973021.023.

Zawada, Sebastian. 2024. Demonstrative TO in Polish – an $\mathrm{L_R}$FG analysis. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 264–284. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/52.

Zawada, Sebastian & Adam Przepiórkowski. 2025. Agreement in Polish revisited: Evidence from copular clauses. Under review.

Semantic parsing and reasoning in LFG: The case of gradable adjectives

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Abstract

In this paper, we present an extension to XLE+Glue that puts the mapping from form to meaning under scrutiny by incorporating a reasoning component based on the Vampire theorem prover. We illustrate various aspects of this system by means of an analysis of gradable adjectives, particularly their positive and comparative uses. Crucially, we show how our system deals with compositional and non-compositional semantic information. As part of this effort, we also present a newly developed XLE+Glue grammar that combines co-descriptive semantics with an additional layer of description-by-analysis. We propose that this approach allows us to better handle certain kinds of context sensitivity and align compositional and non-compositional aspects of meaning. Furthermore, we show that such a layered approach can be extended to the reasoning process.

1 Introduction

This paper presents an analysis of gradable adjectives that is supported by a computational implementation spanning from syntax to semantic interpretation. Thus, its contributions are two-fold: i) it provides an implementation of gradable adjectives at the syntax/semantics interface based on a hybrid approach to Glue semantics, combining local co-description and description-by-analysis, and ii) it highlights the validity of this approach by integrating a reasoning engine into XLE+Glue (Dalrymple et al. 2020; Zymla et al. 2025) and showing that the analysis leads to the correct prediction of various inferences underlying gradable adjectives and comparatives.

Gradable adjectives are an interesting test case at the intersection of compositional and contextual meaning. Following the spirit of Zymla (2017, 2024b), we elaborate on a layered approach to interpreting gradable adjectives, following the assumption that reasoning itself is layered and can be modeled correspondingly as a system that grows in complexity based on the requirements of the context. Thus, for example, (1) can be interpreted correctly without giving the POSITIVE use of *great* an articulated semantics.

(1) Some great tenors are Swedish.
―――――
Are there great tenors who are Swedish? $\rightarrow$ YES

However, in example (2), it is crucial to understand the relation between the POSITIVE uses of *small* and *large*. This relation is context-dependent, as the meaning of these adjectives is affected by the intermediate linguistic context, but also requires further contextual information. Concretely, *small* is (essentially) interpreted as *small for an animal* and *large* is interpreted as *large for a mouse* (Kennedy & McNally 2005). Additionally, we need to ascertain that the antonym relation holds between *small* and *large* without the fact that Mickey is a large mouse obscuring the matter.

(2) All mice are small animals.
Mickey is a large mouse.
―――――
Is Mickey a large animal? $\rightarrow$ NO

Our analysis relies on a layered compositional approach to gradable adjectives consisting of a co-descriptive layer and a description-by-analysis layer, and a method to automatically trigger additional axioms that do not compositionally interact with the meaning of a sentence, allowing us to capture both the linguistic and contextual aspects of gradable adjectives.

Another example that fails when gradable adjectives are interpreted as properties of entities is given in (3), illustrating a COMPARATIVE use of *fast*. Comparatives serve as a syntactically and semantically complex test case for the analysis in the present paper.

(3)
The PC-6082 is faster than every ITEL computer.
The ITEL-ZX is an ITEL computer.
———
Is the PC-6082 faster than the ITEL-ZX? → YES

Figure 1 describes the overall architecture of our system. We use XLE+Glue, an interface between the XLE (Crouch et al. 2017) and the Glue Semantics Workbench (GSWB; Meßmer & Zymla 2018), to provide a co-descriptive analysis capturing core aspects of syntax and semantics (Dalrymple et al. 2020). To deal with the contextual nature of adjectives, the semantics is enriched by LiGER (Linguistic Graph Expansion and Rewriting; Zymla et al. 2025), which is also used to infer non-compositional axioms. Our semantics are rendered in DRT based on Blackburn & Bos (2005), referred to here as BB DRT. The DRT representations are translated to first-order logic (DRT2FOL) and interpreted by the Vampire theorem prover (Kovács & Voronkov 2013).

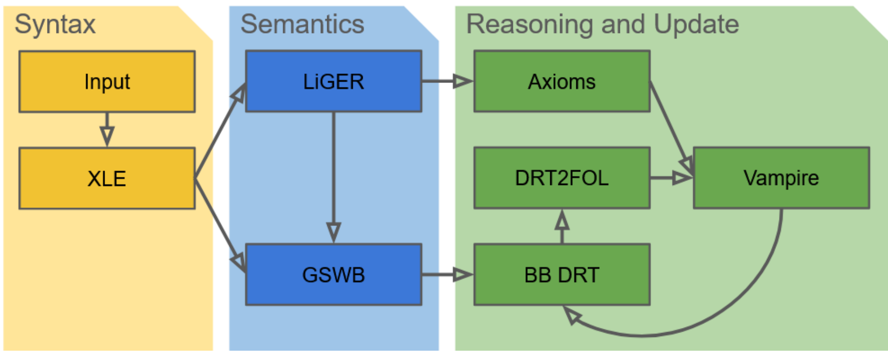


Figure 1: XLE+Glue pipeline

The paper is structured as follows: In the next section, we begin by describing the syntax and semantics of adjectives commonly assumed in (computational) LFG, as a baseline for our approach. In section 3, we discuss the semantics of gradable adjectives. Then, in section 4, we couch the semantics in a syntax/semantics interface based on LFG's Glue semantics. Further, we discuss the computational implementation of the analysis in XLE+Glue. Section 5 describes the inference system used for interpreting the semantics in the context of natural language inference. Finally, section 6 concludes.

2 Adjectives in Lexical Functional Grammar

We assume a fairly standard recursive treatment of adjectival modifiers in the phrase structure of noun phrases. Thus, we posit the c-structure rules in (4), following, e.g., Andrews (1983); Findlay & Haug (2022). However, unlike Andrews (2018), we maintain a flat f-structure.

(4) *Rules:*

$$\begin{array}{lllll} \text{NP} & \rightarrow & \text{(D)} & \text{N}' & \\ & & \uparrow = \downarrow & \uparrow=\downarrow & \end{array}$$

$$\begin{array}{lllllll} \text{N}' & \rightarrow & \text{AP} & \{ & \text{N}' & \mid & \text{N} \ \} \\ & & \downarrow \in (\uparrow \text{ADJ}) & & \uparrow=\downarrow & & \uparrow=\downarrow \end{array}$$

As is traditionally done, we distinguish between attributive uses of adjectives, captured by the rules above, and predicative uses. In comparison to attributive adjectives, predicative uses of adjectives first combine with a copula in English and then subsequently modify the subject (see (7)).

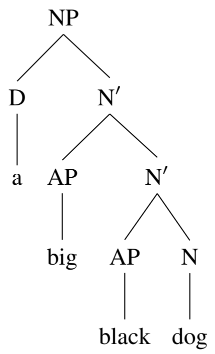
In (5), we illustrate lexical entries for attributive and predicative uses of adjectives.[1] The main difference here is that, in the predicative use, the adjective explicitly selects for a SUBJ, enabling the specification of its meaning as a simple property of that GF. In contrast, attributive uses *modify* their dominating f-structure, resulting in a more complex type (see Dalrymple 2001: Ch. 10 for discussion). This also captures the intuition that while attributive adjectives can be recursively added to the set of modifiers, this is not the case for predicative uses (except via adjectival coordination).

(5) *Lexicon:*

$$\begin{array}{lll} \text{big} & \text{A} & (\uparrow \ \text{PRED}) = \text{`big'} \\ & & \lambda P.big(P) : ((\text{ADJ} \uparrow)_e \multimap (\text{ADJ} \uparrow)_t) \multimap \\ & & \qquad (\text{ADJ} \uparrow)_e \multimap (\text{ADJ} \uparrow)_t \\ \\ \text{tall} & \text{A} & (\uparrow \ \text{PRED}) = \text{`tall} < (\uparrow \ \text{SUBJ}) > \text{'} \\ & & \lambda x.tall(x) : (\uparrow \ \text{SUBJ})_e \multimap \uparrow_t \end{array}$$

As a result of this analysis, the scope of attributive adjectives is not determined by their linear order. Putting all of this together, we get the representation for a complex NP like *a big black dog* in (6) and a predicative structure like *Jordan is tall* in (7).

(6) **a big black dog**



$$\mathbf{1}\begin{bmatrix} \text{PRED `dog'} \\ \text{ADJ} \ \left\{ \begin{bmatrix}\text{PRED `big'}\end{bmatrix}, \begin{bmatrix}\text{PRED `black'}\end{bmatrix} \right\} \end{bmatrix}$$

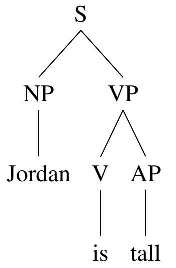
$\lambda P.big(P)$:
$(\mathbf{1}_e \multimap \mathbf{1}_t) \multimap (\mathbf{1}_e \multimap \mathbf{1}_t)$

$\lambda P.black(P)$:
$(\mathbf{1}_e \multimap \mathbf{1}_t) \multimap (\mathbf{1}_e \multimap \mathbf{1}_t)$

$dog : (\mathbf{1}_e \multimap \mathbf{1}_t)$

[1] We generally use subscripts to indicate types. However, we assume first-order Glue (Kokkonidis 2008) as the underlying logic (i.e., types take indices as arguments). The present notation is a notational variant.

(7) **Jordan is tall.**



$$\begin{bmatrix} \text{PRED} & \text{`be}<(\uparrow\text{XCOMP-PRED})>(\uparrow\text{ SUBJ})\text{'} \\ \text{XCOMP-PRED} & \mathbf{1}\begin{bmatrix} \text{PRED} & \text{`tall}<(\uparrow\text{ SUBJ})>\text{'} \\ \text{SUBJ} & \mathbf{2}\begin{bmatrix}\text{PRED `Jordan'}\end{bmatrix} \end{bmatrix} \\ \text{SUBJ} & \begin{bmatrix}\mathbf{2}\end{bmatrix} \end{bmatrix}$$

$$\lambda x.tall(x) : (\mathbf{2}_e \multimap \mathbf{1}_t)$$

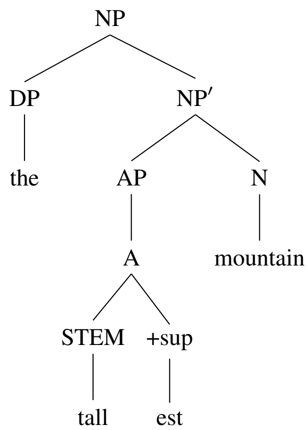
$$Jordan : \mathbf{2}_e$$

Gradable adjectives can be used to express POSITIVE, COMPARATIVE, and SUPERLATIVE meanings. In English, these meanings are reflected in the morphology:

(8) a. The dog is **big**.
b. The cat is **faster** than the dog.
c. Jordan climbed the **tallest** mountain.

We follow the ParGram approach (i.e., a computational LFG approach) to analyzing morphology (Butt et al. 1999: Ch. 12). This approach is realizational (Beesley & Karttunen 2003), such that a single morpheme can realize multiple grammatical and/or semantic distinctions. Words are decomposed via lexical rules. These are rules that can parse regular languages (i.e., those covered by finite-state automata). This is illustrated in (9), where the adjective *tallest* is decomposed into a stem *tall* and a superlative morpheme *-est* which expresses the DEGREE feature SUPERLATIVE. Additionally, it also realizes a PRED feature indicating its semantic import (i.e., a covert *most*):

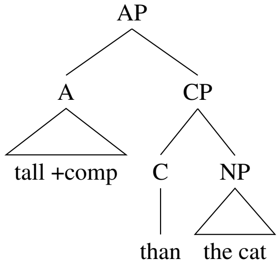
(9) **the tallest mountain**



$$\begin{bmatrix} \text{PRED} & \text{`mountain'} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`tall'} \\ \text{DEGREE} & \text{superlative} \\ \text{ADJ} & \left\{\text{PRED `most'}\right\} \end{bmatrix} \right\} \end{bmatrix}$$

The comparative morpheme also realizes such a PRED feature. In the case of the comparative, it is not *most* but *more*. This proposal is broadly built on Bresnan (1973). These additional PRED features play an integral role in handling the possibility of further modification with a *than-* or *as*-clause. This modifying clause is encoded via the ability of these forms to take an optional OBL$_{compar}$ at f-structure:

(10) The dog is **taller than the cat**.



$$\begin{bmatrix} \text{PRED 'tall'} & \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED 'more} <(\uparrow \text{OBL}_{compar})> \text{'} & \\ \text{OBL}_{compar} & \begin{bmatrix} \text{PRED 'than} <\text{cat}> \text{'} & \\ \text{OBJ} & \begin{bmatrix} \text{PRED 'cat'} \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\} \\ \text{DEGREE comparative} & \end{bmatrix}$$

3 Gradable adjectives

So far, we have simply treated adjectives as properties. This corresponds to a plain translation of the adjective *tall* to a symbol in our non-logical vocabulary. When we look more closely at the kinds of meanings epxressed by certain adjectives, namely gradable ones, we find that their meaning is scalar in nature. Adjectives like *tall* or *heavy* indicate some scale, e.g. height and weight, on which they are perceived. This scale is measured in terms of degrees, e.g. degrees of height or degrees of weight. Consequently, we have to extend our ontology of types to also incorporate degrees. Corresponding systems are broadly covered by the term DEGREE SEMANTICS (see e.g. Cresswell 1976; Kennedy & McNally 2005; Schwarzschild 2008).

Here we assume that gradable adjectives express a relation between an individual and a scale. By uttering (11) we locate Jordan on a scale of height and we identify this degree as being 175cm:

(11) a. Jordan is 175cm tall.
b. $tall(j, \delta) \wedge \delta = 175cm$

Besides expressing degrees overtly, we can also simply imply where a certain individual lies on a scale. To model this, a comparison class is employed. We use θ to indicate the use of contextually provided comparison classes. For (12) to be felicitous, Jordan needs to exceed some contextually supplied standard, here, the one for the height of humans, as indicated by the argument of the comparison class θ. In the case of predicative adjectives, the subscript is inferred via the context. In the case of an attributive use, comparison classes are (at least partially) determined compositionally (e.g., in (12c), Jordan might be tall with respect to a contextually salient subset of teachers).

(12) a. Jordan is tall (for a human).
b. $tall(j, \delta) \wedge \theta_{tall}(human) < \delta$
c. Jordan is a tall teacher.

Additionally, the interpretation of gradable adjectives is modulated by certain axioms. Firstly, we assume that degrees of some property P are monotonic:

(13) $\forall P[\forall x[\forall \delta[P(\delta)(x) \rightarrow \forall \delta'[\delta' < \delta \rightarrow P(\delta')(x)]]]]$ *monotonicity*

This captures the intuition that if an individual reaches a certain height, e.g. that they are 175cm tall, they are also tall to every smaller degree. Secondly, we assume that degrees have an upper bound. Thus, there is a unique degree that identifies the maximal point on the scale of the corresponding property.

(14) $\forall P[\forall x[\exists\delta[P(\delta)(x) \rightarrow \forall\delta'[\delta' > \delta \rightarrow \neg P(\delta')(x)]]]]$ *upper bound*

For now, we simply assume that these axioms are contextually provided, but we will clarify their contribution to reasoning in section 5.

3.1 Comparatives

Traditionally, comparatives are treated as comparing maximal degrees between the modified noun and the *than*-complement, i.e., an explicit comparison class (Cresswell 1976; Kennedy & McNally 2005). This is illustrated in the following example:[2]

(15) The elephant is taller than the mouse.

a. $\exists\delta, \delta', x, y[elephant(x) \wedge max_{height}(x, \delta) \wedge mouse(y) \wedge max_{height}(y, \delta') \wedge \delta > \delta']$

A different implementation was proposed by Klein (1980). Here, we do not need to compute maximal values.[3] The intuition behind this proposal is that we are looking for a degree that is held by the degree holder but not by the object of comparison. This analysis is also referred to as the P-not-P analysis, since we are looking for a threshold that the degree holder exceeds, which the object of comparison does not (Schwarzschild 2008). For the sentence in (15), we arrive at the following representation:

(16) $\exists\delta, x, y[elephant(x) \wedge height(x, \delta) \wedge mouse(y) \wedge \neg height(y, \delta)]$

We can treat equative comparatives in a similar way. Here, we are employing universal quantification, such that for every degree that the degree holder holds, the object of comparison holds it, too.[4]

(17) The elephant is as tall as the house.

a. $\exists x, y[\forall\delta[house(x) \wedge height(x, \delta) \rightarrow elephant(y) \wedge height(y, \delta)]]$

Similar representations have been used for computational purposes by Haruta et al. (2022). Our decision to maintain degrees in our ontology is also inspired by their work. To reconcile Klein's original analysis with a semantics of degrees, we adopt Haruta et al.'s (2022) consistency postulate (CP). This axiom states that in a P-not-P configuration, the degree holder holds any degree of the underlying adjective that the object of comparison holds. Thus, this axiom subsumes monotonicity and the upper bound when a comparative construction is involved.[5]

[2] We abstract away from the semantics of the definite for sake of simplicity. We assume a presuppositional analysis following Van der Sandt (1992), which accommodates existence out of the blue.

[3] Note that in a Klein-style analysis (see also Klein 1982) we do not strictly need degrees in our ontology. Rather, gradable adjectives are partial functions that map individuals to the adjective's positive or negative extension. To keep with the more recent literature, we still employ degrees (see, e.g. Schwarzschild 2008). This allows for a unified treatment of positive and comparative uses of adjectives.

[4] As a reviewer points out, this means the elephant is *at least* as tall as the house. A more strict semantics might require the use of max_{height} similar to (15a).

[5] Consequently, it is only relevant when a comparative construction is used. Thus, we require a method

(18) (CP) $\forall x \forall y[\exists \delta[A(x,\delta) \wedge \neg A(y,\delta)] \rightarrow \forall \delta[A(y,\delta) \rightarrow A(x,\delta)]]$, where A is an arbitrary gradable adjective.

(Haruta et al. 2022: p. 148)

Note that our semantics for the comparative does not employ the contextual standard familiar from the positive. This correctly captures the fact that in examples like (19), the degree holder does not necessarily have to fulfill this standard:

(19) The tick is heavier than the amoeba.

3.2 Clausal and phrasal comparatives

In the literature, two types of comparatives are distinguished:

(20) a. The mouse is smaller than [$_{\text{DP}}$ the dog ~~is small~~]
b. The mouse is smaller than [$_{\text{IP}}$ the dog is ~~small~~]

The sentence in (20a) is referred to as a phrasal comparative while (20b) is referred to as a clausal comparative. We do not assume ellipsis in the syntax for comparatives, but rather resolve it via a semantic treatment of ellipsis (see section 4.5). Furthermore, in contrast to, e.g., Bhatt & Takahashi (2011), we only assume one kind of semantics for the comparative, namely a 2-place operator. Consequently, both sentences in (20) receive the semantics in (21) in our analysis.

(21) $\exists x, y, \delta[mouse(x) \wedge dog(y) \wedge small(x,\delta) \wedge \neg small(y,\delta)]$

In both cases, the elided adjective is thus only represented in the semantics but not in either c- or f-structure. As explained in more detail in the next section, we achieve this kind of analysis by employing description-by-analysis. We show that the analysis is computationally convenient, but we also acknowledge that the situation is ultimately more complicated and needs to be explored in more detail in future research.

4 Deriving the compositional semantics via XLE+Glue

In this section, we couch the semantics presented above in a syntax/semantics interface based on LFG's Glue semantics (Dalrymple 1999). Our analysis is implemented in XLE+Glue (Dalrymple et al. 2020) and make use of recent developments allowing for the specification of hybrid grammars combining co-descriptive semantics with description-by-analysis (DBA; Zymla et al. 2025). Thus, we present a computational grammar accompanied by a set of rewrite rules for extracting compositional semantic information as well as axiomatic knowledge required for reasoning about degrees. Before describing the technical details, we first briefly introduce the FraCaS testsuite, the source of our linguistic data.

for modulating the use of the correct and necessary axioms in different linguistic contexts. This is explained in section 5.

4.1 The FraCaS testsuite

Our grammar is developed on the basis of the FraCas testsuite (Cooper et al. 1996), a test set for natural language inference (NLI), focusing on compositional and functional semantic aspects (e.g., tense/aspect, quantifiers). It is designed to require little lexical knowledge, allowing us to work almost entirely with our grammar, without requiring external semantic resources. Each example in the testsuite consists of one or more premise sentences, a conclusion sentence and their entailment status. The conclusion can either be an entailment, a contradiction or neutral given the premise(s).

In (22) the premise set consists of two sentences. Given this premise set, there are three conclusions in (22) illustrating the possible entailment statuses: *entailment*, *contradiction*, and *neutral*. (22a) is an entailment, as the conclusion is necessarily true given the premises. (22b) is thus a contradiction, as the ITEL-XZ being faster than the PC-6082 can never be true if the inverse in (22a) is true. Lastly, because comparative sentences do not use a contextual standard, the premises, more specifically that the PC-6082 is faster than every ITEL computer, do not necessitate that the PC-6082 is fast in general. Thus, (22c) is neither an entailment nor a contradiction and thus *neutral*.

(22) The PC-6082 is faster than every ITEL computer
The ITEL-XZ is an ITEL computer

---

a. The PC-6082 is faster than the ITEL-XZ $\rightarrow$ Entailment
b. The ITEL-XZ is faster than the PC-6082 $\rightarrow$ Contradiction
c. The PC-6082 is fast. $\rightarrow$ Neutral

The FraCaS suite also minimizes effects of discourse relations. Thus, we parse sentences individually providing a corresponding testsuite. From this testsuite, we build NLI items and process them with the reasoning component. (see section 5).

4.2 The XLE grammar

Syntactically, our grammar aligns its analyses with the English ParGram grammar (Butt et al. 2002) and the specifications in Butt et al. (1999), illustrated in section 2. We decided to re-implement the relevant parts to provide a self-contained semantic grammar that can serve as reference for semantic parsing in XLE.[6] We particularly focus on parsing attributive and predicative adjectives, as well as the related comparative and equative constructions, but the grammar also generally covers a range of syntactic constructions like PPs and relative clauses on a basic level.

Semantically, the grammar provides a core for semantic parsing that captures predicate/argument structure, as well as some other highly compositional aspects, mainly scope taking operators. The core fragment is constrained to a fundamental ontology consisting of entities, events, and truth values. Thus, for this implementation, we have decided to mediate ontological extensions via LiGER (see section 4.5). This design decision allows us to implement a core semantics that is largely operational on its own but is extensible via description-by-analysis. Thus, we essentially pursue a layered approach to semantic parsing (Zymla 2017, 2024b).[7]

[6] Grammar and code are available at: https://github.com/Mmaz1988/xleplusglue/tree/2024_inference
[7] We further motivate this in section 5.

4.3 Co-descriptive semantics

The co-descriptive part of the grammar assumes a standard Neo-Davidsonian event semantics (Parsons 1990; Asudeh & Giorgolo 2012), such that verbs introduce an event predicate and thematic arguments can be added as modifiers of the predicate. We render our semantics in λ-DRT. More generally, we use a semantics close to that used in the Boxer system (Bos 2008).[8] Accordingly, all the DRSs we specify can be translated to first-order logic without loss of information.[9]

For example, in the lexical entry of a verb in our grammar, two meaning constructors (MCs) are specified: the base verbal semantics (23a) (an event predicate) and the existential closure in (23b). Arguments of a verb are treated as modifiers, as shown in (23c), and can be configured according to the logic presented in Asudeh & Giorgolo (2012). We enumerate arguments starting from 1 assuming some form of argument hierarchy, so these argument roles can serve as interface between GFs and thematic roles given an appropriate framework (see Findlay 2020 for discussion).[10]

(23) **Components of the event description:**

a. $\lambda e_v.\begin{array}{|c|}\hline \\ \hline \text{appear}(e) \\ \hline\end{array} : (\uparrow_\sigma \text{EV})_v \multimap (\uparrow_\sigma \text{EV})_t$

b. $\lambda P_{vt}.\begin{array}{|c|}\hline e \\ \hline \\ \hline\end{array} \oplus P(e) : ((\uparrow_\sigma \text{EV})_v \multimap (\uparrow_\sigma \text{EV})_t) \multimap \uparrow_{\sigma_t}$

c. $\lambda P_{vt}.\lambda x_e.\lambda e_v.P(v) \oplus \begin{array}{|c|}\hline \\ \hline \text{ARG1}(e) = x \\ \hline\end{array} :$

$(\uparrow_\sigma \text{EV})_v \multimap (\uparrow_\sigma \text{EV})_t \multimap \%arg1_e \multimap (\uparrow_\sigma \text{EV})_v \multimap (\uparrow_\sigma \text{EV})_t$,
where $\%arg1 = (\uparrow \text{SUBJ})_\sigma$ (determined by linking)

(24) **Components in FOL with instantiated MCs:**

a. $\lambda e_v.appear(e) : \quad e_v \multimap e_t$
b. $\lambda P_{vt}.\exists e[P(e)] : \quad (e_v \multimap e_t) \multimap f_t$
c. $\lambda P_{vt}.\lambda x_e.\lambda e_v.P(e) \wedge \text{ARG1}(e) = x : \quad (e_v \multimap e_t) \multimap g_e \multimap (e_v \multimap e_t)$

Our grammar builds event descriptions around a dedicated EV-index in the s-structure: $(\uparrow_\sigma \text{EV})$ (see, e.g, Haug 2008). This allows for a simple treatment of event closure, which must be obligatorily narrow. In the present example, we build the event description in (25) by adding the ARG1 modifier and then saturating the argument position.

(25) **Building the event description:**

$$\dfrac{\dfrac{\begin{array}{l}\lambda P_{vt}.\lambda x_e.\lambda e_v.P(x) \wedge \text{ARG1}(e) = x : \\ \quad (e_v \multimap e_t) \multimap g_e \multimap (e_v \multimap e_t)\end{array} \qquad \lambda e_v.appear(e) : e_v \multimap e_t}{\lambda x_e.\lambda e_v.appear(e) \wedge \text{ARG1}(e) = x : g_e \multimap (e_v \multimap e_t)} \qquad X_i : [g_e]^i}{\lambda e_v.appear(e) \wedge \text{ARG1}(e) = X_i : (e_v \multimap e_t)}$$

[8]In the following examples, we use $\oplus$ for the merge operation.

[9]This is needed for the reasoning pipeline. Here, we first present the MCs in the DRT format, but construct proofs with their FOL counterparts to highlight the correspondence and for reasons of conciseness.

[10]This is not relevant for the examples covered here, even when reasoning is involved.

Event closure then raises the derivation from modifying the event predicate to the (semantics of the) f-structure, allowing it to interact with other components of the proof (essentially, the semantics of noun phrases).

(26) **Event closure and discharging the assumption linked to the argument:**

$$\cfrac{\cfrac{\lambda P_{vt}.\exists e_v[P(e)] : (e_v \multimap e_t) \multimap f_t \qquad \lambda e_v.appear(e) \wedge \textsc{arg}1(e) = X_i : (e_v \multimap e_t)}{\exists e_v[appear(e) \wedge \textsc{arg}1(e) = X_i] : f_t}}{\lambda x_e.\exists e_v[appear(e) \wedge \textsc{arg}1(e) = x] : g_e \multimap f_t}$$

(27) **Resulting entry for the intransitive verb (uninstantiated):**

$$\lambda x_e.\begin{array}{|c|}\hline e \\ \hline \text{appear}(e) \\ \textsc{arg}1(e) = x \\ \hline \end{array} : \%arg1_e \multimap \uparrow_{\sigma_t}$$

Using the MCs in (28) contributed by the NP and more specifically their combination in (29), the meaning of the sentence “a dog appeared" can be derived as in (30), with the equivalent DRS in (31).

(28) **Components of the quantified noun phrase:**

a. $\lambda x_e.\begin{array}{|c|}\hline \\ \hline \text{dog}(x) \\ \hline \end{array} : (\uparrow \textsc{subj})_{\sigma_e} \multimap (\uparrow \textsc{subj})_{\sigma_t}$

b. $\lambda P_{et}.\lambda Q_{et}.\begin{array}{|c|}\hline x \\ \hline \\ \hline \end{array} \oplus\ P(x)\ \oplus\ Q(x) :$

$((\uparrow \textsc{subj})_{\sigma_e} \multimap (\uparrow \textsc{subj})_{\sigma_t}) \multimap ((\uparrow \textsc{subj})_{\sigma_e} \multimap \%scope_t) \multimap \%scope_t$,
where $\%scope = (\textsc{gf}^{+} \uparrow)_{\sigma} \approx f$.[11]

(29) **Constructing quantified noun phrase meaning:**

$$\cfrac{\begin{array}{c}\lambda P_{et}.\lambda Q_{et}.\exists x[P(x) \wedge Q(x)] : \\ (g_e \multimap g_t) \multimap (g_e \multimap f_t) \multimap f_t\end{array} \qquad \lambda x.dog(x) : g_e \multimap g_t}{\lambda Q_{et}.\exists x[dog(x) \wedge Q(x)] : (g_e \multimap f_t) \multimap f_t}$$

(30) **Finishing up the derivation:**

$$\cfrac{\begin{array}{c}\lambda Q_{et}.\exists x[dog(x) \wedge Q(x)] : \\ (g_e \multimap f_t) \multimap f_t\end{array} \qquad \begin{array}{c}\lambda x_e.\exists e_v[appear(e) \wedge \textsc{arg}1(e) = x] : \\ g_e \multimap f_t\end{array}}{\exists x_e[\exists e_v[appear(e) \wedge dog(x) \wedge \textsc{arg}1(e) = x]] : f_t}$$

(31) $$\begin{array}{|c|}\hline e,x \\ \hline \text{dog}(x) \\ \text{appear}(e) \\ \textsc{arg}1(e) = x \\ \hline \end{array}$$

[11]Reading: The typical case is that the scope of a quantifier corresponds to the f-structure index of the verbal spine (f in our case), but as functional uncertainty is used here, other nodes are in principle possible in more complex proofs.

4.4 Adjectives

Following the analysis presented in section 2, predicative adjectives are analysed as taking the subject as an argument and are themselves so-called XCOMP-PRED arguments of *to be*, thus generally following a raising analysis of predicatives. Attributives are treated as modifiers of a noun collected in an adjunct set. Under this analysis, adjectives are lexically ambiguous, captured by the template in Figure 3. This template highlights the novel Glue notation presented in Zymla et al. (2025), which allows for a "literal" notation of meaning constructors (i.e., not as AVM as in Dalrymple et al. 2020). They are delimited by an initial marker **:** $ and ended by a comma or by a final dot.

The main difference conveyed in this template is that an attributive adjective modifies a property of entities, whereas a predicative adjective modifies a property of events (essentially, the event predicate that identifies the event variable introduced by the copula).[12] The two possibilities are constrained by an ATYPE attribute that is associated with the underlying syntactic positions. To pass down the attribute from the syntax to the lexicon, we use parameterized rules. The NP rule in Figure 2 illustrates this. Analogously, the VP rule introduces the PREDICATIVE parameter.

```
NP -->  (D: ^=!)
        AP[attributive]*: ! $ (^ ADJ);
        (NMod: ! $ (^ MOD))
        N: ^=!;
```

Figure 2: Parameterized NP rule in XLE notation

In section 2, we explained that the comparative marker is represented as a modifier (adjunct) of the adjective in the f-structure. This adjunct can further take an oblique comparative (OBL_{compar}) as an argument, which is contributed by an optional *than*- or *as*-clause.[13] These OBL_{compar} are defined in the CPComp rule in (32). The CComp is either *than* for comparatives or *as* for equatives. For the latter, the first instance of *as* is a different word class, namely an ADVComp, which attaches as an adjunct before the adjective and takes the OBL_{compar} as an argument. Further, as mentioned before, comparatives syntactically allow both phrasal ("than the dog") and clausal ("than the dog is tall") complements. This is reflected in the rule in (32), where either can be the object of the CComp.

(32)
$$\text{CPComp} \rightarrow \underset{\uparrow = \downarrow}{\text{CComp}} \left\{ \begin{array}{c} \text{NP} \\ (\uparrow \text{OBJ}) = \downarrow \\ (\downarrow \text{CASE}) = \text{ACC} \end{array} \middle| \begin{array}{c} \text{S} \\ (\uparrow \text{OBJ}) = \downarrow \\ \end{array} \right\}$$

[12]This analysis patterns with examples like the following.

(i) Sam is a beautiful dancer.

There, *beautiful* can be interpreted intersectively, or as modifying the underlying event. By adding a corresponding axiom linking the subject of the event to the adjectival description, we assume both (rather than an ambiguity). We leave a more refined analysis for future work.

[13]We treat them as complement clauses, but nothing hinges on this exact classification.

```
DEFAULT-ADJ-SEM(P)  = { @(PRED P)
                (^ ATYPE) =c attributive
                s::(ADJ $ ^) = %s
                :$ lam(X,drs([],[pred('P',X)])) : (s::^_e -o s::^_t),
                :$ lam(Q,lam(R,lam(X,merge(app(Q,X),app(R,X))))) :
                ((s::^_e -o s::^_t) -o ((%s_e -o %s_t) -o
                (%s_e -o %s_t))) || noscope,
                |
                (^PRED) = 'P<(^SUBJ)>'
                (^ ATYPE) =c predicative
                (s::(XCOMP-PRED ^) EV) = %s
                :$ lam(X,drs([],[pred('P',X)])) : (s::^_v -o s::^_t),
                :$ lam(Q,lam(R,lam(X,merge(app(Q,X),app(R,X))))) :
                ((s::^_v -o s::^_t) -o ((%s_v -o %s_t) -o
                (%s_v -o %s_t))) || noscope,
                }.
```

Figure 3: Co-descriptive entry for adjectives in XLE notation

4.5 Enriching adjective semantics via description-by-analysis

The presented grammar is designed to deal with the compositional aspects of semantic meaning. However, as explained in section 3, adjectives, particularly gradable ones, are highly context sensitive. We partially capture this by adding a layer of description-by-analysis (DBA) rules, the benefits of which are further explained in section 4.7. For this, we use LiGER (Zymla et al. 2025), which models DBA as a set of ordered rewrite rules, similar to Crouch & King's (2006) rewrite semantics. These rules are used on the one hand to establish additional semantic structure (s-structure) and on the other hand to introduce meaning constructors. LiGER treats the output of XLE as a directed (acyclic) graph and the left-hand side of a rule (which we call a query) must match this graph to apply. `#a...#z` are variables over graph nodes, usually f-structure indices, but also possibly indices of, e.g., s-structure. `%a...%z` are variables over strings, usually attribute values (including PRED values), which are encoded as AVMs attached to the underlying graph's nodes. Thus, the following query matches with an f-structure that has an XCOMP-PRED and that has a semantic structure specifying the index of its event variable (see the f-structure in Figure 7).

(33) `#x XCOMP-PRED #a & #x s:: #y EV #z &`
`#a ATYPE 'predicative'`

To analyze a degree adjective, we begin with type-raising it to a higher type including degrees, i.e., from $< e, t >$ to $< d, et >$. This is illustrated in Figure 4. The antecedent of this rule searches for a a sub-graph of an f-structure that describes a predicative use of a degree adjective (as in (33)). Given that such a structure is found, the rule specifies a semantic structure (indicated via `s::`) for the adjective consisting of a DEGREE attribute and a DEGREE-HOLDER attribute. Furthermore, it adds a meaning constructor that consumes the corresponding semantic description and introduces a new one carrying a degree variable.[14] On the meaning side of the MC, we use the LiGER-

[14]We implement type-raising in this way to keep the the core semantics and the DBA rules independent.

specific predicate strip/1 which, given a PRED-value, returns a string of the same PRED-value without subcategorization information, i.e., just the PRED-value's stem.

```
//predicative
#x XCOMP-PRED #a & #x s:: #y EV #z &
#a ATYPE 'predicative' & #a SEMTYPE 'degree' & #a PRED %a &  #a s:: #s
==> & #s DEGREE #d & #s DEGREE-HOLDER #z &
    #p GLUE lam(P,lam(D,lam(X,drs([],[rel(strip(%a),X,D)])))) :
    ((#s_v -o #s_t) -o (#d_d -o (#s_v -o #s_t))).
```

Figure 4: DBA-rule for type-raising predicative adjectives

Next, we can specify rules that correspond to the different possible realizations of gradable adjectives, i.e., their POSITIVE, COMPARATIVE, and SUPERLATIVE use.[15] Generally, these rules serve as degree closure, binding the degree variable of a gradable adjective. However, the three closure operations are mutually exclusive. For example, the POSITIVE use of a gradable adjective is closed off by the rule in 5.

```
//predicative
#x XCOMP-PRED #a PRED %a & #x SUBJ #y PRED %y &
#a s:: #b DEGREE #d & #b DEGREE-HOLDER #e
==> #d GLUE lam(P,merge(drs([D:d],[]),merge(drs([],[eq(th_strip(%a)
    ('strip(%y)'),D)]),app(P,D)))) : ((#d_d -o #e_t) -o #e_t) ||
    noscope.
```

Figure 5: Rule for positive interpretation of gradable adjectives

This rule applies just in case there exists a predicative adjective that has a DEGREE attribute and a holder of that degree in its s-structure. In the case of the predicative use, the degree is held by the event variable rather than an entity (see Figure 4). This means that a predicatively used adjective introduces an event predicate corresponding to a potentially temporary state during which the adjective is true of the subject of the predicative adjective.[16] The DEGREE and DEGREE-HOLDER attribute have been introduced by the previously discussed type-raising rule, highlighting the incremental nature of these rules. Consequently, this rule only triggers if a suitable degree expression requires POSITIVE closure. Generally, the closure rules check for the information contributed by the morphological component for a given adjective (see section 2). As discussed in section 3.1, the semantics for the POSITIVE closure rule state that the degree in question is

[15]In this paper, we do not provide an analysis of the superlative, which is compositionally challenging due to its inherent ambiguity regarding its comparison class. This ambiguity is arguably mediated by focus, further complicating the analysis.

[16]This approach is necessary (for our semantics) to permit the ambiguity in sentences like "Every dog is faster than a cat". More generally, if a predicative adjective would modify the subject directly, it would always be trapped in the restrictor of the corresponding quantifier. This leads to a situation where the corresponding quantifier cannot outscope a quantifier in a potential comparative clause. The relation between the subject of the predicative and the adjective is established via a meaning postulate that asserts the following correspondence: $adj(e) \wedge be(e) \wedge arg1(e) = x \rightarrow adj(x)$. If a predicative eventuality is modified by an adjective, then the first argument of that eventuality has the property described by the adjective. Admittedly, this is a technical trick, rather than a sophisticated compositional analysis.

larger than a contextual standard, namely the one which is contributed by the modified noun. Thus, in *fast computer*, the comparison class is described by $\theta_{fast}(computer)$. For the sake of our implementation, we assume this to be a constant that can be ordered relative to other standards.[17]

The simplified rule in Figure 6 exemplifies how we deal with comparatives.[18] Similar to the POSITIVE closure-rule, this rule searches for an f-structure of an adjective marked for comparative use with a corresponding s-structure containing a DEGREE attribute and a DEGREE-HOLDER attribute. It also checks whether the comparison class has been explicitly specified via a comparative clause by searching for an OBL_{compar} in the f-structure. In this context, the basic MC for comparative constructions according to the P-not-P analysis is applied.

As already stated, this rule competes with the previously introduced rule for POSITIVE closure (recall also example (19) and the accompanying discussion in section 3.1). This is achieved by both of them aiming to attach an MC to the degree node of the modified adjective (in our rules `#d`). This ensures that positive uses and comparative uses are mutually exclusive.[19]

```
#h DEGREE 'comparative' & #h s:: #b DEGREE #d & #b DEGREE-HOLDER #e &
& #h ADJ #a in_set #o OBL-COMPAR #i OBJ #j
==> #d GLUE \R.\x.\y.Ed[R(d)(x)&~R(d)(y)] :
    ((#g_d -o (#g_e -o #f_t)) -o (#g_e -o (#j_e -o #f_t)))
```

Figure 6: Simplified rule for the comparative

4.6 Example derivation

We present the analysis of the comparative sentence in (34). The semantic derivation process is parallel to the one presented in section 4.3. Thus, we first build the semantics of the predicative construction. The subject or degree holder is saturated by an assumption that is later discharged during combination with the NP *the PC-6082*, making sure that *the* has wide scope.[20] The predicative component of the proof is built twice, once for the subject and once for the comparison class which requires saturation by the object of the OBL_{compar}. Furthermore, its event variable is also saturated by the comparative semantics. Finally, the comparative semantics existentially close their degree variables.

[17]Fixing the constant in this way helps avoid the Sorites paradox , but it leaves underspecified the exact nature of these constants and how they are calculated (see Kennedy 2007 for discussion)

[18]In section 4.6, we present the DRT version of the meaning constructor, which is more complex as it is couched in an event semantics. However, the overall idea remains the same. It is noteworthy that the DRT meaning constructor is more general, as the semantics for the main clause and the comparative clause are constructed separately, rather than sharing the predication of the adjective. This is necessary anyway, as discussed in section 3.1 for cases like the following:

(i) The elephant is taller than the house is wide.

[19]To be precise, the comparative closure rule overwrites the positive closure rule as it is more specific by virtue of checking for COMPARATIVE morphology in the f-structure.

[20]For *the* this is not strictly necessary as the wide scope of *the* could also be modeled via presupposition resolution in the sense of Van der Sandt (1992).

$$
f\left[\begin{array}{lll}
\text{PRED 'be}<(\uparrow \text{ XCOMP-PRED})>\text{PC-6082'} & & \\
\text{SUBJ} & g & \left[\begin{array}{ll}\text{PRED 'PC-6082'} & \\ \text{SPEC} & \left[\text{PRED 'the'}\right]\end{array}\right] \\
\text{XCOMP-PRED} & h & \left[\begin{array}{ll}
\text{PRED 'fast}<(\uparrow \text{ SUBJ})>\text{'} & \\
\text{SUBJ} & \left[g\right] \\
\text{ADJ} & \left\{\left[\begin{array}{lll}
\text{PRED 'more}<(\uparrow \text{ OBL}_{compar})>\text{'} & & \\
\text{OBL}_{compar} & i & \left[\begin{array}{lll}
\text{PRED 'than}<(\uparrow \text{ OBJ})>\text{'} & & \\
\text{OBJ} & j & \left[\begin{array}{ll}
\text{PRED 'computer'} & \\
\text{MOD} & \left\{\left[\begin{array}{l}\text{PRED 'ITEL'} \\ \text{TYPE kind}\end{array}\right]\right\} \\
\text{SPEC} & \left[\text{PRED 'every'}\right]
\end{array}\right]
\end{array}\right]
\end{array}\right]\right\} \\
\text{DEGREE comparative, ATYPE predicative} &
\end{array}\right]
\end{array}\right]
$$

Figure 7: F-structure for *The PC-6082 is faster than every ITEL computer*

(34) The PC-6082 is faster than every ITEL computer.

(35) a. $\textbf{fast}_{\textbf{PC-6082}}$: $\lambda\delta.\lambda e.\begin{array}{|c|}\hline \\ \hline \text{be}(e) \\ \text{fast}(e,\delta) \\ \text{ARG1}(e)\text{=X} \\ \hline\end{array} : g_d \multimap e_v \multimap h_t$

b. $\textbf{fast}_{\textbf{EVERY ITEL COMPUTER}}$: $\lambda\delta.\lambda e.\begin{array}{|c|}\hline \\ \hline \text{fast}(e,\delta) \\ \text{ARG1}(e)\text{=Y} \\ \hline\end{array} : j_d \multimap c_v \multimap i_t$

c. $\lambda P.\lambda Q.\lambda e.\begin{array}{|c|}\hline \delta \\ \hline \\ \hline\end{array} \oplus P(\delta)(e) \oplus \begin{array}{|c|}\hline \\ \hline \neg \begin{array}{|c|}\hline e' \\ \hline \\ \hline\end{array} \oplus Q(\delta)(e') \\ \hline\end{array} :$

$(g_d \multimap e_v \multimap h_t) \multimap (j_d \multimap c_v \multimap i_t) \multimap (e_v \multimap h_t)$

Event closure is applied to the result of combining these elements, after which the quantifiers can be applied. As mentioned above, the definite takes wide scope, while the universal, here modeled via implication (see Bos 2008), takes narrow scope. However, in general, our analysis is compatible with quantifier ambiguity, as the semantics of the comparative are simply part of a complex event description.

The resulting DRS, as produced by the computational system, is shown in Figure 8. It states that there is an instance (`x2`; an event) of being fast to a degree `x5` for the PC-6082 (`x3`), and that there is no instance of an event such that an ITEL computer (`x1`) is fast to that degree. In section 5, we describe the reasoning component on the basis of FraCaS example that it belongs to:

```
 _______________________________________________
| x3                                            |
|-----------------------------------------------|
| x3 = pc-6082                                  |
|  _______________       ______________________ |
| | x1            |     | x2 x5                ||
| |---------------|     |----------------------||
| | kind(itel,x1) | ==> | fast(x2,x5)          ||
| | computer(x1)  |     |       _____________  ||
| |_______________|     |      | x4          | ||
|                       | __   |-------------| ||
|                       |   |  | fast(x4,x5) | ||
|                       |      | arg1(x4,x1) | ||
|                       |      |_____________| ||
|                       | be(x2)               ||
|                       | arg1(x2,x3)          ||
|                       |______________________||
|_______________________________________________|
```

Figure 8: DRS for *The PC-6082 is faster than every ITEL computer*

(36)
The PC-6082 is faster than every ITEL computer.
The ITEL-ZX is an ITEL computer.
Is the PC-6082 faster than the ITEL-ZX? → YES

4.7 Hybrid grammars for analysis prototyping

In principle, both DBA and co-descriptive semantics can be used to build the semantic representations presented here. However, adding meaning constructors to a grammar can considerably increase its complexity, leading to potential challenges during debugging. One such case is meaning constructors that introduce functional uncertainties, such as quantifiers. As in XLE+Glue (Dalrymple et al. 2020; Zymla et al. 2025), meaning constructors are essentially resolved in the same way as f-structures. Thus, adding meaning constructors thoughtlessly can make resolving functional annotations untenable.[21] By disentangling f-structure and meaning constructor creation, the two systems are computationally easier to maintain. Furthermore, since the rewrite system, LiGER, can then operate on fully assembled f-structures, the search space for its queries is much smaller than for functional annotations in an XLE+Glue grammar. In other words, it is easier to resolve a query in LiGER than to resolve a complex set of functional and semantic annotations to find corresponding f-structures with attached MCs.[22] Given all this, we briefly want to highlight that using DBA to test analyses can help analyze generalizations without having to implement large-scale grammar changes, making DBA

[21]One could alternatively opt for quantified linear logic (i.e., first-order Glue; Kokkonidis 2008), but that leads to different issues in devising efficient Glue provers (Lev 2007; Zymla 2024a).

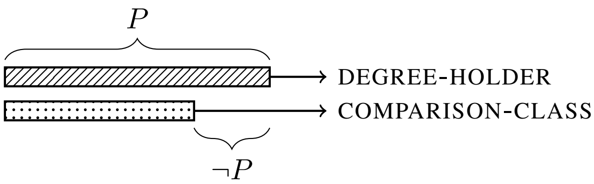
[22]Yet another way to look at this is via the notion of constructive vs. non-constructive constraints (see Crouch et al. 2017 on function application and uncertainty).

ideal for testing the computational implementation of new analyses, and helping to disentangle complexities by making certain MCs non-constructive.

5 Reasoning with XLE+Glue

As indicated in section 3, reasoning about degrees requires additional non-compositional axioms to fall out correctly. To make this clearer, consider the comparative semantics we employ. It is based on the P-not-P-analysis, intuitively indicating that the subject holds a degree that the comparison class does not. However, this alone is true whether the subject's degree is larger or smaller than that of the comparison class. More precisely, we want to encode that the subject *reaches* a degree that the comparison class does not reach. Example (37) (adapted from Haruta et al. 2022) illustrates this. Essentially, the comparative is true if there is a degree in *P* that describes the degree the subject holds that is in the $\neg P$-range for the comparison class.

(37)



As explained in section 3, to express this we need to capture that degrees are *monotonic* and have an *upper bound*. As described in Haruta et al. (2022), these properties can be reduced to a single postulate, the consistency postulate , which we trigger via the following rewrite rule when a comparative is present.

(38) `#a PRED %adj #a DEGREE 'comparative' ==>`
`#a AXIOM` $\forall x \forall y[\exists\delta[\%\text{adj}(x,\delta) \wedge \neg\%\text{adj}(y,\delta)] \rightarrow \forall\delta[\%\text{adj}(y,\delta) \rightarrow \%\text{adj}(x,\delta)]].$

Given a comparative adjective, this rule attaches the axiom to the linguistic structure of the input sentence that triggers it. More concretely, axioms are stored in a separate AXIOM attribute that, similar to the GLUE attribute, flags the information for collection in an axiom set. Note that the axiom is not higher-order as we use the adjective's PRED-value to instantiate the axiom to the case of the adjective present in the input.

Similar to the different types of degree closure discussed in section 4, we also introduce different axioms for the positive use of gradable adjectives as they are not covered by the consistency postulate, but require the more fine-grained *monotonicity* and *upper bound* axioms introduced in section 3. More generally, different syntactic constructions may require different axioms for reasoning. Another way of conceptualizing this is as an activation process, where different aspects of knowledge are primed depending on the problem that is reasoned about. Thus, while it would be possible to have a massive static database of axioms that is called upon for every reasoning step, modeling axiomatic knowledge dynamically makes individual proofs and reasoning steps easier to track and reduces the search space for the automated theorem prover. Together with the DBA-component of the grammar, this also allows us to develop targeted grammars that are able to verify certain kinds of linguistic expressions and their effect on reasoning independently of obfuscating factors. For example, our grammar is heavily specialized to deal with degrees, but currently completely ignores tense and aspect. Thus, having corresponding information in the online processing of our semantic parser would be unnecessary and makes the outputs used, e.g for debugging, less easy to evaluate.

When an input is parsed in our semantic parser, the initially relevant axioms are controlled by LiGER and collected in a set that is attached to linguistic structure of the input sentence. For example, (38) attaches the axiom directly to the f-structure, but it could also be stored in the s-structure or even a separate axiom structure. During reasoning, the individual sentences are combined semantically and in terms of the relevant axioms. Essentially, the axiom set for reasoning is the union of the axiom sets of the individual sentences. Storing the axioms in a set provides a natural way to avoid duplicates.

5.1 Inference via discourse checks

Following Blackburn & Bos (2005), we decompose the NLI task into discourse checks for consistency and informativity. They are modeled as logic problems that are resolved via automated theorem proving with Vampire (Kovács & Voronkov 2013). Example (39) explains how the checks are formalized. In Blackburn & Bos (2005), the positive checks rely on model checking, i.e., they succeed when a model builder finds a model.[23] While we adopt this idea for the core semantics, semantics with non-finite domains, like degree semantics (which, here, make use of integers) are not compatible with it. In this case, discourse checks may remain undefined or only partially defined.[24]

(39) For some (set of conjoined) premise(s) p and a hypothesis q:

a.	$\neg(p \rightarrow q)$	(if model exists) +informative
b.	$p \rightarrow q$	$-$informative
c.	$p \wedge q$	(if model exists) +consistent
d.	$p \rightarrow \neg q$	$-$consistent

To solve this issue, we propose a more fine-grained heuristic for interpreting discourse checks that resolves *undefined* values via the pragmatic notion of *relevance*. Essentially, we assume that new contributions to a discourse are *consistent* and *informative* if we only have partial proof for it or no proof for the opposite.

We also take ambiguities into consideration. Concretely, we determine consistency and informativity by generalizing over all readings, accumulating average scores. Thus, the present approach selects the most likely interpretation to be the one that coincides with the most individual readings. The approach works well in a controlled setting such as the one presented here. However, we anticipate the need to refine this system in future work, e.g., by assigning probabilities to readings and pruning the dialog as it develops.

In example (40), we show how these checks map onto NLI labels: inconsistency is interpreted as a contradiction and if an utterance is consistent but not informative, it is entailed. Thus, it is straightforward to operationlize the discourse checks for reasoning.

[23] Vampire provides different proof search strategies, including model building, and proof by refutation.

[24] If a proof is undefined, it means that neither a negative nor a positive solution was found. Usually because the prover times out.

(40) NLI
- $+C$
  - $+I$ — **neutral**
  - $-I$ — **entailment**
- $-C$ — **contradiction**

5.2 Putting it all together

We alluded to treating NLI as a discourse update problem. When applying this to (36), we get two updates. The first update contributed by the second premise is neutral with respect to the initial premise, i.e., it is supposed to be informative and consistent. However, as explained in the previous section, due to the circumstances imposed by reasoning with degrees, the output, as shown in Table 1, is not fully specified ($+$ indicates satisfiability, $-$ indicates refutation, and $?$ indicates that the result is undefined). From the result of the prover we cannot infer either consistency or inconsistency as satisfiability of the negative consistency check merely means that inconsistency is a possibility not a necessity (consequently, the negative consistency check is really only informative when it fails). However, we have partial results for determining informativity. Concretely, we show that the prover finds a proof indicating that the second premise does not follow from the first.[25] As previously explained, we rely on the maxim of relevance to intrepret such partial results. In this case, we accept the update. Thus, we conjoin the two premises to serve as single premise for the second update (i.e., the original problem from the FraCaS testsuite).

	$+$consistent	$-$consistent	$+$informative	$-$informative
Termination reason	?	$+$	$+$	?
SZS status	?	$+$	$+$	?

Table 1: Update 1

The second update, the conclusion of (36), should be uninformative (and, thus entailed). This is partially captured by the theorem prover, as shown in Table 2. Thus, we graciously interpret the update as intended, providing the correct NLI label.

	$+$consistent	$-$consistent	$+$informative	$-$informative
Termination reason	?	?	$-$	?
SZS status	?	?	$-$	?

Table 2: Update 2

As this example highlights, theorem proving faces challenges when dealing with complex semantic domains. By adapting the underlying heuristic, we can capture these examples. However, a quantitative exploration is necessary to make sure that our system

[25] In the future, we want to explore additional or alternative tests for different reasoning domains as well as adding a confidence value based on how expressive the prover's outputs are. Generally, refutation of a discourse check is the most expressive result, as it makes the strongest generalization over possible situations described by a proof. Satisfiability is less expressive, as it does not generalize over situations, and it is clear that an undefined result is impossible to interpret on logical grounds.

generally makes the correct predictions. As proposed here, we believe that pragmatic principles are a fruitful avenue for further research (see also Blackburn & Bos 2005).

6 Conclusion

In the past few years, XLE+Glue has spurred the exploration of semantic parsing based on LFG principles and formalizations. However, the focus has been strictly on the syntax/semantics interface. While this has contributed to the development of novel analyses regarding the syntax/semantics interface (e.g., Przepiórkowski & Patejuk 2023), the adequacy of the resulting semantics remains untested. This is particularly unsatisfying from a computational perspective, but arguably goes against the holistic approach to LFG as a form-to-meaning mapping more generally.

The present paper aims to close this gap by interfacing XLE+Glue with an inference component. The system highlights the interaction between compositional and non-compositional meaning, which can be seen as a necessary step to incorporate pragmatics into the LFG framework. Correspondingly, we base our approach to reasoning on the discourse checks of *consistency* and *informativity*. We have illustrated how their expressiveness could be extended to deal with complex reasoning problems by invoking the maxim of relevance, although this warrants some more rigorous testing.

The work presented here is implemented as part of XLE+Glue. Correspondingly, we provide an XLE+Glue grammar of English that illustrates the system with a focus on the interpretation of gradable adjectives, as a test case for more complex reasoning. The result is a layered approach to semantic parsing that shows how XLE+Glue grammars can be incrementally extended without violating certain core properties, providing various avenues for future work.

The analysis of gradable adjectives presented in this paper is targeted towards examples from the FraCaS testsuite. However, there is certainly more to be said there. A particularly interesting avenue for future work is the superlative construction, which is challenging due to its subtle interaction with context.

All in all, we lay the foundation for task-oriented semantic parsing within some recently developed computational LFG tools. Thus, we provide an analysis that takes the mapping from form to meaning seriously and that opens up promising new directions for research.

References

Andrews, Avery. 1983. A note on the constituent structure of modifiers. *Linguistic Inquiry* 14(4). 695–697. https://www.jstor.org/stable/4178355.

Andrews, Avery D. 2018. Sets, heads, and spreading in LFG. *Journal of Language Modelling* 6(1). 1–53. https://doi.org/10.15398/jlm.v6i1.175.

Asudeh, Ash & Gianluca Giorgolo. 2012. Flexible composition for optional and derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'12 Conference*, 64–84. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2012/papers/lfg12asudehgiorgolo.pdf.

Beesley, Kenneth R. & Lauri Karttunen. 2003. *Finite state morphology*. Stanford: CSLI Publications.

Bhatt, Rajesh & Shoichi Takahashi. 2011. Reduced and unreduced phrasal comparatives. *Natural Language & Linguistic Theory* 29(3). 581–620. https://doi.org/doi:10.1007/s11049-011-9137-1.

Blackburn, Patrick & Johan Bos. 2005. *Representation and inference for natural language: A first course in computational semantics*. Stanford: Center for the Study of Language and Information.

Bos, Johan. 2008. Wide-coverage semantic analysis with Boxer. In Johan Bos & Rodolfo Delmonte (eds.), *Semantics in text processing. STEP 2008 conference proceedings*, 277–286. College Publications. https://aclanthology.org/W08-2222/.

Bresnan, Joan W. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4(3). 275–343. url:https://www.jstor.org/stable/4177775.

Butt, Miriam, Helge Dyvik, Tracy Holloway King, Hiroshi Masuichi & Christian Rohrer. 2002. The Parallel Grammar project. In *COLING-02: Grammar engineering and evaluation*. https://aclanthology.org/W02-1503/.

Butt, Miriam, Tracy Holloway King, María-Eugenia Niño & Frédérique Segond. 1999. *A grammar writer's cookbook*. Stanford: CSLI Publications.

Cooper, Robin, Dick Crouch, Jan van Eijck, Chris Fox, Josef van Genabith, Jan Jaspars, Hans Kamp, David Milward, Manfred Pinkal, Massimo Poesio & Steve Pulman. 1996. Using the framework. Tech. Rep. LRE 62-051 D-16 The FraCaS Consortium.

Cresswell, Max J. 1976. The semantics of degree. In Barbara H. Partee (ed.), *Montague grammar*, 261–292. Elsevier.

Crouch, Dick, Mary Dalrymple, Ronald M. Kaplan, Tracy Holloway King, John T. Maxwell III & Paula Newman. 2017. *XLE documentation*. Palo Alto Research Center, https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/xle_toc.html.

Crouch, Richard & Tracy Holloway King. 2006. Semantics via f-structure rewriting. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'06 conference*, 145–165. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2006/pdfs/lfg06crouchking.pdf.

Dalrymple, Mary. 1999. *Semantics and syntax in Lexical Functional Grammar: The resource logic approach*. Cambridge, MA: The MIT Press.

Dalrymple, Mary. 2001. *Lexical Functional Grammar* (Syntax and Semantics 34). New York: Academic Press. https://doi.org/10.1163/9781849500104.

Dalrymple, Mary, Agnieszka Patejuk & Mark-Matthias Zymla. 2020. XLE+Glue – a new tool for integrating semantic analysis in XLE. In Miriam Butt & Ida Toivonen (eds.), *Proceedings of the LFG'20 Conference*, 89–108. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG-2020/lfg2020-dpz.pdf.

Findlay, Jamie Y. 2020. Mapping Theory and the anatomy of a verbal lexical entry. In Miriam Butt & Ida Toivonen (eds.), *Proceedings of the LFG'20 Conference*, 127–147. Stanford: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2020/lfg2020-findlay.pdf.

Findlay, Jamie Y. & Dag T. T. Haug. 2022. Managing scope ambiguities in Glue via multistage proving. In Miriam Butt, Jamie Y Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'22 Conference*, 144–163. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/18.

Haruta, Izumi, Koji Mineshima & Daisuke Bekki. 2022. Implementing Natural Language Inference for comparatives. *Journal of Language Modelling* 10(1). 139–191. https://doi.org/10.15398/jlm.v10i1.294.

Haug, Dag. 2008. Tense and aspect for Glue semantics: the case of participial XADJs. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'08 Conference*, 291–311. Stanford, CA: CSLI Publications. http://web.stanford.edu/group/cslipublications/cslipublications/LFG/13/papers/lfg08haug.pdf.

Kennedy, Christopher. 2007. Vagueness and grammar: The semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy* 30(1). 1–45. https://doi.org/10.1007/s10988-006-9008-0.

Kennedy, Christopher & Louise McNally. 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 81(2). 345–381. https://doi.org/10.1353/lan.2005.0071.

Klein, Ewan. 1980. A semantics for positive and comparative adjectives. *Linguistics and Philosophy* 4(1). 1–45. https://doi.org/10.1007/BF00351812.

Klein, Ewan. 1982. The interpretation of adjectival comparatives. *Journal of Linguistics* 18(1). 113–136. https://doi.org/10.1017/S0022226700007271.

Kokkonidis, Miltiadis. 2008. First-Order Glue. *Journal of Logic, Language and Information* 17(1). 43–68. https://doi.org/doi:10.1007/s10849-006-9031-0.

Kovács, Laura & Andrei Voronkov. 2013. First-order theorem proving and VAMPIRE. In Natasha Sharygina & Helmut Veith (eds.), *International Conference on Computer Aided Verification (CAV 2013)* (Lecture Notes in Computer Science 8044), 1–35. Springer. https://doi.org/10.1007/978-3-642-39799-8_1.

Lev, Iddo. 2007. *Packed computation of exact meaning representations*. Ph.D. thesis, Stanford University.

Meßmer, Moritz & Mark-Matthias Zymla. 2018. The Glue semantics workbench: a modular toolkit for exploring linear logic and Glue semantics. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'18 Conference*, 249–263. Stanford, CA: CSLI Publications. https://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG-2018/lfg2018-messmer-zymla.pdf.

Parsons, Terence. 1990. *Events in the semantics of English*. Cambridge, MA: The MIT Press.

Przepiórkowski, Adam & Agnieszka Patejuk. 2023. Filling gaps with Glue. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'23 Conference*, 223–240. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/41.

Schwarzschild, Roger. 2008. The semantics of comparatives and other degree constructions. *Language and Linguistics Compass* 2(2). 308–331. https://doi.org/10.1111/j.1749-818X.2007.00049.x.

Van der Sandt, Rob A. 1992. Presupposition projection as anaphora resolution. *Journal of Semantics* 9(4). 333–377. https://doi.org/10.1093/jos/9.4.333.

Zymla, Mark-Matthias. 2017. Cross-linguistically viable treatment of tense and aspect in parallel grammar development. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG'17 Conference*. Konstanz: CSLI Publications. https://typo.uni-konstanz.de/lfg-proceedings/LFGprocCSLI/LFG2017/lfg2017-zymla-sulger.pdf.

Zymla, Mark-Matthias. 2024a. Ambiguity management in computational Glue semantics. In Miriam Butt, Jamie Y. Findlay & Ida Toivonen (eds.), *Proceedings of the LFG'24 Conference*, 285–310. Konstanz: PubliKon. https://lfg-proceedings.org/lfg/index.php/main/article/view/59/41.

Zymla, Mark-Matthias. 2024b. *Tense and aspect in multilingual semantic construction*. Ph.D. thesis, University of Konstanz.

Zymla, Mark-Matthias, Mary Dalrymple & Agnieszka Patejuk. 2025. Computational semantic tools for Glue semantics. In *Proceedings of the 16th International Conference on Computational Semantics (IWCS 2025)*, 189–207. Düsseldorf: Association for Computational Linguistics. https://aclanthology.org/2025.iwcs-main.18/.