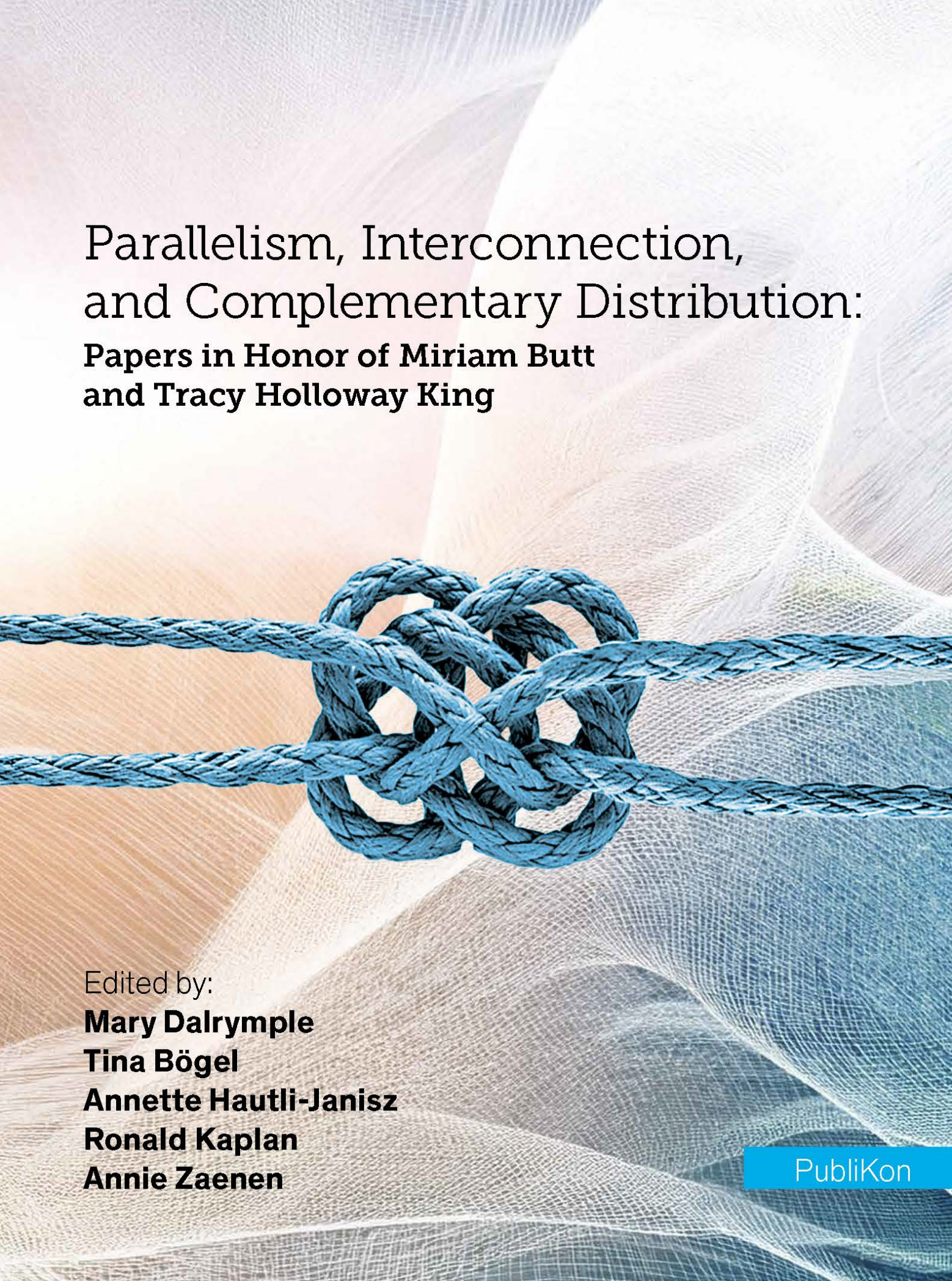




# Parallelism, Interconnection, and Complementary Distribution: Papers in Honor of Miriam Butt and Tracy Holloway King

Edited by:

**Mary Dalrymple**

**Tina Bögel**

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## Introduction

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This volume is a Festschrift in honor of Miriam Butt and Tracy Holloway King, two long-standing colleagues and friends, who have made substantial contributions to theoretical and computational linguistics, particularly within the framework of Lexical Functional Grammar (LFG). The volume brings together work by colleagues, collaborators, and students who have been influenced by their ideas, mentorship, scholarly practice, and friendship from their early academic days at Stanford and continuing in their subsequent roles as leading community members in LFG and ParGram.

### 1 A shared view on (computational) linguistics

Miriam Butt and Tracy Holloway King share a view of linguistics that is grounded in careful empirical work, formal precision, and a strong commitment to cross-linguistic breadth of analysis. Their work consistently treats linguistic theory as accountable both to detailed data and to explicit models. In particular, they have emphasized the importance of grammar architectures that separate levels of representation, while allowing them to interact in constrained and interpretable ways. This perspective has influenced not only research in syntax and morphology, but also work at the interfaces with semantics, prosody, and information structure. At the same time, both have argued that theoretical linguistics and computational linguistics are mutually informative. Their work in LFG and ParGram demonstrates that formally explicit grammatical theories can support the creation of broad-coverage, practically useful grammatical descriptions of multiple languages and that computational models of the messy facts of individual languages can lead to new theoretical insights.

### 2 A shared history

Miriam and Tracy have collaborated closely over many years, starting from their time together as PhD students at Stanford. They have coauthored insightful and influential papers on a range of topics: three illustrative examples are their early paper on topic and focus (Butt & King 1996), the 1999 *Grammar Writer's Cookbook* that Miriam and Tracy coauthored with Frédérique Segond and María-Eugenia Niño (Butt et al. 1999), gathering the collective wisdom of the grammar writers working on the ParGram English, French, and German grammars, and their later paper on the status of grammatical case (Butt & King 2004). They have also jointly edited many volumes; their first coedited volume was published

in 1994 (Butt et al. 1994), and subsequent collections have been seminal to LFG research: *Argument Realization* (Butt & King 2000); *Time over Matter: Diachronic Perspectives on Morphosyntax* (Butt & King 2001); *Nominals: Inside and Out* (Butt & King 2003); *Lexical Semantics in LFG* (Butt & King 2006). Much of this work has been centered on the development and application of LFG, documenting theoretical advances, large-scale grammatical analyses, and computational implementations. Their joint work exemplifies a sustained intellectual partnership built on shared questions, complementary expertise, and a commitment to collaborative scholarship.

Their collaboration has also been institutional and community-oriented. Together, they have played key roles in shaping the LFG research community by organizing conferences and workshops, editing proceedings and journals, and fostering connections between theoretical linguists and computational researchers. They were instrumental in organizing the first LFG conference in Grenoble in 1996, taking on many of the organizational duties, including editing the proceedings. They continued editing the LFG conference proceedings together until 2018, and Miriam continued until 2025. For many years they were in charge of sending out the conference announcements, organizing the reviews of the abstracts and the submissions to the proceedings, and generally being repositories of community knowledge and practice. They were pioneers of open-access publishing, making the LFG literature available and accessible to a wide audience, and they have strengthened the LFG literature by getting manuscripts and chapters ready for publication, arranging for reviews, providing comments and feedback on the analyses, and suggesting research directions. The proceedings and the volumes which they edited have defined LFG research for the past three decades, and our LFG community would not exist without them.

Both are fantastic hosts: at the yearly PARC ParGram meetings, Tracy would always invite everyone to a party at her house, and Miriam's house is frequently home to linguists dropping by Konstanz. Their shared anxiety of making phone calls is legendary<sup>1</sup> and so is their appreciation of time-zone differences: between Mountain View and Konstanz 'you get twice the work done' in 24 hours. Their complementary position in time is paralleled by their different perceptions of the notion of 'time': Tracy, running like clockwork, would provide the exact counterpart to the often last-minute (not to say 'late') Miriam. Tracy, who is very adept at bossing Miriam into meeting a deadline, is matched by Miriam's unrivaled ability to push through sleepless nights. For many years we have been amused by their bickering like an old couple (specifically while cooking), especially because their collaboration is so harmonious in all other aspects.

### 3 Individual paths

Tracy's work spans theoretical linguistics, grammar engineering, and applied language technology. She received her undergraduate degree in Slavic Linguistics from MIT and her PhD from Stanford in 1993. Her dissertation examined how word order, topic, and focus interact in Russian, and she later collaborated with Steven Franks on a seminal work on Slavic clitics (Franks & King 2000). After her PhD she spent a year as a Fulbright Scholar in Tbilisi, Georgia, and in 1995 she joined the Natural Language Theory and Technology (NLTT) group at the Xerox Palo Alto Research Center (PARC). While carrying out her pioneering theoretical work on constituent structure (focusing on Slavic languages) and information structure, she also took on the practical challenge of transforming a research-scale grammar of English into an industrial-level artifact that could be used in language processing applications like information retrieval and translation. Her work bridged the gap between theoretically informed models of language and the requirements of real-world syntactic analysis. She also served as "chairman" of the ParGram Feature Committee, and in that role she guided work on all of the ParGram languages and mentored several generations of grammar engineers. Her career eventually shifted more towards research management, but her current work on multimodal information retrieval is still informed by core insights from linguistics.

Miriam's path as an academic researcher began with her undergraduate degree in Language Studies and Computer Science from Wellesley College, and continued with her PhD from Stanford, also in 1993.

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<sup>1</sup>See Miriam's Featured Linguist interview from 2016 at <https://web.archive.org/web/20160808002728/http://blog.linguistlist.org/fund-drive/featured-linguist-miriam-butt/>

She then moved back to Europe, and after some stops in Tübingen, Stuttgart (with Christian Rohrer, who involved her in ParGram), and Manchester, she settled at the University of Konstanz, where she was part of several collaborative research projects, including her role as Speaker of two high-profile DFG-funded collaborative research networks. Her work is characterized by a deep theoretical engagement with morphosyntax, argument structure, and the syntax-semantics interface. Her treatment of complex predicates, case, and event structure in Urdu remains a reference for anyone new to the field. Her empirical linguistic work on various topics, not only in the context of ParGram, but also in Urdu/Hindi lexical semantics and framing in German, is driven by a strong motivation to advance linguistic theory. This also holds for fruitful collaboration with Visual Analytics, which has led to several third-party funded research projects. At the University of Konstanz, she has also mentored generations of students and researchers.

## 4 Overview of this volume

As expected, given the wide range of Miriam and Tracy’s interests and contributions, the papers in this volume cover various aspects of LFG and linguistic theory in general as well as documenting new phenomena, often in rarely studied languages. Throughout the volume, glosses follow the Leipzig Glossing Conventions (Bickel et al. 2015).

### 4.1 Part I: Syntactic structure and formal constraints: Morphosyntax and clause structure

‘Where does a GO verb go?’ by Kersti Börjars and Nigel Vincent examines the development of GO verbs across Germanic and Romance languages, focusing on the diachronic relationship between lexical verbs, light verbs, and auxiliary verbs. The central issues are the relationship between a light verb and its corresponding lexical verb, and the diachronic paths a light verb can follow. The authors distinguish between lexical verbs (full-meaning verbs that assign a thematic role to their subject), light verbs (vector verbs with reduced semantics that combine with another verb, sharing argument structure), and auxiliary verbs (verbs that combine with a VP, do not assign a thematic role, and express tense/aspect), which develop from lexical verbs via grammaticalisation. A key debate in the literature concerns whether light verbs are an intermediate stage on the path from lexical to auxiliary verb, or an independent category that can either develop further or remain diachronically stable and inert. The evidence and arguments presented in this paper support the latter position, in alignment with the single shared lexical entry analysis of Butt & Lahiri (2013).

‘Modelling negation in diachronic and cross-linguistic comparison: Negation in the history and structure of English and Bulgarian’ by Bozhil Hristov examines negation and related phenomena from a diachronic and cross-linguistic perspective, drawing primarily on data from English and Bulgarian at various historical stages. The central argument is that LFG, with its modular, lexicalist, and surface-oriented architecture, models these phenomena naturally. The basic f-structure for negation is stable across languages and periods; variation and change are located in c-structure rules and lexical constraints. This architecture naturally accommodates gradual change, coexisting variants, and language-specific or construction-specific exceptions — phenomena that are difficult to handle in more universalist, phrase-structure-heavy frameworks like Minimalism.

‘*Aan het puzzelen*: Accounting for the Dutch progressive *aan het* construction’ by Stephen M. Jones presents an LFG analysis of the Dutch *aan het* progressive construction – the structure used to express ongoing actions, as in *Zij is aan het lezen* (‘She is reading’). The central debate in the literature is whether the infinitive in this construction should be treated as a nominalisation (i.e., a verbal noun following the definite article *het*), or as a true verbal category. The paper argues against the nominalisation analysis and treats the construction as a complex verbal inflection. It introduces ‘AAN-HET’ as a new value of the *VFORM* feature. To handle the unusual positional constraints on the construction, it extends phrase structure rules developed for ‘the fourth construction’. The paper also addresses the historical origins of the construction. Overall, the paper demonstrates how LFG’s modular architecture – separating functional

and constituent structure and allowing fine-grained feature specifications – can provide a unified account of a construction that has resisted clean treatment as either a PP or a simple verbal form.

‘Drift, convergence, and the Ergative Cycle’ by Paul Kiparsky addresses three classic problems in historical linguistics – drift, convergence, and cyclic change – through the lens of Indo-Iranian case and agreement syntax. It proposes an OT-based (Optimality Theory) bias-driven model of language change as an alternative to traditional error-driven models. The author argues that language change is directional, driven by learners’ prior biases or expectations. These biases are formalized as violable OT constraints that define a “fitness landscape” that accounts for the drift of languages toward certain typological configurations and for changes that emerge independently across unrelated languages (convergence). The bias-driven, OT-based model of change explains why Indo-Iranian languages independently followed similar paths out of ergativity, why nominative/accusative syntax prevails in verb-agreeing languages, and why apparent unidirectional drifts are actually phases of larger, recurring cycles. This paper thus supports a view of language change as an evolutionary process constrained by the same principles governing grammar itself.

In ‘A Scandinavian argument for restructuring in pseudopassives’, Helge Lødrup adds a new variety to the Mainland Scandinavian collection of passive constructions, the PasPrePas. In this construction the passive verb is followed by a preposition and then an infinitive, with the subject corresponding to the internal argument of the second verb. He shows that the construction can be handled in LFG by a cascade of two restructuring operations, and that one of these operations can also account for restructuring in pseudopassives.

‘Double control in Sanskrit: An LFG analysis’ by John Lowe presents an LFG analysis of Sanskrit infinitival complement constructions, focusing on verbs like *śak* (‘can’) and *iṣ* (‘want’). He revises and expands his earlier analysis of these constructions, now treating all Sanskrit complement-control verbs as equi verbs with obligatory anaphoric control. In passive contexts, a second functional control relation operates simultaneously, producing ‘double control’. Lowe also shows that this phenomenon, though rarely described, is attested cross-linguistically.

In ‘Let’s talk about case in PPs...’, Agnieszka Patejuk discusses Polish coordination of two or more prepositions requiring different grammatical cases, in which the shared nominal object only needs to satisfy the case requirements of the closest preposition. The paper surveys three existing approaches to representing case in LFG, showing that none of them can handle this phenomenon. The proposed solution draws inspiration from Closest Conjunct Agreement (CCA), a well-known phenomenon where agreement targets can agree with the nearest conjunct rather than the whole coordinated phrase. Patejuk adapts the formal LFG machinery used for CCA (using a variant of f-precedence to identify the closest conjunct) to allow non-closest prepositions to optionally waive their case requirements when coordinated. The paper closes by acknowledging two open issues.

In ‘Mixed agreement vs. case assignment patterns’, Adam Przepiórkowski addresses an unusual and puzzling construction in North Slavic languages wherein agreement and case assignment interact in a non-uniform way, depending on the syntactic position of the whole phrase. The paper summarizes the author’s previous Minimalist analysis of this Mixed Agreement vs. Case Assignment construction, and develops a new account based in LFG. This account relies on three independently motivated components: (1) the dual adjectival/nominal nature of numerals, (2) the “expose the most marked case” principle, and (3) Caha’s case markedness hierarchy. These same components, implemented via Agree in Minimalism and subsumption-based concord in LFG, account not only for numeral-noun constructions but also for the “something interesting” construction in Polish and for collective numeral phrases as well.

In ‘Case-marking in Pitjantjatjara: Edge inflection and noun phrase structure’, Sasha Wilmoth and Rachel Nordlinger provide a unified LFG analysis of the case-marking system of Pitjantjatjara. The language represents a typologically unusual intermediate case in the cross-linguistic spectrum of case realization: its case markers are morphologically affixal but are positioned syntactically at the NP edge (similar to Turkish suspended affixation); unlike Turkish, however, they cannot take wide scope over coordination. This places Pitjantjatjara in a distinct position in the typology, having affixal edge inflection within (not projecting beyond) the NP. The authors distinguish two classes of markers, edge-inflected

case suffixes and postpositional clitics, and model both within LFG using a combination of partitioned lexical sharing, non-projecting words, and constructive case.

## 4.2 Part II: Syntax and its interfaces

‘Reconfiguring topic and focus in Russian’ by Danil Alekseev and Oleg Belyaev presents the first serious update to King’s influential LFG account of Russian, bringing it into alignment with the current parallel architecture of the framework. King (1995) argues that Russian is a discourse-configurational language. She divides the Russian clause into positional fields where all preverbal constituents are in discourse-marked positions. Alekseev and Belyaev identify some technical problems with King’s original formalization and propose corrections. But the main contribution of the paper is integrating King’s syntactic analysis with Bögel’s syntax-prosody interface framework within LFG’s parallel architecture. They make use of i-structure (information structure) as a separate projection and formalize the mapping between syntactic positions and Russian intonational contours. The paper identifies open challenges, in particular in analyzing certain types ofthetic sentences, and in accounting for certain unusual types of pitch accent patterns.

‘Prepositional marking of adjective phrases in Catalan’ by Alex Alsina proposes a formal analysis of the distribution of the preposition *de* before adjective phrases (APs) in Catalan. This adjectival *de* appears only under a highly specific conjunction of conditions. Alsina argues that the phenomenon cannot be accounted for by standard LFG c-structure rules alone, and instead proposes a licensing rule that simultaneously accesses c-structure, f-structure, and information structure (i-structure). This is similar in spirit to morphological rules in a lexicalist realizational approach, and in accordance with Alsina’s broader program of exploring ways in which word-formation rules use information from the syntactic context. Adjectival *de* is treated as a kind of syntactically conditioned morphological exponent. The analysis aims to illustrate that the boundary between morphology and syntax is porous: the same type of rule that licenses inflectional morphology on the basis of syntactic information can also license a specific word in a specific c-structure position.

‘The morphosyntax of information structure’ by Asudeh and Siddiqi examines how information structure (i-structure) influences morphosyntactic exponence within the L<sub>R</sub>FG (Lexical-Realizational Functional Grammar) framework. The authors claim that exponence (morphological realization) is sensitive to information-structural content, and that i-structural effects on morphosyntax are typologically widespread, illustrated here through a new analysis of the Ojibwe inverse marker and a reanalysis of Spanish pro-drop. The paper demonstrates that information structure is not peripheral to morphosyntax but directly governs which vocabulary items can be used in which contexts.

In ‘From space to the grammar of affectedness: Semantics, syntax, and pragmatics of Kodhi DAT Marking’, Yustinus Ghanggo Ate and I Wayan Arka provide the first in-depth description and analysis of dative (DAT) case marking in the Austronesian language Kodhi. Kodhi’s DAT marking system is typologically distinctive (especially the double-DAT construction and the mirative use). The analysis given here draws on cognitive-linguistic theories, treating the spatial metaphor as a universal cognitive foundation for grammatical constructions. The LFG-based analysis also draws on Localist theories and Jackendoff’s Lexical Conceptual Structure to explain how spatial, semantic, and pragmatic factors all condition DAT marking in the language. Moreover, contrastive focus can influence case marking: When the predicate itself is in contrastive focus, it undergoes nominalization marked by a GEN clitic, backgrounding the arguments. Ghanggo Ate and Arka represent this using an independent information structure (i-structure), following Butt & King’s (1996) framework.

‘Generating second position clitics in Gothic’ by Tina Bögel analyses the Gothic question particle *=u*, a second position clitic that optionally marks yes/no- and wh-questions. The particle usually appears after the first unit of the clause, but is very flexible with regard to the category of that host. Besides verbs, it can, for example, also follow prepositions (thus interrupting prepositional phrases), and can even be placed between a verbal prefix and the following verb stem. Previous syntacto-centric analyses attributed placement to verb movement, but could not explain cases where the clitic targets a position within a

prepositional phrase or at a word-internal morpheme boundary. The paper presented in this volume adopts a modular language architecture in which syntax and prosody operate as separate modules: the particle is syntactically placed in sentence-initial position, but since this position violates prosodic constraints, the prosodic component adjusts the particle's position by means of prosodic inversion. Besides a new solution for a long-established problem, the paper also provides a first-ever computational implementation of second position clitic generation at the syntax-prosody interface.

'These kind of noun phrases' by Mary Dalrymple provides a syntactic and compositional semantic analysis of English noun phrases involving the nouns *sort/kind/type*. These nouns are notable for exhibiting an apparent agreement mismatch in which a morphologically singular/unmarked form (*kind, sort, type*) co-occurs with a plural determiner and plural verb agreement (e.g., *these kind of dogs are friendly*). The paper argues that this mismatch requires no special phrase structure, but is instead captured through a lexically specific treatment of the underspecified number features of unmarked *kind/sort/type*. The two construction families which these nouns can participate in ('KIND of NOUN' and 'NOUN of KIND') exhibit standard syntactic structures; their different semantic composition is handled via meaning constructors in LFG+Glue, which derive the correct meanings and scope possibilities without syntactic ambiguity.

Zymla's 'Stitching together dialogue: The inter-sentential syntax and semantics of fragment answers' provides an analysis of fragment answers to questions within LFG. Fragment answers are grammatically incomplete utterances (e.g., answering "Who ate the cake?" with just "The dog") that nonetheless convey full propositional content. Zymla establishes a spectrum of silence, from Pro-drop to sluicing, and identifies key analytical dimensions that constrain what counts as a valid source for elided material. Silence is then framed naturally within the LFG architecture as a mismatch between c-structure and f-structure. Nominal fragments, for example, are shown to fill some or all of the grammatical functions and features of an unpronounced f-structure. Zymla proposes to extend syntactic rules for NP and VP fragment answers with discourse-level specifications that distribute f-structure features from question to answer, and to use Partial Compositional Discourse Representation Theory to provide the correlated semantic interpretations. Zymla thus shows how to characterize fragment answers within LFG by a multi-level, cross-projection approach involving syntax, semantics, and pragmatics.

### 4.3 Part III: Language, mind, and reality: Theoretical and philosophical foundations

'Linguistics: Theories and formalisms' by K. P. Mohanan and Tara Mohanan is a reflective, pedagogically oriented essay aimed primarily at graduate students in theoretical linguistics. Its central goal is to help researchers distinguish between the CONTENT of a linguistic theory (its concepts and propositions) and the LANGUAGES used to express that content. These may be natural languages, formal/algebraic languages, or diagrammatic languages. The paper argues that conflating these is a source of confusion in linguistic theory. The overarching message is that progress in linguistic theory requires ongoing attention to the conceptual and formal foundations of what is being claimed. It is important to distinguish the languages of theory-making, to distinguish theories from the formalisms that express them, to distinguish categories from functions and units from levels, and to distinguish declarative from procedural approaches.

In 'Hierarchy and linearity: Discussions across frameworks', Gillian Catriona Ramchand reflects on how syntactic frameworks represent two fundamental properties of language: hierarchical structure and linear order. She walks through several approaches: standard generative/Chomskian tree structures, which blend both hierarchy and order into a single diagram; LFG's separation of f-structure (order-neutral, captures grammatical relationships) from c-structure (captures word order and constituency); and a hypothetical 'direct linearization' approach where hierarchy and order are fully decoupled. The paper argues that diagramming conventions are not neutral: the way syntactic relationships are visually represented shapes which patterns researchers notice and which hypotheses they pursue.

In 'The tripartite distinction between grammar, cognition, and the world', Ida Toivonen argues that linguists should maintain a clear three-way distinction between GRAMMAR, COGNITION (speakers' conceptual construal of the world), and THE WORLD. The central claim is that not everything observable in linguistic data is governed by grammar. Some patterns reflect cognitive construal; others reflect

facts about the world. Conflating these levels leads to analytical confusion. The paper illustrates this distinction through two empirical case studies: the relationship between verb argument structure and event participants, and the concept of animacy in language, where animacy as a grammatical feature is distinct from both biological animacy and conceptual animacy. Recognizing this tripartite grammar/cognition/world distinction, the paper argues, clarifies many puzzles in these research areas.

## 5 Acknowledgements

First and foremost, the editors thank Miriam and Tracy for their decades-long commitment to the LFG and ParGram community. We further thank all authors and reviewers who have contributed to this Festschrift, making it a unique collection of linguistic expertise, views and backgrounds. We thank PubliKon at the University of Konstanz for enabling us to publish this Festschrift as part of their open-access strategy: without their effort and their willingness to adapt to our ideas, this Festschrift would not exist. We also thank Neha Beru, University of Passau, for proof-reading. We further acknowledge the use of Claude and ChatGPT for grammar checks, support with LaTeX editing, and bibliography assembly.

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## **Part I**

# **Syntactic structure and formal constraints: Morphosyntax and clause structure**



# Where does a GO verb go?

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## 1 Introduction

As Butt (2010: 48) points out ‘the study of light verbs and complex predicates is fraught with dangers and misunderstandings that go beyond the merely terminological’. Andrews (2023) helpfully addresses this issue by providing a breakdown of the broad class of complex predicates into five sub-types of construction which he then cross-classifies with four semantic/conceptual categories. The constructions that are our concern in the present paper fall into his type (c) defined 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). Examples of this type include the Urdu permissive in (1) and the Italian causative (2).<sup>1</sup>

- (1)    naaddyaa=ne    yassiin=ko    paodaa    kaṭ-ne    dii-yaa  
      Nadya.F.SG=ERG Yassin=INST plant.M.NOM cut-INF give-PRF.M.SG  
      ‘Nadya let Yassin cut the plant.’ (Butt 2010: 51, ex (4))
- (2)    Maria lo=farà    leggere ai    suoi    studenti.  
      Maria it=do.FUT.3SG read.INF to.DEF.M.PL her.M.PL student.PL  
      ‘Maria will make her students read it.’

Our approach differs from Andrews’ in two respects; first in that our starting point is a particular class of lexical items, albeit defined in semantic/conceptual terms, and second in that we are interested principally in the diachronic dimension, while his focus is synchronic. At the same time, we will move beyond Andrews’ typology by including constructions that fall under the label of pseudo-coordination, structures which differ from those exemplified in (1) and (2) not only in the presence of the conjunction, but also in that both verbs take the same form: in the Swedish example in (3) they are both finite.

- (3)    Vi bara satt    och pratade hela    kvällen.  
      we just sit.PST and talk.PST whole evening.DEF  
      ‘We were just talking the whole evening.’

What all these examples have in common is that the first verbal element has been labelled as ‘light’ in the sense that its argument structure has been reduced and the behaviour of the whole is derived from both parts. In this paper we consider these issues from the perspective of the development of GO verbs in some varieties of Germanic and Romance (we will explain what we mean by GO verbs in Section 2).

With respect to light verbs, there is general agreement that they develop historically from lexical verbs, but there the agreement ends. There are different views on the nature of that development and also

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<sup>1</sup> The following glosses not found in the Leipzig Glossing Conventions have been used: SUP supine, PRSPRT present participle and PSTPRT past participle. We have not aimed for complete detailed glossing, but just to highlight the relevant items.

on what further changes a light verb may be susceptible to, in particular whether a light verb is a natural step in the progression from lexical to auxiliary verb.

A light verb, also referred to as a vector verb, is generally defined as a verb that has little semantic content, and in some instances may even be considered semantically empty (for instance Grimshaw & Mester 1988). The loss of meaning that the light verb has undergone is often discussed in terms of argument structure, but there are different interpretations of what this means depending on what approach to argument structure is assumed. Grimshaw & Mester (1988) argue that a light verb has only a skeletal, or incomplete, argument structure, and that its ability to assign  $\Theta$ -roles is transferred from the element with which it combines through a process of Argument Transfer. Rosen (1989) applies a similar analysis to so-called restructuring constructions in Romance, but refers to the process as ‘merger’ of argument structure, rather than transfer.<sup>2</sup> Hilpert & Koops (2008), in a study of pseudo-coordination in Swedish involving the light verb *sitta* ‘sit’, exemplified in (3), also assume that the verb has undergone a change to its argument structure, but they consider it to be due to a process of grammaticalisation in which there is a ‘gradual loss, or “bleaching out”, of the verb’s postural and locative meaning’ (2008: 248). This then involves a broader conception of argument structure, beyond the notion of arguments and  $\Theta$ -roles. Anderson (2005: 331–332) also considers the process by which light verbs develop to be one of grammaticalisation. In particular, he argues that light verbs develop from serial verb constructions and, in turn that they may be ‘reanalysed or further semantically “bleached”, “grammaticalized”, or “functionally generalized”’ and thereby develop into auxiliary verbs. The diachronic connection between light verbs and auxiliary verbs is rejected by Butt & Geuder (2001), Butt (2010) and Butt & Lahiri (2013).<sup>3</sup> They argue instead that a light verb is diachronically stable and closely connected to the corresponding lexical verb, to the point that they share a lexical entry. Bowerman (2008: 167) similarly argues that light verbs and auxiliaries ‘have different origins and do not readily change into one another’. However, at the same time, she considers claims that light verbs form a ‘dead end’ historically to be too strong (2008: 167).

Given that terminology is not understood in the same way in different accounts, it is worth briefly outlining how we understand the terms. We understand an auxiliary to be a verb that combines with a VP and that does not assign a  $\Theta$ -role to its subject. Instead, the subject’s  $\Theta$ -role is assigned by the head verb of the VP complement. Thus in line with Ross (1969) and Postal (1974), we view auxiliaries as raising verbs. An auxiliary develops from a lexical verb by a process of grammaticalisation, involving bleaching of the semantics from lexical to purely functional. This process is frequently referred to more specifically as auxiliarisation. An auxiliary expresses meanings such as tense or aspect. Light verbs involve a combination with another element, and in this paper, we will focus on light verbs that combine with either a non-finite form of a lexical verb or, in the case of pseudo-coordination, with a lexical verb in the same form as the light verb. This combination has a joint argument structure that is derived from the argument structures of the individual verbs, exactly how may vary between verbs. As we have said, a light verb has reduced semantics, but we follow Butt & Geuder (2001: 326) in assuming that a light verb does not come about through a process of grammaticalisation, but that it ‘conveys a special type of lexical meaning which consists in a modulation of the event description provided by the full verb that it is in a construction with’.

Based on our brief discussion of the literature, we can identify two issues to be addressed in this paper: (i) what is the relation between a light verb and its corresponding lexical verb? and (ii) what is the potential for diachronic development of a light verb? With respect to (ii), we can distinguish three different approaches: (a) light verbs are an intermediate stage between lexical verb and auxiliary verb (e.g. Hook 1991, Anderson 2005, Hilpert & Koops 2008); (b) light verbs are an independent diachronic development from lexical verbs, they form a separate category and can develop further (e.g. Bowerman 2008); (c) light verbs are diachronically inert (e.g. Butt & Geuder 2001, Butt 2010, Butt & Lahiri 2013).

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<sup>2</sup>We use the term ‘construction’ in a non-technical sense throughout the paper.

<sup>3</sup>It is interesting to note that in the first edition of their book on grammaticalisation, Hopper & Traugott (1993: 108) included ‘vector verb’ as a stage in the cline from full verb to affix, but in the second edition (Hopper & Traugott 2003: 111–114) they omit it from the cline, with reference to an earlier version of Butt (2010).

When considering where GO verbs go, it is relevant also to consider where they come from, and this we do for Romance and Germanic in Section 2. In Section 3 we consider Germanic GO, with a focus on a detailed analysis of the Swedish light verb GO in pseudo-coordinations and its relation to the corresponding lexical verb. In Section 4, we compare the different developments of the GO verb in a number of Romance varieties and constructions. Finally, in Section 5 we draw some conclusions on the basis of our more detailed look at Swedish in its Germanic context and our broad view of Romance.

## 2 Germanic and Romance GO verbs and their sources

What do we mean by a GO verb? If we adopt the classification of motion verbs proposed by Talmy (1985), there is a contrast between those which identify manner of movement – *walk, rush, run, crawl* – and those which incorporate a path – *descend, cross, tunnel*. To these we can add what Fanego (2012) calls ‘neutral’ verbs, namely those which simply express a deictic direction towards the speaker or more broadly the locus of conversation (*come, bring*) or direction away from the speaker/conversation (*go, take*), but without any inherent reference to the manner or path of the movement. Both broader typological studies such as Ricca (1993) and investigations of the history of specific constructions such as Bourdin (2014) confirm the conclusion that languages vary as regards the extent to which the deictic dimension is lexicalised and, even when it is, that there is frequent asymmetry between GO and COME verbs.

If we compare the etymological origins of the relevant items in Romance and Germanic, we can discern a clear tendency for neutral verbs such as English *go* or French *aller* to derive from or be supplanted by manner-based items. Thus, the etymon of English *go* is the PIE root *\*g<sup>h</sup>eh<sub>1</sub>-* ‘reach, walk’, which involves both manner and path. It is the manner dimension which still survives in Swedish, Norwegian and Danish *gå*. In these languages the simple motion verb varies. For example, in Danish it is *ta/tage*, cognate with English *take* but unlike the latter also used intransitively as in (4) contrasting with (5).

- (4) Han tog        til station.  
       he take.PST to station  
       ‘He went to the station.’
- (5) Han gik        til station.  
       he GO.PST to station  
       ‘He walked to the station.’

In Norwegian instead *dra*, cognate with English manner verb *drag*, is used as a manner-neutral movement verb. In Swedish *gå* allows both manner and simple ‘go’ uses, as in (10) below, though *dra* can also be used in more casual registers. At the same time, the past tenses in the Germanic languages are from a different and suppletive source – Germ. *ging*, Sw. *gick*, Dan. *gik* < PIE *\*g<sup>h</sup>eng<sup>h</sup>-* ‘stride’ – but once again one which expresses a manner of motion (Plank & Vincent 2019: 329–331). For English *go*, the past *went* derives instead from *wendan*, in turn the reflex of PIE *\*wendh-*, an item whose lexical content involves both change of direction and manner of movement, compare the related item *wander*. The form *went* replaces the earlier suppletive Old Eng. past *eode*, cognate with Latin *ire*, both derived from PIE *\*h<sub>1</sub>ei-*, a root which seems to have been neutral in meaning throughout its reconstructible history.

When we come to Romance, similar patterns of development are discernible although the details are more complex, and there is greater etymological variation, but still building on reflexes of verbs expressing manner of movement. French *aller* ‘go.INF’ is derived from Lat. *ambulare* ‘walk’, while its present tense forms *vais, va, vont* ‘go.1/2/3SG/3PL’ are from Lat. *vadere* ‘rush’, which is cognate with Eng. *wade*. The future forms *irai, iras*, etc. are instead the reflex of the univerbation of a late Latin periphrasis *ire habeo, habes*, etc. involving the neutral verb *ire* plus inflected forms of the HAVE verb.

What all these lexical verbs have in common is that they assign a  $\Theta$ -role to their subject. By contrast, when they develop the auxiliary uses as in the English *be going to* construction or the corresponding French future as in (6),  $\Theta$ -role assignment depends exclusively on the verb of its complement. Light verbs differ in that they do not completely lose their ability to assign a  $\Theta$ -role; instead their argument

structure merges in some way with that of the verb with which they combine. Auxiliaries and light verbs have in common that they form monoclausal structures, but an auxiliary is part of a V + VP structure while a light verb enters a V + V combination. The difference is evident in the pair of French sentences in (6) and (7).

- (6) Pierre va me=parler.  
Pierre GO.PRS.3SG me=speak.INF  
'Pierre is going to speak to me.'
- (7) Pierre me=fait parler son frère.  
Pierre me=make.PRS.3SG speak.INF his brother  
'Pierre makes his brother speak to me.'

In French, clitics precede both infinitives and finite verb forms. The fact that the infinitive in (6) is preceded by the clitic shows that it is in a phrase of its own, separate from the auxiliary, whereas in (7) it is part of the complex predicate *fait parler* and therefore the clitic precedes the finite verb. The theoretical issue is then whether there is a diachronic connection between the stage of merger of argument structure of the light verb and the loss of a  $\Theta$ -role of the auxiliary verbs.

It is of interest too to note the asymmetry in the historical profiles of GO and COME verbs. Each can develop independently in different ways within different languages or families and hence it does not make sense to treat them as linked deictic pairs as is standardly done with demonstratives like *this* and *that* or spatial adverbs like *here* and *there*. It is striking that, as we have just seen, GO verbs commonly show patterns of suppletion and suppletive change but COME verbs typically do not. Indeed, they show remarkable diachronic consistency so that, for example, almost all Romance varieties express 'come' with a reflex of Latin *venire* (Fr. *venir*, Ital. *venire*, Port. *vir*, Rom. *vină*, etc.), itself derived from PIE *\*gwmie-*, as is the proto-Germanic root *\*kwem* which lies behind Eng. *come*, Germ. *kommen*, Dan. *komme*, etc. It is perhaps, therefore, no surprise that, although COME verbs do develop into both auxiliary and light verbs (see for example the contributions to Devos & van der Wal 2014), they do not exhibit the same constructional diversity as GO verbs.

### 3 go in Germanic

#### 3.1 Auxiliary go

It is well-known that GO has developed into a future auxiliary for instance in English and Dutch as illustrated in (8) and (9).

- (8) She is going to move house next year.
- (9) Zij gaat volgend jaar verhuizen.  
she GO.PRS next year move house.INF  
'She is going to move house next year.'

In both languages GO has been replaced by another verb in the meaning of moving on foot; *walk* and *lopen*, respectively.<sup>4</sup> Though there are differences in the use of the future GO in the two languages, there are also many parallels that can be traced to the original meaning of the words (see for instance Hilpert 2008, Fehringer 2017).

Swedish GO retains its original movement-by-foot meaning, but as the ambiguity of the example in (10) shows, a new, more general, movement meaning has developed. However, it has not followed

<sup>4</sup>In Belgian-Dutch and Frisian GO can still be used in its original meaning (e.g. Wijers 2012: 19).

the same path as English and Dutch, in that GO has not developed into a future-oriented auxiliary, as illustrated by the infelicity of (11). Instead COME is used as the auxiliary of the future, as in (12).<sup>5</sup>

- (10) Imorgon ska jag gå till jobbet.  
tomorrow shall.PRS I GO.INF to work.DEF  
'Tomorrow I will go/walk to work.'
- (11) #Hon går att flytta nästa år.  
she GO.PRS INF move house.INF next year
- (12) Hon kommer att flytta nästa år.  
she COME.PRS INF move house.INF next year  
'She will move house next year.'

### 3.2 Lexical GO in Swedish

As we shall see in Section 3.3, Swedish *gå* has developed a range of light-verb uses, but since we are interested in the connection between the lexical verb and the corresponding light verb, we will start by considering the lexical variant.

Already in the earliest remaining non-runic texts in Swedish we find examples where the manner component of GO has been lost, as in (13), where *gangu* just indicates movement, and is similar to *faræ* used earlier in the example. There is no implication that the men should travel to court by foot, indeed, in the standard translation into modern Swedish it is translated by *komma* 'come', which has never had a manner connotation.<sup>6</sup>

- (13) þa skal væghændi til þings faræ ok vtæn vider þing standi mæn til þings  
then shall.PRS killer to court travel.INF and outside court stand.INF men to court  
gæræ griþær at bezas þings mæn skulu hanum loua þings gangu.  
send.INF peace INF ask.INF court men shall.PRS him promise.INF court GO.INF  
'Then the killer shall travel to the court and he shall stand outside the court and send men to the court to ask for peace. The court men shall promise him to come to the court.'  
(*Ävgl, Mandrâp I*, late 13th c)

Examples in which even a sense of movement has been lost are also frequent in the earliest texts. The standard way of expressing 'take an oath' in the early laws is *ganga ep* literally 'go oath', and in (14) and (15) we see GO combining with a preposition to acquire an idiomatic meaning.

- (14) þa skal köpit atær ganga  
then shall.PRS purchase.DEF back GO.INF  
'then the purchase shall be returned' (*Ögl, Giftermål XIV*, mid-14th c)
- (15) Nu uill iak til þingxs fara ok ganga uiþær drape  
now want.PRS I to court travel.INF and GO.INF by killing  
'Now I want to travel to court and confess to the killing.' (*Ögl, Drâp XI*, mid-14th c)

In the earliest texts, GO could also occur with an inanimate subject, as in (16).

<sup>5</sup>We have not marked (11) as ungrammatical since it is grammatical in the meaning 'It will be possible to move her next year'.

<sup>6</sup>For the examples from Old Swedish not cited from other sources, we have used the resources of Språkbanken (<https://spraakbanken.gu.se/>), and we are grateful to those who have put time and effort into creating these. The abbreviations for texts are: *Ävgl Äldre Västgötalagen*, *Ögl Östgötalagen*, *Sdml Södermannalagen*, and the translation of example (13) referred to is Wessén & Holmbäck (1979).

- (16) Kan gisninga ek i giærþe standa. oc **elder** wiþare **ganga** æn hawa þorf. brænne vp  
 can fruit-bearing oak in field stand and fires further GO.PRS than have need burn up  
 ek enæ. böte III. örä.  
 oak INDF pay fine three öre  
 ‘If an oak stands within the field and the fire progresses further than is required and it burns up an oak, then he shall pay a fine of three öre.’ (Sdml, Byggnung XVIII, first half of 14th c)

Turning now to modern Swedish, as Josefsson (2014: 10) puts it: ‘The verb *gå* is probably one of the most polysemous of all Swedish words’. Viberg (1999) also highlights the polysemy of Swedish GO and provides ample examples. It can be used with the original manner meaning ‘by foot’, but it can also indicate general movement, as we saw in (10). In addition, it has a range of meanings more abstractly related to movement in space or time, and in both uses it can indicate directionality or not. As (17) illustrates, it is still used in the context of an oath, as it was in the early Swedish laws, *vidgå* is still used in a legal context to mean ‘confess, admit’ as in (15), and the use of *återgå* in (18) can be compared with (14).<sup>7</sup>

- (17) Åklagaren frågar om han kan gå ed på att det handlar om två olika  
 prosecutor.DEF ask.PRS if he can.PRS GO.INF oath on COMP it act about two different  
 personer.  
 people  
 ‘The prosecutor asks if he can swear that it is about two different people.’ (2017, *Korp modern*)
- (18) ... försöka få säljaren att gå med på att köpet ska återgå.  
 try.INF get.INF seller.DEF INF GO.INF with on COMP purchase.DEF shall.PRS return.INF  
 ‘... try to get the seller to agree to the purchase being annulled.’  
 (2018, <https://lawline.se/answers/skal-for-att-bryta-kontrakt-for-huskop>)

In (19) to (22) we provide a number of examples that illustrate the broad range of meanings modern Swedish *gå* can have.

- (19) Det går inte.  
 it GO.PRS NEG  
 ‘It is not possible.’
- (20) Dom går i samma klass.  
 they GO.PRS in same class  
 ‘They are in the same class (at school).’
- (21) Det har gått politik i saken.  
 it have.PRS GO.SUP politics in thing.DEF  
 ‘It has become a political issue.’
- (22) Hundens skällande går alla på nerverna.  
 dog.DEF.POSS barking GO.PRS everyone on nerve.PL.DEF  
 ‘The dog’s barking gets on everyone’s nerves.’

### 3.3 Light verb GO in Swedish

With the early meanings of Swedish lexical GO in mind, we turn to its light-verb uses. We will focus here on the light-verb use in pseudo-coordination since that shows interesting developments over time. However, we should point out that there is another context in which *gå* in modern Swedish can be used in what may be argued to be a light-verb construction. It then combines with adverbial modification, as in

<sup>7</sup>*Korp modern* indicates that the example is taken from Språkbanken’s corpus of modern Swedish texts.

*gå i strejk* literally ‘go in strike’ or *gå till anfall* literally ‘go to attack’, and has an inceptive meaning compared to *strejka* ‘to strike’ or *anfälla* ‘to attack’ (see Ekberg 1989).

The Swedish pseudo-coordination construction with GO is a relatively well-studied phenomenon, see for instance Wiklund (2009), Wijers (2012), Werkelin (2013), Josefsson (2014), Andersson & Blensénus (2018a,b), and Blensénus & Andersson Lilja (2022); and also Lødrup (2002) on parallel phenomena in Norwegian.<sup>8</sup> There is general agreement that this construction differs from regular coordination in a number of ways and is monoclausal (see for instance Teleman et al. 1999: 4.902–903). Andersson & Blensénus (2018a) carry out a thorough diachronic study of the development, and our account of the early data relies heavily on their findings.<sup>9</sup> They identify the early example in (23), where the adverb *borth* ‘away’ indicates directed movement, and point out that directional movement was explicit or implied in most early examples of GO in the pseudo-coordination, though the manner aspect is rarely present.

- (23) The gingo borth ok spordho män ther till vm  
they GO.PST away and ask.PST men there to about  
‘They went away and asked people about it.’ (1440–1450, AB18a:90)

However, there are also some early examples where there is no directionality, indeed, as in (24), where movement, whether directional or not, does not play a role.

- (24) varfrw gik oc thagde  
Virgin Mary GO.PST and keep silent.PST  
‘The Virgin Mary kept silent.’ (1410–1430, AB18a:91)

There is a contrast in the effect of the pseudo-coordination in these two examples; in (24), the effect is to indicate expansion in time of the activity expressed by the second verb, *thagde*, whereas in (23) the sense of movement is associated with inception rather than duration. This effect may be a consequence of the nature of the verb with which it combines; *spordho* in (23) is an activity, whereas *thagde* in (24) is a state.

Examples where GO combines with a verb indicating manner of movement can be found in some of the early texts. Examples such as (25) show that any manner of movement component has been lost from GO in this use, but we saw in examples such as (13) and (16) that the meaning of lexical *ganga* had also generalised beyond manner of movement at this point.

- (25) Tha bwken är offwerfuldher, antiggia dragher han til sömpn at hwila  
when stomach.DEF be.PRS overfull either go.PRS he to sleep INF rest.INF  
owerfflödoga säcken, ällar twingar til at gaa oc spazsera at han säcken swa  
overfull sack.DEF or force.PRS to INF GO.INF and stroll.INF until he sack.DEF so  
tömer.  
empty.PRS  
‘When the stomach is overfull, he will either go to sleep to rest the overfull sack or he is forced to go for a stroll until he empties the sack.’ (1480, AB18a:91)

For the 1800s, Andersson & Blensénus (2018a) report frequent combinations of GO with cognitive verbs in pseudo-coordination, as in (26), where any sense of movement is further backgrounded. This example resembles (24) in that there is a sense of expansion in time compared to the same example with just *grubblade*.

<sup>8</sup>The coordinator *och* is pronounced /ɔ/ when unstressed, as is the infinitive marker *att*, and there have been arguments in the literature that the phonetic identity may have played a role in the development of the pseudo-coordination construction (see Andersson & Blensénus 2018b: 151 for a summary of the discussion in the literature). It is of interest to note a similar formal overlap of linking items in the two sources of Italo-Romance *a* mentioned in Section 4.4.

<sup>9</sup>We will refer to examples taken from this paper with AB18a and a page reference.

- (26) Han gick och grubblade på problemet att vinna regeringen.  
 he GO.PST and ponder.PST on problem.DEF INF win.INF government.DEF  
 ‘He was pondering the problem of how to persuade the government.’ (1840s, AB18a:93)

Similar examples with *omkring* ‘around’ are frequent, clearly indicating non-directionality but also with an effect of extending the action expressed by the second verb. Parallel to (26), *gå omkring och tigga* could be replaced with *tigga* in (27) without any loss of lexical/core meaning.

- (27) han måste i sitt halfnakna och svagsinta tillstånd gå omkring och tigga hos  
 he must.FIN in his half-naked and feeble-minded condition GO.INF around and beg.INF at  
 grannarne  
 neighbour.DEF.PL  
 ‘in his half-naked and feeble-minded condition he had to beg from his neighbours’  
 (1840s, AB18a:93)

Andersson & Blenselius (2018a) also point to an increase in examples of the use of the pseudo-coordination with words for suicide in the 19th century, but with examples being found already from the 18th century.

- (28) At han må gå och hänga up sig sielf, om han will, den besten.  
 INF he may.INF GO.INF and hang.INF up REFL if he want.PRS the beast.DEF  
 ‘He may very well hang himself if he wants to, the beast.’  
 (Gyllenborg: *Svenska sprätthöken*, 1740)

In the 19th century, GO appears frequently in combination with verbs expressing social relationships and emotions, generally in contexts where a negative attitude is expressed, as in (29) and (30). It is interesting in this context, where no physical movement is implied, that *åstad* ‘away’ is used in (29), and this is not uncommon in these examples.

- (29) dåraktig nog att gå åstad och förälska sig utan tillstånd  
 foolish enough INF GO.INF away and fall in love.INF REFL without permission  
 ‘foolish enough to have gone and fallen in love without permission’ (1870s, AB18a:93)
- (30) Ja, men att han, som var en sån träbock kunde gå och bli kär!  
 yes but COMP he REL be.PST INDF such bore can.PST GO.INF and become.INF in love  
 ‘Yes, but that he, who is such a bore, could fall in love!’ (1885, AB18a 95)

We have seen a development of the pseudo-coordination construction with GO over time in what meaning it conveys and in terms of what second verb it combines with. However, there is also clear stability in that present-day examples parallel to the early ones can still be found. Compare for instance (31), (32), (33) and (34) with (24), (25), (28) and (29), respectively.<sup>10</sup>

- (31) Och vad är det Petra går och tiger om?  
 and what be.PRS it Petra GO.PRS and keep silent.PRS about  
 ‘And what is it that Petra is keeping quiet about?’  
 (2004, <https://www.boktipset.se/bok/skatan>)
- (32) Att bara gå och spatsera i Gamla stan är väldigt mysigt!  
 INF only GO.INF and stroll.INF in Old Town is tremendously cosy  
 ‘To simply stroll around in the Old Town is lovely.’ (2018, [www.tripadvisor.se](http://www.tripadvisor.se))

<sup>10</sup>The supine is the form selected by the perfect auxiliary in Swedish, but the auxiliary may be omitted in certain contexts as it is in (33) and (34) (Andersson & Dahl 1974 is a classic paper on this).

- (33) Han gick och hängde sig sedan han spelat bort sin fiol tre gånger.  
 he go.PST and hang.PST REFL after he gamble.SUP away his.REFL violin three times  
 ‘He hanged himself after he had gambled away his violin three times.’ (2015, *Korp modern*)
- (34) Vem är den framträdande gängledaren Stockholmsadvokaten gått och  
 who be.PRS the prominent gang leader.DEF Stockholm lawyer.DEF GO.SUP and  
 förälskat sig i?  
 fall in love.SUP REFL in  
 ‘Who is the prominent gang leader that the Stockholm lawyer has fallen in love with?’  
 (2021, <https://www.flashback.org/p75122973>)

More generally, the pseudo-coordination with GO is still used with a similar general sense as in the earliest examples. The construction can be associated with expansion of the activity expressed by the second verb, as in (35), frequently with no sense of movement. It can also be associated with inception, as in (36).

- (35) Det är ju inte så att vi har gått och sovit hela tiden men det  
 it be.PRS to be sure NEG so that we have.PRS GO.SUP and sleep.SUP whole time.DEF but it  
 är som att ingen riktigt har brytt sig.  
 be.PRS as if no-one really have.PRS care.SUP REFL  
 ‘It is not like we’ve been asleep the whole time, but it is as if no-one has really cared.’  
 (2018, <https://www.svt.se/nyheter/lokalt/vast/>)
- (36) Intensivplugga nu när det är ljus och gå och sov kl 22.00.  
 intensive study.IMP now when it be.PRS light and GO.IMP and sleep.IMP o’clock 22.00  
 ‘Study intensively now when it is light and go to sleep at 10 o’clock.’  
 (2012, <https://gamla.pluggakuten.se/forumserver/viewtopic.php?id=68753>)

Examples in which the pseudo-coordination is associated with duration are still common with *omkring* ‘around’ though no movement is implied, as illustrated in (37) as are examples best described as resultative, where neither duration nor inception appears to play a role, as in (38).

- (37) ... en annan går omkring och väntar på att hennes otrogna man ska lämna  
 one other GO.PRS around and wait.PRS on COMP her unfaithful man shall.PRS leave.INF  
 henne.  
 her  
 ‘another one is waiting for her unfaithful husband to leave her’ (*Korp modern*)
- (38) När man gått och röstat får man bläck på fingrarna.  
 when one GO.SUP and vote.SUP get.FIN one ink on finger.PL.DEF  
 ‘When you have voted you get ink on your fingers.’ (*Korp modern*)

The type of pseudo-coordination that has been most well-studied in modern Swedish is what is described as having the ‘surprise effect’ (e.g. Wiklund 2009, Josefsson 2014), also referred to as mirative. As we will see in Section 4.4, this is found also in Romance, and Ross (2016) provides a cross-linguistic survey of parallel constructions. As indicated by Teleman et al. (1999: 4.905), the effect is broader than surprise in Swedish. They describe it as ‘accidental or unexpected’ and with ‘a pejorative overtone’, and also point to the fact that this effect is most clear with non-agentive subjects. Some examples are found in (39) and (40). The difference in meaning between these examples and versions without GO is difficult to pin down, but the constructed example in (41) makes clear that it is indeed not simply a matter of surprise. Teleman et al. (1999) point out that such examples are associated with the spoken language, and since earlier sources are based on written language, it is hard to be confident that this is a recent development.

- (39) Jag vill inte gå och bryta benet lagom till jul.  
 I want.PRS NEG go.INF and break.INF leg.DEF just right to Christmas  
 ‘I don’t want to go and break my leg just in time for Christmas.’ (2016, *Korp modern*)
- (40) Jag säger inte att Jan Myrdal har gått och blivit nazist på gamla dagar.  
 I say.PRS NEG COMP Jan Myrdal have.PRS GO.SUP and become.SUP Nazi on old days  
 ‘I’m not saying that Jan Myrdal has become a Nazi in his old age.’ (2022, *Korp modern*)<sup>11</sup>
- (41) Jag hörde att han har gått och brutit benet lagom till jul, det  
 I heard.PST COMP he have.PRS go.SUP and break.SUP leg.DEF just right to Christmas it  
 förvånar mig inte, han har alltid varit klumpig.  
 surprise.PRS me NEG he have.PRS always be.SUP clumsy  
 ‘I heard that he has gone and broken his leg just in time for Christmas, it doesn’t surprise me, he has always been clumsy.’

Though it is not our aim to explore the less well-studied English light verb GO here, we want to point out that the ‘surprise effect’ is present also in English. The example in (42) is from the banner welcoming visitors to Manchester Museum as The European Museum of the Year in 2025. We’ll see similar examples from Romance in Section 4.4.

- (42) We’ve only gone and won it!

To sum up this section, we have seen that there are Germanic languages like English and Dutch, where GO has developed into an auxiliary of the future. In Swedish, on the other hand, there has been a light-verb use for more than half a millennium, and there is no evidence of a development into an auxiliary. We have seen both development and stability not just in the lexical verb, but also in the light verb. In both uses, GO is a strikingly polysemous verb. We will return to what this means for an analysis of light verbs in Section 5.

## 4 Go in Romance

Within Romance there are a wide variety of constructions involving the GO verb, which we review here in terms of the different non-finite forms with which they are constructed and the consequential semantic developments.<sup>12</sup>

### 4.1 GO + infinitive

As we have already seen in (6), GO + infinitive in French has a future meaning and thus provides a striking contrast with the formally parallel construction in Catalan where the meaning is simple past; hence the cross-linguistic minimal pair in (43) and (44).

- (43) Pierre va visiter son frère demain. (Fr)  
 Pierre GO.PRS.3SG visit.INF his brother tomorrow  
 ‘Pierre is going to/will visit his brother tomorrow.’
- (44) En Pere va visitar el seu germà ahir. (Cat)  
 DEF Pere GO.PRS.3SG visit.INF DEF his brother yesterday  
 ‘Pere visited his brother yesterday.’

Despite the semantic difference, there can be no doubt that in both French and Catalan the GO verb serves as an auxiliary in a temporal periphrasis but makes no contribution to the argument structure of the clause.

<sup>11</sup>The obituary of Jan Myrdal in the *Washington Post* referred to him as a ‘radical leftist Swedish writer’.

<sup>12</sup>The morphological structure of the GO paradigm also varies from language to language and construction to construction but we will not consider this dimension in the present context. For discussion and references, see Micali et al. (2025).

The French pattern dates back to the late medieval period (Gougenheim 1929) and appears to be an instantiation of a classic grammaticalisation profile of the kind mentioned in Section 1, whereby a lexical item comes to develop, alongside its lexical meaning, a separate grammatical function. In the words of Bybee et al. (1994: 269): ‘When one moves along a path towards a goal in space, one also moves in time. The major change that takes place is the loss of the spatial meaning.’ But if this is the case, how is the use in (44) to be explained? The answer according to Detges (2004) is that it begins as a narrative device highlighting significant and to some extent surprising events: ‘The eventual grammaticalisation of *anar* + *inf* as an unmarked anterior was due to a massive extension of this rhetorically motivated over-use. The more of the information conveyed is marked as surprising and noteworthy, the less relevance will be attributed to each individual piece of information.’ (Detges 2004: 13) The construction has been argued to emerge first in Occitan and to pass from there to Catalan (Jacobs 2011). Example (45) is from 12th century Occitan.<sup>13</sup>

- (45) Elle ... le=veit                      descendre;    de poor li=trembla                      lo cor; fait  
 she    him=see.PRS.3SG get down.INF of fear her=tremble.PST.3SG DEF heart cause.PRS.3SG  
 les portes fermer;    wait                      les claus prendre.  
 DEF doors close.INF GO.PRS.3SG DEF keys take.INF  
 lit. ‘She sees him get down. Her heart trembled in fear. She closes the doors, she goes to take the  
 keys.’ i.e. ‘She saw ... Her heart trembled ... She closed ... she took ...’  
 (Girart de Roussillon, 1150)

What is described here is a sequence of events, first with the historic present *veit* ‘sees’, then a plain past *trembla* ‘trembled’, then a historic present use of the light verb causative *fait fermer* ‘make/have be closed’ and finally the GO verb construction *vait prendre* which is ambiguous between a movement sense ‘goes to fetch’ and a simple narrative past ‘fetched’. The use in (45) is parallel to some of the early Swedish examples of light verbs in pseudo-coordination, like those we saw in (23) and (24), and reinforces the view that the development of light verbs and semantic bleaching are independent diachronic trajectories. If Detges’ (2004) analysis is correct and the auxiliary use of Catalan GO developed from the light-verb use exemplified from Occitan in (45), then this provides a challenge to the view that light verbs do not develop into auxiliaries. However, the development from light verb to auxiliary in Catalan is not an example of grammaticalisation as standardly understood in that it is not based on semantic bleaching. Paoli & Wolfe (2022) provide an alternative analysis of the development of the GO past tense construction. They propose that in origin the GO construction had a single function, namely to express posteriority either with respect to the reference time and hence past tense as in a narrative, giving the Catalan auxiliary, or to the situation time and hence future in direct discourse, resulting in the future marker of French and other Romance languages. If this analysis is correct, then the Catalan GO past developed from a lexical verb through a process of grammaticalisation and is not connected to the light-verb use exemplified from Occitan in (45). Crucial to any account is the fact that the form involved is the infinitive, the prototypical non-finite form (Lowe 2019), which has no inherent temporal or aspectual value and thus is compatible with either outcome.

A different minimal contrast is to be seen in the examples (46) to (48).

- (46) voy                      a correr (Span)  
 GO.PRS.1SG to run.INF  
 ‘I will run.’  
 (47) vaig                      a correr (Cat)  
 GO.PRS.1SG to run.INF  
 ‘I will run.’

<sup>13</sup>In modern Occitan GO + INF expresses future and the past meaning has been lost as a result not of internal grammatical change but rather due to external contact with French (Mooney 2020).

- (48) vado a correre (Ital)  
GO.PRS.1SG to run.INF  
'I will run.'

The construction with the 'to' preposition/prepositional complementiser in (46) and (47) is standard in Spanish, has been borrowed into Catalan, where it creates a minimal pair with the GO past, and has developed recently and independently in Italian, illustrated in (48) (Dessi Schmid & Momma 2024).

Another prepositional construction is to be seen in the Sicilian example in (49), where the GO verb is linked to the infinitive by the preposition/prepositional complementiser *per* 'for' and brings us back on the light-verb track, with the GO verb contributing the agent argument but expressing not movement but rather an unsuccessful attempt.

- (49) jisti pi futtiri e fusti futtutu  
GO.PST.2SG for swindle.INF and be.PST.2SG swindle.PSTPRT  
'You went to swindle and you got swindled.'

As Cruschina (2018) shows, this pattern is found in regional varieties throughout southern Italy. A close parallel is to be seen in the English example (50).

- (50) I pulled into our lot this morning and went to stop my car and it just kept sliding.  
(<https://forums.audiworld.com/showthread.php?t=2446616>)

Dalrymple & Vincent (in preparation) argue that what they call the *go to* construction similarly expresses an attempt with an unexpected outcome and thus fits into the broader cross-linguistic typology of avertive and mirative constructions.

## 4.2 GO + present participle

In a number of Romance languages the GO verb, often but not always together with the COME verb, can be combined with the present participle to express continuity or progression as in the representative set of examples in (51) to (54).<sup>14</sup>

- (51) Ella va poniendo la mesa mientras yo termino de cocinar. (Span)  
she GO.PRS.3SG lay.PRSPT DEF table while I finish.PRS.1SG COMP cook.INF  
'She is laying the table while I finish the cooking.'
- (52) Vou andando para casa. (Port)  
GO.PRS.1SG go.PRSPT to house  
'I'm going home.'
- (53) Teresa andava scrutando l'orizzonte. (Ital)  
Teresa GO.IPV.3SG scan.PRSPT DEF.horizon  
'Teresa was scanning the horizon.'
- (54) La situazione si è andata complicando. (Ital)  
DEF situation REFL be.PRS.3SG GO.PSTPRT complicate.PRSPT  
'The situation has been getting more complicated.'

In all these examples the relevant tense/aspect value is expressed in the form of the GO verb, including the possibility that that expression may itself be periphrastic as in (54), while the continuity of the event or action described is expressed via the participial form of the lexical verb. The languages, however, differ in the subsets of verbs that may be part of this construction. As noted by Bertinetto (2000: 577–581), in

<sup>14</sup>We use the term 'present participle' here but the forms in question are usually referred to in the local grammatical traditions as *gerundio* or *gerondif*. These terms are reflexes of the Latin *gerundival* forms in *-ndu-* that are their etymological source but it is important to avoid confusion with the term 'gerund' in reference to verbal nouns.

Italian there is a preference for accomplishment verbs and what he calls ‘inherently intensified’ verbs such as *scribacchiare* ‘scribble’ beside *scrivere* ‘write’ or, as in (53) *scrutare* ‘scan’ rather than *guardare* ‘look at’, whereas Spanish, Portuguese and Catalan use the construction with a broader range of verbs.

Where there is also a parallel auxiliary use of the COME verb it typically expresses the meaning of coming from the past and having implications for the future, as in (55) to (57).

- (55) Eu venho estudando português há alguns meses. (Port)  
I COME.PRS.1SG study.PRSPRT Portuguese for some months  
‘I have been studying Portuguese for a few months.’
- (56) Vengo pensando que quizás debería disculparme con Antonio. (Span)  
COME.PRS.1SG think.PRSPRT COMP perhaps must.COND.1SG apologise.INF with Antonio  
‘I’m thinking/I’ve been thinking perhaps I should apologise to Antonio.’
- (57) La sterlina viene aumentando di valore. (Ital)  
DEF sterling COME.PRS.3SG increase.PRSPRT of value  
‘The pound sterling is increasing in value (and this matters).’

Thus, (55) has the pragmatic implication that I will continue to study Portuguese and (56) that I will go ahead and apologise. Put differently, this contrast implies that the deictic difference between GO and COME survives even when the core motion content has been bleached, with the GO verb construction typically being more neutral – and indeed at times virtually synonymous with the BE + participle that these languages also have – while the COME verb typically implies immediate contextual relevance.

Across the family this construction is attested already in early texts; the examples in (58) and (59) are a representative pair.

- (58) La edad y la posibilidad se va disminuyendo.  
DEF age and DEF possibility REFL GO.PRS.3SG diminish.PRSPRT  
‘The age and the possibility are decreasing.’ (Span, 16th cent.; Fernández Martín 2015: ex. 121)
- (59) Lo caldo andarà aumentando en verso la fine de la primavera.  
DEF heat GO.FUT.3SG increase.GER towards DEF end of DEF spring  
‘The heat will go on increasing towards the end of spring.’ (Ital, 1282; Restoro d’Arezzo)

However, the diachronic profiles are different. While in Spanish and Portuguese the range of verbs with which the construction is attested consistently increases with the passage of time as might be expected with the usual grammaticalisation trajectory, in Italian it contracts (Giuliani 2012); a process of grammaticalisation which stalls halfway according to Giacalone Ramat (1995). Even so, there is no need to see this as anything other than the development of an auxiliary function via the classic mechanism of semantic bleaching.

### 4.3 go + past participle

The combination of GO with a past participle is found only in Italian, where there are two passive constructions built from GO and the past participle, as illustrated in (60) and (61).

- (60) Il libro andrebbe letto.  
DEF book GO.COND.3SG read.PSTPRT  
‘The book should be read.’
- (61) Il libro è andato perso/\*trovato.  
DEF book be.PRS.3SG GO.PSTPRT lose.PSTPRT/find.PSTPRT  
‘The book got lost/\*found.’

In the type exemplified in (60) the construction has a deontic modal interpretation and is typically used with present and future oriented forms of the GO verb *andare*. In (61), by contrast, the preference is for past-oriented forms including, as here, periphrastic ones. Semantically, the latter is restricted to verbs with a negative meaning such as *perdere* ‘lose’ or *distruggere* ‘destroy’ but cannot be formed with *trovare* ‘find’ and *costruire* ‘build’.

This is another construction which has a long attested history. In origin, according to Mocciaro (2014), the meaning seems to have been one of simple passive with the modal meaning coming later. In her words: ‘... this development can be interpreted as a focus shift from “result reached through a path” (passive orientation) to “movement towards a result which is not yet reached and, for metonymical contiguity, should be reached” (future orientation > deontic reading)’ (Mocciaro 2014: 64). As argued by Giuliani & Vincent (2025), the context for this transition is typically instructions and recipes as in (62).

- (62) ... qual carne merita andare arrosto e quale allessò.  
which meat deserve.PRS.3SG GO.INF roast.PSTPRT and which boil.PSTPRT  
‘... which meat deserves to be roasted and which boiled.’  
(*Maestro Martino Libro de arte coquinaria*, 1498)

There is a striking parallel with the culinary context noted for the future construction *andare a* by Dessì Schmid & Momma (2024). We should note too that once again the form of the participle contributes some of the content, in this instance the voice value. Here too we have an instance of grammaticalisation but with the difference that GO has passed through two stages, namely from lexical verb to passive auxiliary and from there to modal auxiliary.

#### 4.4 GO in pseudo-coordination

Romance, and in particular Sicilian and other southern Italian varieties, also exhibits pseudo-coordination patterns though with considerable formal and semantic variation. For instance in northern Calabria, as Ledgey (2021: 13, ex (29a)) shows, there is often no overt co-ordinating element but simply the finite GO verb followed by another finite lexical verb as in (63).

- (63) Ti vaiu accattu i scarpe. (Cosentino)  
you go.PRS.1SG buy.PRS.1SG DEF shoes  
‘I’m going (to the shop) to buy you the shoes.’

Here the GO verb retains its motion sense but the structure is that typically associated with the V+V pattern of light verbs. Thus, the two verbs are inseparable and head a monoclausal structure with the clitic *ti* ‘to/for you’ preceding the GO verb despite being logically an argument of *accattu* ‘I buy’. Elsewhere in the region the two finite forms are linked by the particle *a* as in (64) (Di Caro & Menza 2024: 3, ex (5a)), which in this instance is generally taken to be a reflex of Latin *ac* ‘and’ rather than the preposition *ad* ‘to’ which is the source of the linking *a* in the future constructions discussed in Section 4.1.

- (64) Vaju a ppigghju u pane.  
go.PRS.1SG A fetch.PRS.1SG DEF bread  
‘I go and fetch the bread.’

In this literal sense the pseudo-coordination pattern is also found with other motion verbs such as COME and SEND, but it is only in certain places and only with the GO verb that the mirative sense is found as with the Sicilian dialect Mussomelines (65) (Cruschina 2022: 133, ex (8)).

- (65) ... mi vannu a dunanu na pizza accussì ladia  
me GO.PRS.3PL A give.PRS.3PL INDF pizza so ugly  
‘They gave me such a bad pizza!’

As Cruschina (2022: 130–131) puts it, what we have here is ‘a functional verb associated with a mirative conventional implicature’. The fact that the surprise reading is attributed to a conventional implicature implies that it is cancellable, much as in Swedish as illustrated in (41). And as we saw with the Cosentino example (63), Cruschina also cites the fact that the clitic *mi* ‘to me’ is attached to *vannu* ‘they go’ despite being logically an argument of *dunanu* ‘they give’ as evidence that the structure is monoclausal; in short, here too we seem to have a light-verb construction even if Cruschina himself does not use that term. The formal patterns may be different but the link between GO and events which are unexpected or narratively focussed is to be seen here just as in the construction exemplified in (45) and in Detges’ (2004) explanation for the origin of the GO past construction in Occitan and Catalan.

## 5 Conclusions

We showed in Section 3 that the Swedish lexical verb *gå* could be used without manner connotations already in the earliest preserved texts, as in (13). Indeed it was also used idiomatically without association with physical movement at this stage, as in (14) and (15). However, as (10) illustrates, the verb can still be used also as a manner movement verb. We have shown that the light-verb use of Swedish GO in a pseudo-coordination goes back at least to the 15th century, and there is no evidence of the verb developing into an auxiliary.<sup>15</sup> We have seen rather that there are two independent historical trajectories: on the one hand, the range of contexts in which the light verb is used has expanded, and on the other, over the same time period the full verb has undergone some changes in its own distribution as is normal for any lexical item. However, at the same time, there is evidence of stability, for instance, the light-verb use with a noun *gå ed*, which we find in the earliest texts, is still used in the modern language, as in (17). The striking parallels between the modern examples in (31), (32), (33) and (34), and the earlier examples in (24), (25), (28) and (29) further illustrate the stability of the light-verb construction.

The Swedish light verb GO then supports the claim made in Butt & Geuder (2001), Butt (2010) and Butt & Lahiri (2013) that light verbs are not an intermediate stage in the development from a lexical verb to an auxiliary (*pace* for instance Anderson 2005); light verbs form an independent stable category. It is of course logically possible that the light verb could develop into an auxiliary at some unknown – and to us unknowable – future point, but there is good reason to think this will not happen. Grammaticalization changes typically develop over relatively short timespans and involve detectable ‘step changes’ (Börjars & Vincent 2019). Thus, the French GO future exemplified in (6) has its first attestations in the fifteenth century and was well established by the end of the eighteenth century, while the causative construction in (7) is already attested in the twelfth century and has remained in place and structurally unchanged down to the present day. It also fits well with the analysis of light verbs proposed in Butt & Geuder (2001), Butt (2010) and Butt & Lahiri (2013). They posit as a characteristic of the set of verbs that they identify as likely to be able to function both as a lexical verb and a light verb that ‘their lexical semantic specifications are so general that they can be used in a multitude of contexts’ (Butt & Lahiri 2013: 24). The polysemous nature of the Swedish verb *gå* then makes it a likely candidate for doubling as a light verb. The fact that both for the lexical verb and the light verb, the meaning of the verb is determined by the context supports the analysis presented in different forms in Butt & Geuder (2001), Butt (2010) and Butt & Lahiri (2013) of one single underspecified lexical entry for the lexical and the light verb. We have not carried out a detailed semantic analysis of the kind that underlies their analysis, but a possible starting point might be ‘movement or transition: punctual or extended; physical or figurative’. In support of their analysis, they emphasise form identity between the lexical and the light verb, and assume that it is a common characteristic of an auxiliary verb that as part of the grammaticalisation the auxiliary verb has a reduced form compared to the lexical verb. Indeed, the lexical verb from which it developed may even have disappeared. Swedish *gå* shows no difference in form between the lexical and the light use.

<sup>15</sup> It is worth remembering that the earliest texts we have are limited in genre and exemplify the kinds of texts that are still unlikely to use the light-verb pseudo-coordination construction, in particular legal texts. So it is not impossible that the construction was used in the spoken language at an earlier stage.

However, the auxiliary *kommer* (*att*) also shows no form change compared to the lexical verb.<sup>16</sup> This is, of course, not an argument against their analysis, just a quirk of Swedish.

The Romance data provide an excellent demonstration of how, within a single family and over a well-documented historical period, a wide variety of different constructions built around the GO verb can emerge and have emerged. The majority of these follow well-attested cross-linguistic grammaticalisation paths leading to new temporal, aspectual, and diathetic periphrases. Beside them there is also the light-verb use, as evidenced in the southern Italian pseudo-coordination patterns with close parallels to the Swedish and English structures we have reviewed here. This then fits with Butt & Lahiri's (2013: 24–25) argument that GO is one of the verbs that 'contain comparatively less lexically specified information that allow their wide range of application', including development both to auxiliary and to light verb.

Interestingly, in both Germanic and Romance, GO appears to have negative connotations. We saw this in some of the light-verb uses in Swedish and in the felicity restrictions on the Italian GO + past participle construction in Section 4.3. The effect can also be observed in English examples such as (66) and in contrast with *come* as in (67).

(66) go wild/bananas/\*happy/\*chuffed

(67) go crazy vs. come to your senses

We would speculate that this derives from an original meaning of GO as movement from a deictic point, as opposed to COME, which is movement towards a deictic point. In a familiar development, over time the notion of movement associated with GO can be in time rather than space. This can then be extended to abstract movement away from the expected, to give the mirative meaning, and abstract movement from the generally accepted, to give the negative connotations.

Returning then to the questions we asked in Section 1, our conclusions are that there is evidence from Germanic and Romance that there is an independent category of light verb, it is not simply a stage in a grammaticalisation cline from lexical verb to auxiliary verb. As illustrated by Swedish in Section 3.3, light verbs may develop new meanings and expand the class of verbs they combine with, but when they do, they remain light verbs. Under Detges' (2004) analysis of Catalan, it provides an example of an auxiliary verb that has developed from a light verb, but the process by which this happened cannot be described as grammaticalisation. Our conclusions are then in line with those of Butt & Geuder (2001), Butt (2010) and Butt & Lahiri (2013); there is a separate, diachronically stable category of light verb. At the same time, we also accept Bower's (2008) argument that though light verbs are stable over time, they may not be a diachronical dead end, but this does not imply that there is a grammaticalisation path from light verb to auxiliary.

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<sup>16</sup>There is reduction in the sense that the complementiser *att* is frequently left out, particularly in the spoken language, but there is no change to the verb itself.

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# Modelling negation in diachronic and cross-linguistic comparison: Negation in the history and structure of English and Bulgarian

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## 1 Introduction

This paper examines negation and some negation-related phenomena in diachronic and cross-linguistic perspective, focusing predominantly on data from earlier and contemporary English and Bulgarian. The main aim is to explore how these phenomena can be modelled in various formal frameworks, and in particular the framework of Lexical Functional Grammar (LFG). Although negation is often accorded the status of a language universal, in that all languages can deny propositions and all languages have negative morphemes (Dryer 2013), the data demonstrate that it operates rather differently in the two languages under consideration for this study. In Modern English, only auxiliaries can host negation (with a post-posed negator), while this is not the case in Bulgarian or in earlier English (both with pre-posed negators). Moreover, there can be prolonged periods of variation, as in Shakespeare’s English, when both *do*-support (the insertion of a dummy auxiliary *do* to host the negator in the absence of another auxiliary) and direct negation of the lexical verb coexisted side by side to express semantically equivalent sentential/verbal negation. In Modern English, the post-posed negator can be a separate word (*not*) or a bound morpheme (*-n’t*). All this diversity militates against positing a universal Negation Phrase (NegP) functional projection to house negation in a dedicated (higher head) position in the phrase-structure tree, as is done in mainstream transformational theory, including Minimalism, and instead favours a lexicalist and more language-specific, surface-oriented approach, such as the one advocated by practitioners of LFG. The more universal functional aspects of negation can be appropriately treated in LFG’s separate f(unctional)-structure representation rather than the constituent-structure tree. Since there may be no evidence for a full phrase-structure projection (as negators cannot themselves be modified), it is deemed an advantage that LFG can operate with non-projecting constituent-structure categories, with negators among them. Confirming the impression of cross-linguistic non-uniformity, strict negative concord obtains in Bulgarian, requiring that negative items should occur in combination with verbal negation. However, certain syntactic contexts admit variation, again pointing to the need for a finer-grained treatment which appeals to construction- and lexeme-specific constraints. While multiple negation was outlawed in standard English as a result of 18<sup>th</sup>-century normative proscriptions, it persists in various colloquial and non-standard varieties. Reaffirming the plausibility of an analysis which relies on potentially violable (or optional) constraints, multiple negation was not obligatory in earlier Bulgarian in the same way that it is today. This was the case in earlier English too.

In view of these data, it is a distinct advantage that LFG does not accord primacy (or ubiquity) to phrase structure and models the functional and semantic effects of negation in its separate f- and s-structures, rather than hosting all the relevant information in the constituent-structure syntactic tree. In diachronic perspective, such an architecture predicts that the phrase-structure status or distribution of an item can change without concomitant changes to its functional or semantic contribution. Conversely, there could be changes in the functional properties of an item, while its syntactic distribution remains the same. This is indeed what we find. Such a theoretical framework can furthermore elegantly capture the role and evolution of words that might accompany negation, such as French *pas* ‘not (in the least)’.

The separation between constituent and functional structure can neatly accommodate so-called negative (or Jespersen's) cycles and their attendant changes, including the loss of the predication content of original reinforcers like *pas*, from Latin *passum* 'a step'. While they can persist in the constituent structure reasonably unaffected, their functional contribution changes and they can ultimately be recruited as the sole exponents of negation (as in colloquial French) (see Jespersen 1917, 2025, Kemenade 2001, Gelderen 2008, 2011, 2016, 2023 for work in the philological and generative-transformational traditions). This is what happened in English too, with *not* starting out as a reinforcer which has now displaced the earlier pre-posed negator *ne*, after a period of variation (see further Brinton & Aronovick 2017: 232, 302–304, 376–378 for a descriptive account, and Los 2015: Chapter 4 for a more formalised transformational outline of the major developments). The modular design of LFG provides a natural fit for such variation and change in the functional domain (modelled as the loss of a PRED feature as a result of semantic bleaching) without attendant changes in the overt morphosyntactic exponence. At the same time, LFG allows us to easily analyse subsequent shifts in those items' morphosyntactic (and phonological) properties too, including the demotion to a non-projecting word and ultimately an affix. Crucially, these processes often proceed gradually and out of step with each other, which is anticipated in LFG's modular architecture, unlike the sudden cataclysmic shifts proposed in early diachronic generative syntax (including Lightfoot's 1979 research programme).

These issues will be explored in greater depth in the remainder of the chapter. Section 2 provides an outline of the major properties of negators in English and Bulgarian, while Section 3 zooms in on negative concord and multiple negation. Section 4 looks more closely at how negation phenomena can be formally captured in LFG by harnessing its well-established formal analytical tools and mechanisms, including the distinctions between c- and f-structure and between defining and constraining equations. Section 5 is dedicated to the diachronic evolution of negation. Finally, Section 6 summarises the main points and draws some conclusions about the merits of adopting a lexicalist, modular and constraint-based approach to analysing negation.

## 2 Overview of negation and negators in English and Bulgarian

Implementing the overall architecture of LFG, Butt et al. (1999) consider negation in a cross-linguistic perspective. This is what this contribution sets out to do too, drawing parallels between the instantiations of negation and related phenomena at various stages in the history of English and Bulgarian, two distantly related Indo-European languages. The paper is based on the results from a project to complete a comparative grammar of English and Bulgarian cast in the non-transformational, constraint-based framework of LFG (Hristov in preparation), for which I have heavily relied on Butt et al.'s (1999) seminal work, as well as standard reference work on LFG (Bresnan 2001, Bresnan et al. 2016, Dalrymple 2001, Dalrymple et al. 2019, Dalrymple 2023, Falk 2001), including King's (1995, 1997) influential analyses of Slavonic.

To put it rather simply, negation has to do with rejecting or denying a proposition (or only part of it). Negation appears to be one of the few absolute language universals found in all languages, and yet its instantiations and the manners in which it is expressed can differ significantly from language to language (see Bond 2023: 483–484). Unsurprisingly, its encoding is also subject to change over time. We can take negation to be part of a wider polarity category, which can in turn be positive or negative. The positive is the unmarked default, while the negative is the marked member of this binary opposition.<sup>1</sup> Negation can be indicated by individual words, such as *not*, *no*, *neither*, or *never* (e.g. *I **never** hit our kids. **Neither** did my husband.* [COCA (Davies 2008)]), which can serve different syntactic functions. For instance, *not* might be seen as an adjunct, *never* is an adjunct too, and *no* is a determiner (in *no people*, though not in *No, they didn't*). Negation can also be marked by affixation, including the prefixes *dis-*, *non-*, and *un-* or suffixes such as *-less* (associated with sub-clausal constituent negation).

<sup>1</sup>Consult Greenberg (2005 [1966]: 50) for the broader typological ramifications of this claim.

The Modern English contraction of *not*, *-n't*, is treated as an enclitic in more traditional sources such as Quirk et al. (1985), but it is now increasingly analysed as a suffix rather than a clitic (see Huddleston & Pullum 2002; Huddleston et al. 2022: 229). Arguments in favour of the affix analysis include the ability of the contracted *-n't* to cause unpredictable morphophonemic alternations in the stems to which it attaches, as in *shan't*, *can't*, and *won't*, among others. Moreover, only single words (rather than word strings) appear to be allowed in the auxiliary slot in front of the subject in questions like: *Doesn't he read?* ~ *\*Does not he read?*. Morphological means of encoding negation via affixation are more straightforwardly expressed in a lexicalist framework like LFG than in theories which appeal to across-the-board NegP projections like Minimalism (see Bond 2023: 488–496, 516).

Negative particles like English *not*, French *ne* or Bulgarian *не/ne* can be regarded as a subtype of adverb, since negation modifies the entire proposition or an individual constituent of the clause – just what is done by other adverbs or adverbial expressions. Negation is therefore modelled as a type of adjunction in some LFG analyses (see Bond 2023: 498–501, Hristov 2023, with references, as well as the discussion below). The syntactic status of negative particles has received a great deal of attention in the theoretical linguistic literature (for which see Bond 2023: 489, with references), including LFG (for which see Butt et al. 1999, Przepiórkowski & Patejuk 2015). Unlike other adverbs, ‘negative particles’ are frequently restricted in where they can occur and they cannot themselves be freely modified (except for reinforcers like French *pas*, to which we will return later in the exposition). This behaviour justifies adopting the vaguer but convenient term *particle*, rather than *adverb*, in typological work (see Butt et al. 1999: 141–142, who conclude that the negators *not* and *nicht* of closely related English and German belong to a special NEG category, making them different from other adverbs, with their different behaviour captured via appropriate c-structure rules). In LFG, a negator could be treated as a non-projecting word that does not project a full phrase (see Toivonen 2001, 2003).

In English finite clauses, the negative particle (or morpheme) is placed immediately after the finite auxiliary, negating the entire clause: *He might **not** have been reading*, or *He **doesn't** read*, but not *\*He reads not*. The latter was current in earlier English (as shown in (2) below) but is now disallowed. Only auxiliaries can host negation in Present-Day English, hence the need for so-called *do*-support (a.k.a. *do*-insertion). In other words, if there is no appropriate auxiliary (or a form of copular *be*, or, occasionally, lexical *have*), the appropriate form of the dummy auxiliary/operator *do* is inserted.<sup>2</sup>

In Bulgarian, by contrast, various individual constituents can be negated by a pre-posed *не/ne*, as can the verb and hence the entire clause. The verb need not be an auxiliary. This is shown in (1).

- (1) a. Не Иван дойде, а Мария.  
       Ne Ivan dojde, a Marija.  
       NEG Ivan came but Marija  
       ‘It wasn’t Ivan that came but Marija.’  
       b. Иван не дойде вчера.  
       Ivan ne dojde včera.  
       Ivan NEG came yesterday  
       ‘Ivan did not come yesterday.’ [lit. ‘Ivan not came yesterday.’]  
       c. Иван дойде не вчера, а още миналата седмица.  
       Ivan dojde ne včera, a ošte minalata sedmica.  
       Ivan came NEG yesterday but already last week  
       ‘Ivan didn’t come yesterday, but last week.’  
       [lit. ‘Ivan came not yesterday, but as early as last week.’]

<sup>2</sup>The existence of patterns like old-fashioned British *I haven't a clue*, alongside more widely accepted *I don't have a clue*, further demonstrates the indispensability of a lexicalist approach which takes into account cross-dialectal variation in highly specific lexical and syntactic contexts. Conversely, *do*-support occurs even with *be* in imperatives, e.g. ***Don't** be stupid*. Again out of line with the general trend, the negator can be pre-posed in some subjunctive constructions without an auxiliary, e.g. *it was important that she **not** offend him* [COCA, 2019].

As becomes evident from the comparison above, despite their ultimate etymological affiliation, the negators of English and Bulgarian behave differently, attaching to different nodes in the c-structure tree (see King 1995, Dalrymple 2001: 61, Dalrymple et al. 2019, Bond 2023: 490, Hristov 2023). An analyst might therefore be ill-advised to rely on a universal NegP but can instead place the negator in the appropriate positions according to each language's specific phrase-structure rules, based on each item's characteristic morphosyntactic behaviour (in the relevant syntactic environment). The variation that existed in Renaissance English likewise favours a language-by-language/period-by-period lexicalist approach, as illustrated by the following examples with, (2a), and without *do*-support, (2b), both from Shakespeare's *Henry IV*, part 2, Act 3, Scene 2 (c. 1596–1599).

- (2) a. he **doth not do** it right  
b. By my troth, I **care not**<sup>3</sup>

### 3 Negative concord and multiple negation

In both English and Bulgarian, non-verbal constituents of the clause can be negated by using a negative pronoun/pro-form. If such a negative pro-form is present, then the verb has to be obligatorily negated with the proclitic/particle *ne/ne* in Bulgarian (without contributing additional negative semantics), a phenomenon known as negative concord and illustrated in (3).

- (3) a. Никой не дойде.  
Nikoj ne dojde.  
nobody NEG came  
'Nobody came.' [lit. 'Nobody didn't come.']  
b. \*Никой дойде.  
Nikoj dojde.  
nobody came  
lit. 'Nobody came.'  
c. Някой не дойде.  
Njakoј ne dojde.  
somebody NEG came  
'Someone didn't come.'  
d. Никога не съм го виждал.  
Nikoga ne sām go viždal.  
never NEG AUX.1SG him seen  
'I have never seen him.' [lit. 'I have never not seen him.', though it cannot have the meaning 'I have always seen him', which we might get in this context in English]  
e. \*Никога съм го виждал.  
Nikoga sām go viždal.  
never AUX.1SG him seen  
lit. 'I have never seen him.'

Unlike Bulgarian, where negative concord is obligatory, standard Modern English disallows multiple negation following 18<sup>th</sup>-century prescriptive doctrine. This necessitates the deployment of so-called negative polarity or non-assertive items such as *any* or *anyone*, which are better described as non-assertive since they are not restricted to negative clauses (see Bond 2023: 512ff.). The sociolinguistic and historical circumstances surrounding the gradual social stigmatisation of multiple negation in Tudor and Stuart England are charted in Nevalainen & Raumolin-Brunberg (2017), summarised in Trask &

<sup>3</sup>Mira Kovatcheva (p.c.) surmises that the choice might have to do with considerations of rhythm and stress. Such effects could be factored into LFG's separate p(honological)-structure and built into the syntax-prosody interface, for which see Bögel (2023), with references.

Millar (2023: 278–281). Despite the long tradition of stigmatisation of multiple negation on the grounds of perceived logic and emulation of Latin grammar, multiple negation persists in non-standard English to this day. Consider non-standard modern examples, such as *!I ain't spoken to nobody*, *!She don't do nothin'*, *!They never meant no harm*, as well as Chaucer's verse in (4) below. Although it was most certainly admissible, as in (4a), multiple negation was not mandatory in Middle English, as shown in (4b), where *never* occurs with a positive verb, as it would in standard English today, or in (4c), with negative *na* and no accompanying negation on the verb (cf. (12a)–(12b) below). Note that multiple negative items do not cancel each other out in earlier English and in contemporary non-standard English or standard Bulgarian (as they would in logic or in Latin), but merely produce greater emphasis.<sup>4</sup>

- (4) a. He **nevere** yet **no** vileynye **ne** sayde / In al his lyf unto **no** maner wight  
 he never yet no villainy not said in all his life, unto no manner creature  
 'He never said a rude word to anyone in all his life'  
 [*Canterbury Tales*, 14<sup>th</sup> c.]
- b. Al speke he **never** so rudeliche and large  
 'Although he [may] never speak so rudely and freely' [*Canterbury Tales*]
- c. nede has **na** peer  
 'need/necessity has no peer/equal' [*Canterbury Tales*, imitation of northern dialect]

In the light of Chaucer's example in (4a), we can compare non-standard English *!I ain't told nobody nothin'* to perfectly standard Bulgarian (5a), where all those negative items have to obligatorily co-occur, as confirmed in (5b)–(5e).

- (5) a. На никого нищо не съм казвал  
 Na nikogo ništo ne sām kazval  
 to nobody nothing NEG AUX.1SG said  
 'I haven't said anything to anyone', 'I haven't told anybody anything'
- b. \*На никого нещо съм казвал  
 Na nikogo nešto sām kazval  
 to nobody something AUX.1SG said<sup>5</sup>
- c. \*На някого нещо не съм казвал  
 Na njakogo nešto ne sām kazval  
 to somebody something NEG AUX.1SG said

<sup>4</sup>Similar variability occurs in Old English, as shown in (i) and (ii) from 'Alfred's' (ninth-century) translation of Bede's account of the poet Caedmon (Whitelock 1967: 45–46). For (ii), other manuscripts have *ic naht singan ne cuðe*, *ic singan ne cuðe*, *ic naht cuðe*. For more on negation in Old English, see Mitchell (1985: 659–674).

- (i) Ne con ic **noht** singan  
 not can I nought sing  
 'I don't know how to sing (anything)'
- (ii) forðon ic **noht** cuðe  
 because I nought could  
 'because I knew nothing/I didn't know'

Like (4b), the examples in (iii) and (iv) also contain negative words which are not accompanied by verbal negation.

- (iii) he **n-æfre** **n-ænig** leoð ge-leorn-ad-e  
 he NEG-ever NEG-any poem/song PREF-learn-PAST-SG  
 'he never learned any poetry' [multiple negative items but without negative concord on the verb]
- (iv) þa word þe he **n-æfre** ge-hyr-d-e  
 those.ACC.PL word[ACC.PL] that he NEG-ever PREF-hear-PAST-SG  
 'the words which he [had] never heard'

<sup>5</sup>Note that this cannot mean 'There is something (a particular thing) that I did not say to anyone'.

- d. \*На никого нещо не съм казвал  
 Na nikogo nešto ne sâm kazval  
 to nobody something NEG AUX.1SG said
- e. \*На никого нищо съм казвал  
 Na nikogo ništo sâm kazval  
 to nobody nothing AUX.1SG said

In other words, not only does Bulgarian allow multiple negation, but it requires it. In Old Bulgarian/Old Church Slavonic, by contrast, multiple negation was allowed but not required, as becomes evident in (6), where the negative pronominal arguments do not necessarily trigger verbal negation (cf. Chaucer's material in (4) above; see further Lunt 2001: 163 and Willis 2013, who note that verbal negation is optional if the negative pro-form precedes the verb; Ingham 2013: 141–142 has detected similar restrictions in Old English dialects).

- (6) a. и не хотѣше да никто не увѣс(тъ)  
 i ne хотѣше da **nikto** ne uvēs(тъ)  
 and not wanted that nobody not knows  
 'and [he] did not want anyone to find out/know' [*Boyana Palimpsest*, Mark 9:30]  
 [negative pronoun + verbal negation]<sup>6</sup>
- b. никътоже отъ васъ творитъ закона  
**nikъtože** отъ vasъ tvoritъ zakona  
 nobody of you keeps law  
 'No one of you keeps the law' [*Zographensis, Marianus*, John 7:19; from Huntley (1993: 173)]  
 [negative pronoun without verbal negation, ungrammatical today]
- c. блюдѣте сѧ чѣда да никтоже васъ отължчитъ отъ ѡубъве христосовъ  
 bljudēte sę čēda da **niktože** vasъ otъlžčitъ otъ ѡubъve xristosovy  
 guard REFL children that nobody you turns.away from love Christ's  
 'Beware, children, that no one should turn you away from Christ's love'  
 [*Codex Suprasliensis* 236.13] [negative pronoun without verbal negation]

Even in contemporary Bulgarian, negative concord may be optional in some highly exceptional syntactic contexts involving *нито... нито.../nito... nito...* 'neither... nor...', as shown in (7a). The availability of this fluctuation depends on word order, as shown by the obligatory multiple negation in (7b). In standard English, only one negative item is permitted, with the rest being non-assertive forms as in *I haven't told anybody anything* in the translation of (5) above.<sup>7</sup>

<sup>6</sup>Modern Bulgarian would have no verbal negation in the subordinate clause in (i), as it would most likely produce an interpretation whereby he/she didn't want a situation in which nobody knew, though cf. (ii).

- (i) не искаше никой да узнае  
 ne iskaše **nikoj** da uznae  
 not wanted nobody that knows  
 '[he/she] didn't want anyone to find out'
- (ii) не искаше никой да не казва нищо  
 ne iskaše **nikoj** da ne kazva **ništo**  
 not wanted nobody that not says nothing  
 '[he/she] didn't want anyone to say anything'

<sup>7</sup>If two negative items co-occur in standard English, the meaning of each will be retained, as in the following advertisement drawn to my attention by Mary Dalrymple: *Everybody doesn't like something, but nobody doesn't like Sara Lee*, i.e. 'there is nobody who doesn't like Sara Lee' [source: <https://www.youtube.com/watch?v=eBXZd2GZ6cY>, accessed on 3 February 2025] (cf. Przepiórkowski & Patejuk 2015: 324).

- (7) a. Нито той, нито аз (не) бяхме сигурни.  
 Nito toj, nito az (ne) bjaxme sigurni.  
 neither he nor I NEG were.1PL sure.PL  
 ‘Neither he nor I was/were certain.’
- b. Не бяхме сигурни нито той, нито аз.  
 Ne bjaxme sigurni nito toj, nito az.  
 NEG were.1PL sure.PL neither he nor I  
 ‘Neither he nor I was/were certain.’

Based on this evidence, more complex restrictions will be needed, but in any case they ought to be associated with certain syntactic contexts and with certain lexemes, reaffirming the usefulness of a lexicalist and constructionist approach. In Modern Bulgarian, negative-polarity words will be restricted to negative contexts, while in standard Modern English, their non-assertive counterparts will have a wider distribution. In non-standard English, negative items might work as in Modern Bulgarian, where they are obligatory, or they may be optional as in Old Bulgarian/Old Church Slavonic or in earlier English. Be that as it may, all this cross-linguistic diversity and language-internal variation calls for proceeding language by language, with further constraints attached to individual lexical items in their relevant syntactic environments.

#### 4 Modelling negation in LFG

In an LFG setting, negation is modelled at f-structure, usually as a binary feature/attribute with positive and negative values. There have also been proposals that more than one feature is needed in order to account for the complete range of negation phenomena. Therefore, some authors distinguish between representations of so-called constituent negation (CNEG) and eventuality negation (ENEG) (see Laczko 2015, Przepiórkowski & Patejuk 2015; cf. Butt et al. 1999, Bond 2023: 501–503, with references). These distinctions largely have to do with the scope of negation, in this case whether it is relevant and has a semantic (and/or syntactic) effect on the level of the entire clause or below it.<sup>8</sup>

As pointed out by Bond (2023: 498ff.), within f-structure representations, negation can be modelled as a feature-value pair, e.g.  $\pm$ POL(arity),  $\pm$ NEG(ation), as an adjunct with a negative value, or by appealing to multiple features within the same f-structure (cf. Przepiórkowski & Patejuk 2015, Dalrymple et al. 2019: 67–69). It is the first approach that is adopted by King (1995) and Butt et al. (1999), as well as in the current chapter. According to such an approach, the negative element contributes the specification [POL –], [NEG +] or [POL NEG] to the relevant f-structure.

Butt et al. (1999: 142–143) offer the following treatment of negation in the standard (written) French sentence in (8), which requires preverbal *ne* and postverbal *pas*. Both elements are included in the f-structure in (9), with *ne* contributing the NEG feature, and *pas* contributing only NEG-FORM (cf. Dalrymple et al. 2019: 67, Bond 2023: 504).

- (8) French (from Butt et al. 1999: 143, Dalrymple et al. 2019: 67, Bond 2023: 504):
- David n’ a pas mangé de soupe.  
 David NEG have POSTNEG eaten of soup  
 ‘David did not eat any soup.’

<sup>8</sup>Consider the following pair of sentences from Horn & Wansing (2022), in which so-called negative inversion can be triggered only if the negation is taken to have clausal scope (cf. Klima 1964). Here, LFG would presumably rely on the interfaces between semantics and syntax (s-, f- and c-structure).

- (i) a. With no job **will I** be happy. [= ‘I won’t be happy with any job’]  
 b. With no job **I will** be happy. [= ‘I will be happy without any job’]

(9) F-structure for example (8):

|          |                   |
|----------|-------------------|
| NEG      | +                 |
| NEG-FORM | PAS               |
| PRED     | 'EAT (SUBJ, OBJ)' |
| SUBJ     | [PRED 'DAVID']    |
| OBJ      | [PRED 'SOUP']     |

According to Butt et al.'s analysis, the marker which contributes the [NEG +] feature can only appear if the NEG-FORM associated with *pas* is there too. As shown in (10), *ne* can also combine with the adverb *jamais* 'never', which might be specified like its counterpart in Bulgarian, i.e. as an item which can only occur in a negative context (cf. (14) below).

(10) French (from Butt et al. 1999: 143, Bond 2023: 505):

David *ne* mange *jamais* de soupe.  
 David NEG eat POSTNEG.NEVER of soup  
 'David never eats soup.'

A proposal accounting for the distribution of *pas* (grammaticalised from Latin *passum* 'a step') might likewise constrain it to appear as a negative-concord item in the presence of *ne*. In spoken French, however, only *pas* can express negation, so it seems that its specifications have changed and now it is the item which contributes the [NEG +] feature. This instantiates a typical negative cycle, for which see Jespersen (1917, 2025) and Gelderen's (2008, 2011, 2016, 2023) work, to be revisited in the next section. English saw the same type of cyclical development (as did closely related German). The original Indo-European negator *ne* came to be reinforced with an emphatic negative adverb or particle, as shown for Old English in (11a) and for Middle English in (11b). *Ne* could sometimes be downgraded to a prefix and merge with the relevant stem, as in (11c).<sup>9</sup>

- (11) a. Byrhtnoð... bæd þæt... **ne** forhtedon **na**  
 Byrhtnoth bade that [they] not feared not.at.all  
 'Byrhtnoth urged that they should not fear at all' [*The Battle of Maldon*, 10<sup>th</sup>/11<sup>th</sup> c.]<sup>10</sup>  
 b. **ne** beth **nat** yvele apayd  
 'be not displeased' [Chaucer, *Canterbury Tales*, *The Prologue to Sir Thopas*, 14<sup>th</sup> c.]  
 c. That ye **narete** it **nat** my vileynye  
 'That you do not consider it my villainy/rudeness' [*Canterbury Tales*, *General Prologue*, 14<sup>th</sup> c.]

As is usually the case in language change, there was a period of variation, as illustrated by the material in (12), which shows that the reinforcing emphatic *not/nat/noght* was not obligatory in Middle English – see especially (12a)–(12b). At that stage, either pre-posed *ne* or post-posed *not/nat/noght* could negate a verb on its own – cf. in particular (12c)–(12d), with the two competing options side by side (see further Brinton & Arnovick 2017: 302–304). These examples are admittedly a rather heterogeneous 'mixed bag of things', with a negative conjunction in (12a)–(12b) and negation with or without an auxiliary in (12b)–(12d), but I will not go into any additional tendencies or restrictions that may have been in place. The crucial point is that either of those negators is able to negate the clause without the other.

<sup>9</sup>Cf. Roberts (2007: 142–149) for a Minimalist account of such cyclic developments in French and English from preverbal negative markers, to combinations of pre- and postverbal marking, to a final stage where only the postverbal marking survives. See also Hansen (2013) for French, as well as Wallage (2012) and Ingham (2013) for alternative Minimalist takes on English.

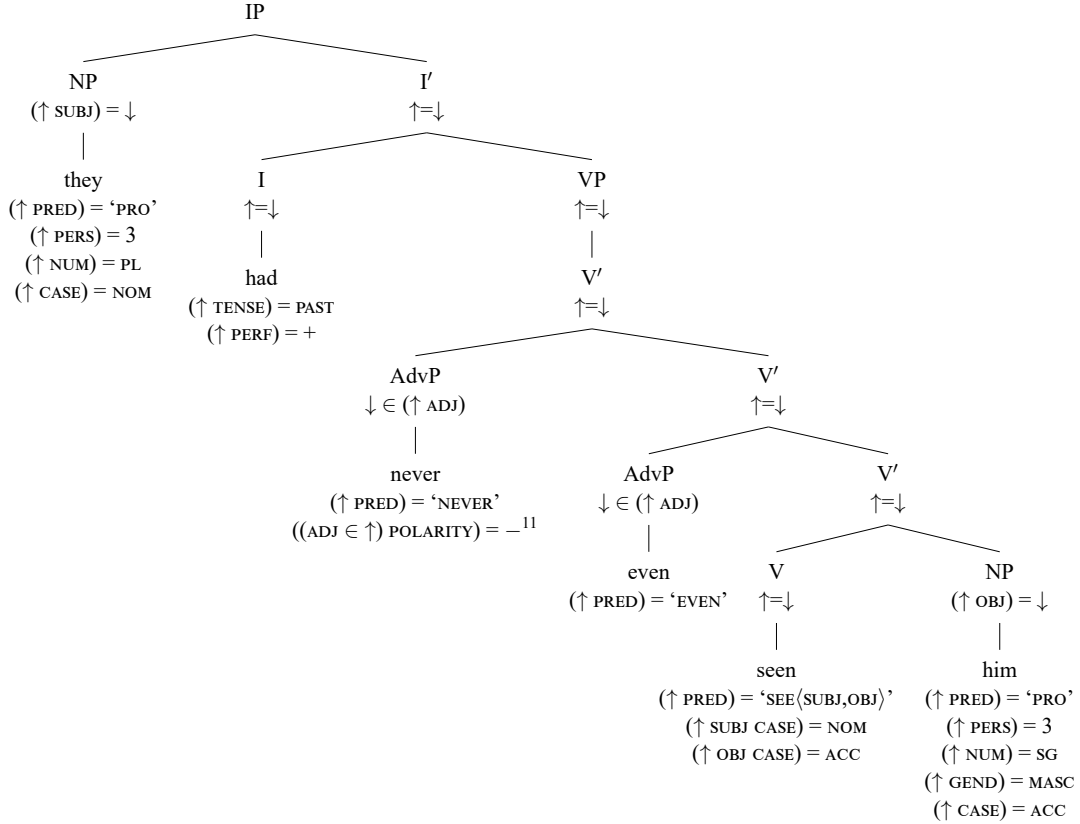
<sup>10</sup>Cf. *ne ondret þu ðe æniges þinges* 'do not dread anything' (from *Apollonius*, cited in Mitchell 1985: 672), alongside *Nis nu cwicra nan* 'There is no one alive now', lit. 'There isn't now none alive' [*The Wanderer*], with multiple negation.

- (12) a. **Ne** thogh I speke hir wordes proprely  
 lit. ‘Nor though I speak their words properly’ [with *ne* as a negative conjunction]  
 ‘Although I do not speak their words properly’  
 [*Canterbury Tales*, *General Prologue*]
- b. As thou right now were copen out of the ground,  
**Ne nevere** er now **ne** hadde knowen me.  
 ‘As [if] you right now had [lit. were] crept out of the ground,  
 Nor never before now had known me.’  
 [*Canterbury Tales*, *Franklin’s Tale*, 14<sup>th</sup> c.]
- c. He sholde **nat** be called a gentil man that... **ne** dooth his diligence.  
 ‘He should not be called a gentle man that does not do his diligence.’  
 [*Canterbury Tales*, *The Tale of Melibee*, 14<sup>th</sup> c.]
- d. The king was **noght** so sone come,  
 That whanne he hadde his chambre nome,  
 His brother **ne** was redi there.  
 lit. ‘The king was not come so soon,  
 that when he had his chamber taken,  
 his brother was not ready there.’  
 ‘The king had no sooner arrived,  
 And had just entered his bedroom,  
 When his brother was ready there.’  
 [Gower, *Confessio Amantis*, 14<sup>th</sup> c., transl. by Brian Gastle and Catherine Carter]

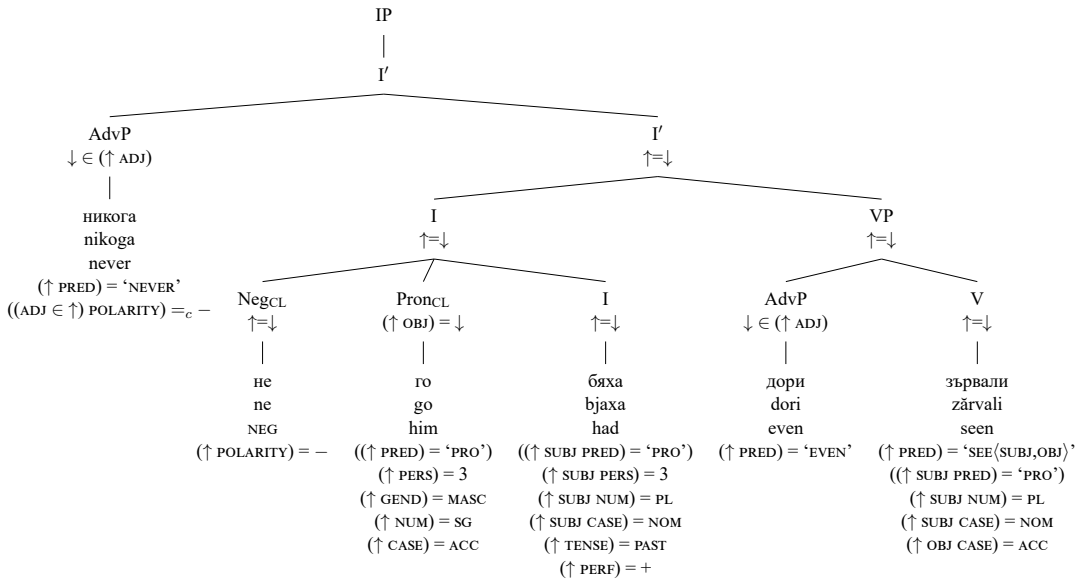
The originally reinforcing word *na* was able to appear on its own (i.e. without *ne*) as early as Old English, as in *Na cunne*, translating Latin *nesciat* ‘not know’ (<https://bosworthtoller.com/23359>, accessed on 16 February 2025; cf. Mitchell 1985: 669, 672). We return to these diachronic developments in Section 5, but in the following paragraphs, we first concentrate on some of the more technical aspects of an LFG account.

Since LFG is a constraint-based theory, extra emphasis ought to be laid on the constraints which govern the interfaces between the different modules, including phrase-structure rules. These can be briefly illustrated with the diagrams in (13) and (14) of naturally occurring translation equivalents (from the opening chapter of J. K. Rowling’s *Harry Potter and the Philosopher’s Stone* (1997) and its Bulgarian translation). Examples (13) and (14) demonstrate that English has a more articulated, layered constituent structure compared to the much flatter ‘non-syntactically-configurational’ tree in Bulgarian, though both share a similar underlying functional structure, (15). Negation is expressed rather differently in the two languages. English has the sole negator *never*, while Bulgarian has a negative adjunct alongside verbal negation (as per obligatory negative concord). A Minimalist account might envisage a NegP for both clauses, but it would then have to resort to manipulations such as the movement or the deletion of the negator, while LFG offers a surface-based representation of the constituency in line with empirical tests, including the clitic status of the negator, so the different encoding of negation is expected and does not call for additional stipulations.

- (13) English constituent structure for *they had never even seen him*:



- (14) Corresponding Bulgarian c-structure for *никога не го бяха дори зървали/nikoga ne go bjaxa dori zărvali* 'they had never even seen him':



<sup>11</sup>I here adopt a polarity feature with positive and negative values; see further Przepiórkowski & Patejuk (2015) and Bond (2023).

(15) F-structure for the c-structure trees in (13) and (14):

|          |                  |
|----------|------------------|
| PRED     | ‘SEE⟨SUBJ, OBJ⟩’ |
| TENSE    | PAST             |
| PERF     | +                |
| POLARITY | —                |
| SUBJ     | [                |
|          | PRED ‘PRO’       |
|          | PERS 3           |
|          | NUM PL           |
| OBJ      | CASE NOM         |
|          | ]                |
| OBJ      | [                |
|          | PRED ‘PRO’       |
|          | PERS 3           |
|          | NUM SG           |
|          | GEND MASC        |
| ADJ      | CASE ACC         |
|          | ]                |
|          | {                |
| ADJ      | [PRED ‘NEVER’]   |
|          | [PRED ‘EVEN’]    |
| ADJ      | }                |
|          | ]                |

The order of the clitics housed in I in (14) is templatic, with the negator coming first. Although the Bulgarian negator is a proclitic, it can enable the clitic cluster to appear clause-initially, which would be impossible without it: *He go бяха зървали./Ne go bjaxa zărvali.* ‘They hadn’t seen him.’ (consult the gloss in (14)) ~ *Бяха го зървали./Bjaxa go zărvali.* ‘They had seen him.’ ~ *\*Го бяха зървали/\*Go bjaxa zărvali,* where the pronominal clitic *го/go* cannot be clause-initial. The proclitic negator even imparts stress to the otherwise stressless clitic which follows it. This can be given a plausible LFG or L<sub>R</sub>FG analysis, accounting for the templatic arrangement of the clitic cluster and the interaction between sequencing, clitic placement and prosody, which will be left for future work. More information about L<sub>R</sub>FG can be found on the Lexical-Realizational Functional Grammar website (<https://lrfg.online/>, accessed on 1 April 2025). For more on clitics in Slavonic, see Franks & King (2000).

The interface between the items appearing in the constituent structure and the functional domain is regulated by constraints associated with individual word forms (and annotated phrase-structure rules). They can capture the different behaviour of the respective items. The polarity equation associated with the Bulgarian word for ‘never’ in (14) is a constraining equation (with subscripted <sub>c</sub>), unlike English *never* in (13), which is associated with a defining equation. In other words, by virtue of the appearance of English *never* the clause in which it appears becomes negative, while its Bulgarian counterpart requires the negative feature value to be already present in the clause. This is a notational way to represent the difference between obligatory multiple negation in Bulgarian, and its absence from standard English. These mechanisms can be extended to non-standard English too, e.g. *!They ain’t never seen nobody*, as well as to French *ne...pas* vs. just *pas*. Non-standard English *never* will get an optional constraint identical to its Bulgarian counterpart, i.e. ((ADJ ∈ ↑) POLARITY) =<sub>c</sub> —, while colloquial French *pas* now contributes the negative meaning, (↑ POLARITY) = —, on its own.

It has been noted that, unlike many other theories, LFG has been remarkably stable since its inception in the late 1970s and early 1980s. So instead of recasting old analyses in novel formal moulds, it has been my aim to provide novel analyses with the well-established tools from LFG’s toolkit, including the distinction between c- and f-structure or formal distinctions such as those between defining and constraining equations. I here adopt the treatment of negative concord in Polish proposed by Przepiórkowski & Patejuk (2015: Section 5) and extend it to account for the contrasts between negation in English and Bulgarian.<sup>12</sup> Thus, without introducing any formal modifications to the mechanisms already available, I show how they can be successfully harnessed to provide a natural explanation of relevant phenomena in different languages, as

<sup>12</sup>Przepiórkowski & Patejuk (2015) work with an opposition between constituent negation (CNEG) and eventuality negation (ENEG), which I have omitted here in order to ease the exposition.

well as different varieties of the same language. The final section probes LFG's suitability for diachronic theorising.

## 5 The diachronic dimension

As pointed out by Booth & Butt (2023: 906), 'LFG's fundamental design principles and its parallel projections are particularly well suited to modelling diachronic change'. Crucially, since LFG separates surface appearance (at c-structure or m-structure) from the functional and semantic contributions of an item (at f- or s-structure), it is especially well placed to offer illuminating treatments of reanalysis and morphosyntactic change in general (see Vincent 2001, Börjars & Vincent 2017: 642–646, Booth & Butt 2023: 907, with references). Other models, such as Minimalism, might rely on proliferating functional heads and projections such as NegPs in syntactic trees. These functional heads can frequently be covert. LFG, by contrast, keeps the constituent structure and the functional dimension apart (see Börjars & Vincent 2017: 658–661). In Vincent's (2001: 6) words:

the parallel correspondence architecture of LFG is a great benefit. Since no prior assumption is made that all aspects of language are to be modelled in terms of a single set of primitives such as Merge and Move, LFG leaves open the possibility of treating not just syntax but all aspects of language as autonomous and representable as different types of structure.

Taking these tenets as a point of departure, Butt (1997) logically assumes that the analyst would then have to figure out how best to link two or more sub-structures or modules, potentially finding change at such interface points between the levels.

In English, the negator underwent grammaticalisation from a word reinforcing negation, itself the product of amalgamating an earlier phrase, to the sole negator, and ultimately to an affix. The negator subsequently came to be restricted in its occurrence with auxiliary verbs only (barring a few residual uses). The latter development will receive a natural treatment at c-structure, entailing a modification of the phrase-structure rules. This c-structure change, i.e. changing the c-structure positions in which the negator is licensed to appear, will have no effect on the f-structure representation, as the functional contribution of the negator presumably remains the same (cf. Börjars & Vincent 2017, Booth & Butt 2023: 908 for similar developments from other areas of grammar).<sup>13</sup> On the other hand, the shift from reinforcing particle to actual negator, as with colloquial French *pas*, will alter the item's functional contribution (while its form can remain the same). Another important change involves the 18<sup>th</sup>-century prescriptive ban on multiple negation, which will also be naturally handled by modifying the lexical entries of the items concerned (cf. the constraints in (13) and (14)). Presumably, earlier English *never* had two alternative options in its lexical entry: ((ADJ ∈ ↑) POLARITY) =<sub>(c)</sub> –, where the optionally constraining equation would either require it to appear in the context of verbal negation, or allow it to negate the clause on its own (see fn. 4 and example (12b) above). Over time, only the second option remained and the first was lost (i.e. the constraint became defining, notationally accounted for by removing the subscripted <sub>c</sub>). The Bulgarian word for 'never' has gone in the opposite direction, with the equation becoming obligatorily constraining.<sup>14</sup>

Other lexical items could, but didn't necessarily have to, go through the same changes. This falls out from a lexicalist approach to grammar. In Bulgarian, optional multiple negation became obligatory,

<sup>13</sup>Here, a Minimalist account might appeal to parameter resetting between different generations of speakers, licensing the negator to appear with any verb or with auxiliaries only. Once a parameter is reset, it should lead to a sudden cataclysmic overhaul across the board, but the variation we get instead militates against such a scenario, forcing proponents of Principles and Parameters to postulate competing grammars (see the discussion in Roberts 2007: 132–139). As acknowledged by Roberts (2007: 138), lexical exceptions involving the older pattern persisting with certain lexemes might pose further problems for such an account and are more amenable to a lexicalist analysis.

<sup>14</sup>Although in Modern Bulgarian the word for 'never' has to be obligatorily accompanied by verbal negation, as shown in (14), this wasn't the case in Old Bulgarian/Old Church Slavonic. There is verbal negation accompanying 'never' in (i) but not in (ii).

except in certain syntactic contexts with concrete lexical items. In LFG terms, this process can be thought of as abandoning the optionality of the relevant constraints in the vast majority of syntactic environments, with a few residual exceptions definable in concrete lexical and syntactic terms.

The development of *not* from a phrase meaning ‘not a thing/not at all’ (Old English *nawiht* ‘naught, nothing, no whit/wight’ < *na* ‘no’ + *wiht* ‘thing, creature’, for which cf. (4a)), to a reinforcing adjunct similar to standard French *pas*, to the sole negator, to an affix is a typical example of grammaticalisation, whose grammaticalisation path or cline can be represented as going from a phrase > lexical word > function word > clitic > affix. In LFG, the original lexical item will be modelled as a word supplying its own semantic content to the set of adjuncts, associated with its own lexical PRED, as in the partial lexical entry in (16).

- (16) *not*                    (↑ PRED) = ‘NOT AT ALL’  
                               ((ADJ ∈ ↑) POLARITY) =<sub>c</sub> –

Once *not* was bleached of its emphatic degree meaning, it would have been represented as no longer contributing a separate semantic PRED but only an accompanying NEG-FORM (as with French *pas*, once it came to shed the original meaning of ‘a step’), optionally co-occurring with the original (and still primary) negator *ne*. This is shown in (17).

- (17) *not*                    (↑ NEG-FORM) = NOT  
                               ((ADJ ∈ ↑) POLARITY) =<sub>c</sub> –                    later:    ((ADJ ∈ ↑) POLARITY) =<sub>(c)</sub> –

In terms of semantics, lexical meanings of ‘small quantity’ (‘a single step’, ‘a single thing’) are used across languages to underscore the lack of something, which can in turn naturally lead to reinterpretation as a negator. Once *not* became the sole negator, i.e. a function word, it came to be exclusively associated with the [NEG +] or [POL –] feature value. Needless to say, there was a long intervening period of competition and overlap, showcased in (12), when either the original or the secondary negator was able to negate a clause on its own. At that stage, presumably both of them (i.e. *ne* and *not*) had lexical entries associated with the [POL –] feature value, in addition to a concurrent lexical entry for the reinforcer *not* associated with the NEG-FORM attribute (or with a lingering emphatic lexical meaning such as ‘not at all’), in order to account for the contemporaneous material in (11b)–(11c). Eventually ousting *ne*, only the secondary negator *not* survived the competition stage, gradually eliminating its (subsidiary/alternative) entries associated with the NEG-FORM attribute (or with the obsolescent emphatic lexical meaning ‘not at all’). At some point, it further lost the ability to project a complete phrase, which may or may not have happened at exactly the same time when it lost its lexical meaning. Unlike sudden Lightfootian restructuring which would call for simultaneity, an LFG view enables the researcher to remain agnostic on the point of timing, with either scenario lending itself to modelling equally well. The affixal realisation of the negator *-n t* will be expressed as part of the lexical entry of the word form to which it is attached, in line with LFG’s lexical integrity principle.<sup>15</sup> Irrespective of its morphologisation, its functional contribution remains

- (i)    **ВЪ НЕМЪЖЕ НЕ БѢ НИКЪТОЖЕ НИКОГДАЖЕ ПОЛОЖЕНЪ**  
       **въ** **немъже** **не** **бѣ** **никътоже** **никогдаже** **положенъ**  
       in which not was nobody never laid  
       ‘[a sepulchre that was hewn in stone,] wherein never man before was laid’ [Luke 23:53]
- (ii)    **НИКЪГДА БО ВЪ СЛОВЕСИ ЛАСКАНИЮ БЪХОМЪ**  
       **никъгда** **бо** **въ** **словеси** **ласканию** **бухомъ**  
       never particle in word of.flattery we.were  
       ‘we never used [words of] flattery’ [1 Thessalonians 2:5]

<sup>15</sup>This is indeed what happened to *never* a long time ago – it is etymologically made up of the original negator *ne* + *ever*. A similar fused form exists in contemporary Bulgarian, where *няма/няма* ‘not.have.3SG.PRES’ (from negator *не/ne* and *има/има* ‘have.3SG.PRES’) can express existence, futurity or possession (when it has a complete paradigm) (see Veselinova 2010). In addition, Old Bulgarian/Old Church Slavonic had contracted present-tense forms of ‘be’, except for the third person plural, i.e. *нѣсмь/něsmь* ‘not.be.1SG.PRES’, *нѣси/něsi* ‘not.be.2SG.PRES’, *нѣстъ/něstь* ~ Old English *nis* ‘not is’, etc. but *нѣ сѣтъ/ne sьtь*

the same as that of the free morpheme *not*. As demonstrated by the material adduced earlier, all of this restructuring didn't happen overnight but was achieved via small incremental steps over long periods of variation.

Crucially, as pointed out by Booth & Butt (2023: esp. 944–945), LFG provides a natural setting to model variation and gradual change, since the steps can overlap and items with different specifications can co-exist and compete at any one time (consider the gradual relaxation of the restriction on the status of *much* as a non-assertive item in Present-Day English, e.g. *I don't have (too) much work today ~ ?\*I have much work today ~ I have too much work today ~ This theory has much to offer*; cf. similar results reported by Veselinova 2016). This is easily modelled in a lexicalist framework and is in stark contrast to the abrupt 'catastrophic' changes proposed in early generative work on syntactic change (including Lightfoot 1979, 1981, 1991, 1997), which has come under criticism for being unrealistic and difficult to square with the rather more complex situation on the ground (see Trask & Millar's 2015: 140ff, 2023 assessment). The issue of gradualness is examined from different theoretical perspectives by Vincent (2001: 8–10), who points out that gradualness is dismissed in Lightfootian historical syntax but it is predicted and expected in the setting of a modular lexicalist architecture like that of LFG. Butt & Lahiri (2013), for instance, assume that grammaticalisation involves losing or altering the relevant functional information at f-structure, while the surface form initially remains constant.<sup>16</sup>

Another facet of the subsequent downgrading processes of cliticisation and morphologisation (and ultimate loss) will be linked to the accompanying stress shifts which must have affected the prosody of the items involved. The loss and/or the cliticisation and morphologisation of a negator (such as Old English *ne* or Modern *not*) will often have to do with its stressless nature or it gradually losing its accentual properties, necessitating the recruitment of a more emphatic, stressable reinforcer. LFG's modular makeup is well-placed to incorporate this phonological dimension (cf. Bögel 2023 for an outline of the syntax-prosody interface from an LFG perspective).

## 6 Conclusion

Since its inception, LFG has been conceived as a framework providing robust analysis of cross-linguistic variation. It was at first not meant to address historical developments or diachrony more generally (Vincent 2001: 5, Börjars & Vincent 2017: 642). Later, starting in the late 1980s and early 1990s, this approach was adapted and extended to the diachronic domain. As highlighted by Vincent (2001), due to its architectural makeup, fundamental design principles and basic underlying assumptions, LFG is a flexible framework that can accommodate various competing analyses. It can therefore reconcile formalist/language-internal and functionalist/language-external explanations of variation and change, which is deemed a particular strength for the current investigation. What is more, LFG makes it straightforward to model processes such as grammaticalisation which transcend the boundaries between morphology and syntax, as well as changes which show discrepancies between the formal expression and the functional contribution of an item. The material adduced in the body of the text has demonstrated that such a flexible analytical tool has a great deal to recommend it, providing adequate means of describing and elucidating negation phenomena across language boundaries and time periods. What we saw above is that the basic f-structure is shared across languages and time, while the c-structure and the lexical constraints are subject to variation and change. The separate histories of English and Bulgarian have seen shifting constraints (dis)allowing or requiring multiple negation at various times, sometimes with highly specific exceptions and divergent trends, as well as rivalry between older and newer layers of negators that came with their own restrictions as a result of the gradual progression of grammaticalisation. All of this complexity, including the attendant variation and long periods of competition or overlap, can be successfully captured

'NEG be.3PL.PRES' (Veselinova 2010: 202). This gap in the paradigm confirms that free morphemes (i.e. separate words) and bound morphemes (i.e. affixes) can serve the same negating function.

<sup>16</sup>As stressed by an anonymous reviewer, even though the linear order of constituents may remain the same while the f-structure changes, some of these changes will necessarily affect the c-structure too (e.g. in terms of what type of constituents they are interpreted as), as well as the lexical specification of word forms in the lexical entry (e.g. constraining equations).

in a lexicalist framework which, in view of its design, anticipates such variation and therefore does not suffer from some of the problems associated with more universalist transformational-generative accounts.

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# *Aan het puzzelen: Accounting for the Dutch progressive *aan het* construction*

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This paper presents an LFG account of the Dutch progressive *aan het* ‘on the’ construction. Although it has been argued that the presence of the definite article *het* points to a nominalised form of the verb, this account provides evidence that the construction is in fact a complex verbal inflection. C-structural constraints on the *aan het* construction are accounted for by extending the phrase structure rules for Poortvliet’s (2015) proposed *fourth construction* and introducing AAN-HET as a possible value of the *VFORM* attribute. Data from Mortier (2008) are presented to show the emergence of the form.

## 1 Introduction

Dutch does not require explicit marking of progressive aspect (1). However, if a speaker wishes to emphasise that an action is in progress, two explicit constructions are available. In one of these progressive constructions a durative, positional verb such as, for example, *zitten* ‘sit’, *staan* ‘stand’, or *lopen* ‘walk’ is followed by the *te*-infinitive form of the verb (2). In the other, a copular, aspective or perceptual verb such as *zijn* ‘be’, *lijken* ‘seem’ or *houden* ‘hold’ is followed by the preposition *aan*, the neuter definite article *het* and an infinitive (3).<sup>1</sup>

- (1)   Zij leest  
      she reads  
      ‘She reads / she is reading.’
- (2)   Zij zit te lezen  
      she sits to read.INF  
      ‘She is reading.’
- (3)   Zij is aan het lezen  
      she is on the read.INF  
      ‘She is reading.’

The *aan het* construction is well-described in the literature, but still lacks a satisfactory syntactic account. Booij (2010) provides an analysis in terms of construction morphology, but a purely morphological approach cannot address syntactic constraints on the position of the construction in relation to other verbs in the clause. Two syntactic analyses have been proposed, one that analyses the ‘*aan het* verb’ sequence as a complement prepositional phrase (PP) to a copular verb (Broekhuis et al. 2015), and another that treats the construction as a complex verb inflection (Smits 1984). However, neither of these accounts fully addresses the constraints on the internal composition of the construction and its position within the clause.

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<sup>1</sup>A reviewer points out that *aan het* + *V<sub>INF</sub>* can also appear after the verb *gaan* ‘go’ to give an inchoative reading or *krijgen* ‘get’ to give a causative reading. In line with Broekhuis et al. (2015) I am treating these verbs as contributing inchoative and causative aspect respectively: I assume that progressive aspect then applies to the action that has been initiated or caused.

LFG provides the tools for a unified account that allows for the observed patterns. In this paper I describe the construction and its constraints and argue that it is neither a PP nor a nominalised verb. Instead I propose an account that builds on Smits (1984), applying proposals developed by Zaenen & Kaplan (1995) and Kaplan & Zaenen (2003) and Poortvliet (2015). Although the analysis does not require the use of mixed categories, the paper touches on one possibility of how they could contribute to a diachronic account of the construction.

## 2 The construction and its constraints

The *aan het* construction has three elements. The first is a matrix verb that licenses the construction; and the remaining two form the sequence *aan het* V<sub>INF</sub>, which occurs between the clausal midfield and postfield, at the beginning of any verbal cluster. The matrix verb may be *zijn* ‘to be’, or one of a small set of aspectual or perceptual verbs that are usually treated as copular verbs (Broekhuis et al. 2015). The element *aan het* comprises the locative preposition *aan* (at, on, or by) and the neuter definite article *het*. *Aan het* is invariable and is described by Smits (1984: p. 282) as *de minst interessante term*, ‘the least interesting element’. The final element V<sub>INF</sub> is described in this paper as the embedded verb: it is the infinitive form of the verb with progressive aspect. Only verbs denoting durational activities or telic accomplishment events can appear here (Boogaart 1999, Booij 2010).

The embedded verb is generally treated as a nominalisation, occurring as it does after the article *het*, in common with other nominalisations. However, there are specific syntactic constraints on the embedded verb in the *aan het* construction that distinguish it from other examples of nominalisation. These constraints fall into two groups: the position of dependents of the embedded verb in relation to that verb; and the position of the sequence *aan het* V<sub>INF</sub> in relation to other verbal constituents. In discussing these, I follow Haeseryn et al. (1997) in assuming that Dutch clauses have two ‘poles’ around which the other elements (*eerste zinsplaats*, *middenstuk*, *laatste zinsplaats*, given here as prefield, midfield, and postfield) are ordered. The prefield can contain only one constituent and the types of constituents in the postfield are also constrained. A diagram of the structure is given in Figure 1.

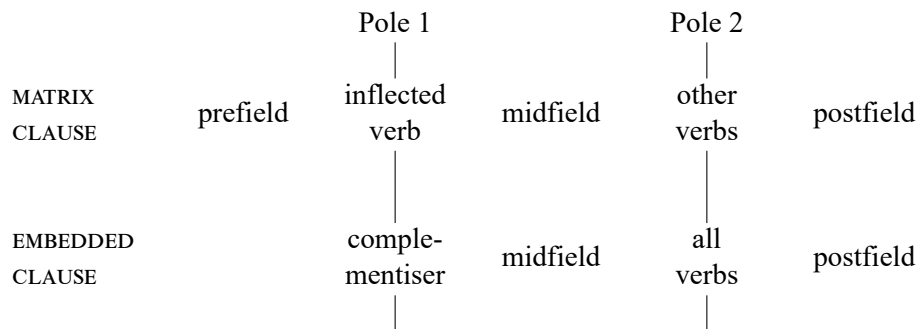


Figure 1: Assumed Dutch clause structure following Haeseryn et al. (1997)

### 2.1 A nominalisation?

Although the verb in the *aan het* construction is often treated as a nominalisation, distributional constraints suggest that this is not the case. In the construction, modifiers and arguments of the embedded verb must occur in the clausal midfield, before the *aan het* element. In addition to their constrained position, non-prepositional modifiers of a verb in the *aan het* construction may not inflect (4b). However, non-prepositional modifiers of a nominalised verb occur in an inflected form between the determiner and the verb, indicating that they are adjectival dependents of a noun (4a).

- (4) a. ⟨\*gretig⟩ het ⟨gretige⟩ eten van een eierbal  
 ⟨\*greedily⟩ the ⟨greedy⟩ eat.NMLZ of a Scotch.egg  
 ‘the greedy eating of a Scotch egg’<sup>2,3</sup>  
 b. Zij is een eierbal ⟨gretig⟩ aan het ⟨\*gretige⟩ eten  
 she is a Scotch.egg ⟨greedily⟩ AAN HET ⟨\*greedy⟩ eat.INF  
 ‘She is greedily eating a Scotch egg.’

Core arguments of nominalised verbs occur after the nominalised verb as obliques, illustrated in (5a), where the object *anjers* ‘carnations’ of the nominalised verb *planten* ‘plant’ appears as *het planten van anjers* ‘the planting of carnations’. This DP is itself the object of the preposition *aan*, which is an oblique argument of the matrix verb *denk* ‘think’ which takes a fixed preposition. Note that although the string *aan het* occurs, the matrix verb does not license the *aan het* construction, and so we are unambiguously dealing with a nominalisation. It is not possible for *anjers* ‘carnations’ to appear immediately after the matrix verb (5b).

- (5) a. Ik denk aan het planten van anjers  
 I think at the plant.NMLZ of carnations  
 ‘I think about the planting of carnations.’  
 b. \*Ik denk anjers aan het planten  
 I think carnations at the plant.INF  
 (intended) ‘I think about the planting of carnations.’

Conversely, where ‘planting carnations’ appears in the *aan het* construction, it is not possible for *anjers* ‘carnations’ to appear as an oblique after the embedded verb *planten* (6a). Instead, it must appear after the matrix verb (6b).

- (6) a. \*Zij is aan het planten van anjers  
 she is AAN HET plant.NMLZ of carnations  
 (intended) ‘She is planting carnations.’  
 b. Zij is anjers aan het planten  
 she is carnations AAN HET plant.INF  
 ‘She is planting carnations.’

The only exceptions to this for the *aan het* construction are objects that have become lexically incorporated, e.g. *paardrijden* ‘horse-riding’. In cases such as this, the object may be incorporated into the verb or treated as a separable particle.

Similar constraints also apply to resultative adjectives, which for a nominalised verb occur between the determiner and the verb (7a). A resultative adjective outside the *het*-DP is unacceptable (7b). However, with the *aan het* construction, a resultative adjective between *het* and the verb is highly marginal at best: Broekhuis et al. state that it is impossible (8b). There is a strong preference, and for many speakers an obligation, for any resultative particle to occur after any objects and before *aan het* (8).

- (7) a. het lichtblauw verven van het hek  
 the light.blue painting of the fence  
 ‘painting the fence light blue’  
 b. \*lichtblauw het verven van het hek  
 light.blue the painting of the fence  
 (intended) ‘painting the fence light blue’

<sup>2</sup>Alternative positions for a constituent are indicated by ⟨angle brackets⟩. Where an alternative is disallowed, this is indicated with an ⟨\*asterisk⟩.

<sup>3</sup>An *eierbal* is a delicacy from Groningen, where a hard-boiled egg is coated with a thick curry sauce, then breaded and deep-fried. A ‘Scotch egg’ is the closest English equivalent, but this is not an exact translation.

- (8) a. \*Ze zijn het hek aan het lichtblauw verven  
they are the fence at the light.blue painting  
b. Ze zijn het hek lichtblauw aan het verven  
they are the fence light.blue at the painting  
'They are painting the fence light blue.'  
(Example and judgement from Broekhuis et al. 2015: p. 154)

Separable verbs in Dutch (e.g. *opdrinken* 'drink up') require the separable particle to appear before the morpheme *ge-* in the past participle (9) or in the *te*-infinitive form in complement clauses (10). However, when a separable verb is nominalised, the separable particle must be attached to the verb stem (11).

- (9) We hebben de wijn ⟨op⟩ge⟨\*op⟩drinken  
we have the wine ⟨up⟩GE⟨\*up⟩drink.PTCP  
'We have drunk up the wine.'  
(10) ...om de wijn ⟨op⟩te ⟨\*op⟩drinken  
...COMP the wine ⟨up⟩to ⟨\*up⟩drink.INF  
'...that we may drink up the wine.'  
(11) ⟨\*op⟩het ⟨op⟩drinken ervan kan een feest zijn  
⟨\*up⟩the ⟨up⟩drink.NMLZ of.it can a party be  
'Drinking it up can be a party.'

In the *aan het* construction, the particle may appear either before or after *aan het*, e.g. *aan het opdrinken* / *op aan het drinken* 'drinking up' (12). This optionality is comparable to the position of the particle in clauses with an auxiliary verb (13). Thus once again, the *aan het* construction patterns with a verb rather than a *het*-nominalisation.

- (12) We zijn de wijn ⟨op⟩aan het ⟨op⟩drinken  
we are the wine ⟨up⟩AAN HET ⟨up⟩drink.INF  
'We are drinking up the wine.'  
(13) ...dat we de wijn ⟨op⟩mogen ⟨op⟩drinken  
...that we the wine ⟨up⟩may ⟨up⟩drink.INF  
'...that we may drink up the wine.'

Based on this, I conclude along with Smits (1984) and *contra* Broekhuis et al. (2015) and others, that the verb in the *aan het* construction is not a nominalisation.

## 2.2 A prepositional phrase?

While it may seem simplest to analyse the sequence *aan het* V<sub>INF</sub> as a PP, this requires significant stipulations on the PP. Besides restriction of the preposition itself to *aan*, either a specific phrase structure rule or lexical constraints must ensure that there are no dependents within the phrase, and must also restrict the form of nominalisation.

An assumption that the sequence *aan het* V<sub>INF</sub> is indeed a PP with a preposition and an object, whether nominalised (Broekhuis et al. 2015) or not (Booij 2010), results in two predictions about the syntactic behaviour of the construction. First, it should be possible to substitute the object *het* + V<sub>INF</sub> for the non-human PP object pronoun *er* 'it',<sup>4</sup> and second, it should be possible for two of these objects to be coordinated as the object of the preposition *aan*.

<sup>4</sup>Dutch does not allow the 3SG.N pronoun *het* 'it' to appear as the object of a preposition. Instead the pronoun *er* appears either immediately before the preposition, in which case it fuses to the preposition to form a single word such as *eraan* in (14b), or earlier within the clause, separated from the preposition. For a fuller discussion of *er* within LFG, see Jones (2020).

Where a *het*-nominalisation is the object of a PP, it can be replaced by the pronoun *er* (14). However, in the *aan het* construction, this pronominal substitution is impossible (15).

- (14) a. Ik denk aan het zwemmen  
I think at the swim.INF  
'I'm thinking about swimming.'
- b. Ik denk eraan  
I think at.it  
'I'm thinking about it.' (it = swimming)
- (15) a. Ik ben aan het zwemmen  
I am at the swim.INF  
'I'm swimming.'
- b. \*Ik ben eraan  
I am at.it  
(intended) 'I'm doing it.' (it = swimming)

This is evidence against the analysis of the sequence *aan het V<sub>INF</sub>* as a PP. Further evidence against this analysis comes from considering the possibility of coordinating *het V<sub>INF</sub>* within the PP. For a *het*-nominalisation, such coordination is possible (16).

- (16) Denk aan [ [ het eten van een tompouce ] en [ het uithangen van de vlag ] ]  
Think at [ [ the eat.INF of a custard.slice ] and [ the hang.out.INF of the flag ] ]  
'For example, eating *tompouce* or hanging out the flag.'<sup>5</sup>

In the *aan het* construction, however, coordination as the object of a PP is impossible (17).

- (17) \*Joost is zijn kleren aan [ [ het strijken ] en [ het vouwen ] ]  
J. is his clothes at [ [ the iron.INF ] and [ the fold.INF ] ]  
(intended) 'Joost is ironing and folding his clothes.'

Here, any coordination must be either of the whole construction (18) or of two NPs within the DP object of the PP (19).

- (18) Joost is zijn kleren [ [ aan het strijken ] en [ aan het vouwen ] ]  
J. is his clothes [ [ at the iron.INF ] and [ at the fold.INF ] ]
- (19) Joost is zijn kleren aan het [ [ strijken ] en [ vouwen ] ]  
J. is his clothes at the [ [ iron.INF ] and [ fold.INF ] ]  
'Joost is ironing and folding his clothes.'

From these tests, we can conclude that *het V<sub>INF</sub>* is not a prepositional object, and that therefore the sequence *aan het V<sub>INF</sub>* is not a PP. Furthermore, the inability to coordinate *het + V<sub>INF</sub>* within the construction is further evidence that this is not a *het*-nominalisation.

### 2.3 An inflected verb?

If *aan het V<sub>INF</sub>* is not a PP, can we follow Smits (1984) in treating it as a verb with a complex inflection? Other evidence suggests that this analysis is not wholly unproblematic. Specifically, there is a further syntactic constraint on the position of the *aan het V<sub>INF</sub>* sequence. In Dutch embedded clauses the complementiser occupies Pole 1 and all verbs appear at Pole 2 (see Figure 1). In the *aan het* construction, the *aan het V<sub>INF</sub>* sequence must occur after the midfield and before any other verbal elements (20a). This

<sup>5</sup><https://klasvanjuflinda.nl/recensies/prentenboeken/15409/muizen-abc/>

is in contrast to participles and other verb forms, which have much more freedom of ordering at the second verbal pole (20b).

- (20) a. ...dat Jan ⟨aan het wandelen⟩ is ⟨\*aan het wandelen⟩ op de hei  
 ...that Jan ⟨at the walking⟩ is ⟨\*at the walking⟩ on the meadow  
 ‘that Jan is walking on the meadow’  
 b. ...dat Jan ⟨gewandeld⟩ heeft ⟨gewandeld⟩ op de hei  
 ...that Jan ⟨walked⟩ has ⟨walked⟩ on the meadow  
 ‘that Jan walked on the meadow’ (Broekhuis et al. 2015: p. 152)

In other words, the analysis of *aan het* V<sub>INF</sub> as a complex inflected verb will require additional c-structure constraints specific to the construction.

## 2.4 The boundary of the embedded clause

One further question arises as to the status of arguments that appear between the matrix verb and the *aan het* V<sub>INF</sub> element. Although the matrix verb in the *aan het* construction is usually a copular verb, Smits (1984) points out that other verbs can also appear in the construction. He identifies two classes of verbs that are possible as the matrix verb, based on the relationship of their arguments to the embedded *aan het* clause. These are the *zijn* class: where the subject of the matrix verb provides the subject of the embedded *aan het* clause (21); and the *houden* class, where the object of the matrix clause provides the subject of the embedded *aan het* clause (22). Smits notes that where a verb of the *houden* class appears with the *aan het* construction, the embedded verb may not have an object unless it can be counted as incorporated object as described above.

- (21) Wij zijn kranten aan het lezen  
 We are newspapers AAN HET read.INF  
 ‘We are reading newspapers.’  
 (22) Büch houdt de mensen aan’t lezen  
 B. holds the people AAN-HET read.INF  
 ‘Büch keeps people reading.’

Boogaart (1999) reports that passivisation of the objects of verbs in the AAN HET construction is not possible (23). However, where the construction is used with a matrix verb of the *houden* class, the subject of the embedded verb can become the subject of the matrix verb through a passivisation process (24), indicating that in (22) *de mensen* ‘the people’ is the object of the matrix verb as well as the subject of the embedded verb.

- (23) \*De krant was aan het lezen geworden  
 the newspapers was AAN HET read.INF become.PTCP  
 (intended) ‘The newspapers were being read.’ (Booij 2010: p. 152, ex. 10)  
 (24) De mensen worden aan’t lezen gehouden.  
 the people become AAN-HET read.INF hold.PTCP  
 ‘People are kept reading.’

Thus where the matrix verb that licenses the *aan het* construction does not select an object, arguments between the matrix verb and *aan het* belong unambiguously to the embedded clause. However, where the matrix verb *does* select an object, the argument that follows it is part of the matrix clause, but also provides the subject of the embedded clause.

## 2.5 Summary

In this section I have presented evidence that the *aan het* construction does not include a nominalised verb, nor is it a prepositional phrase. Instead I propose an analysis of the construction as an embedded verb with a complex inflection, but which requires specific constraints to restrict its position in c-structure. Furthermore, there is evidence that grammatical functions are shared between the matrix clause and the embedded *aan het* clause, with the precise nature of that sharing being lexically determined by the matrix verb. These elements together suggest that LFG is well-equipped to provide an account of the phenomenon.

## 3 An LFG account

This proposed LFG account draws on three elements of the theory to date. The open complement analysis of copula constructions described by Dalrymple et al. (2004) and the c-structure ordering constraints for Dutch, proposed by Kaplan & Zaenen (2003) and refined by Poortvliet (2015), are directly used in the account. Bresnan and Mugane's account of nominalisation (2006) is used to explain the presence of the definite article *het* in an otherwise purely verbal construction. The account rejects Broekhuis and colleagues' c-structure analysis of the construction as a complement PP in favour of Smits' inflected verb analysis, while maintaining a complement analysis at f-structure.

I begin with a proposed target functional analysis before moving on to consider what c-structure rules are required to project the f-structure and account for the various positional constraints.

### 3.1 Functional analysis

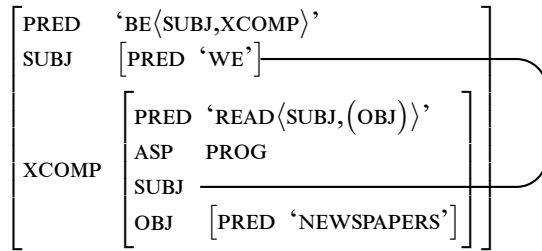
The unambiguous sharing of a grammatical function between a matrix and an embedded clause, with the nature of the sharing determined lexically by the matrix verb, illustrated in Section 2.4, has the characteristics of functional control, following Bresnan et al. (2016) and others, with thematic subject control in (21) and non-thematic object control in (22). This leads us to an open complement analysis, which in turn ensures that whichever verb serves as the copula, its meaning can be treated distinctly in a semantic analysis. Example lexical specifications are given for the *zijn* class (25) and the *houden* class (26).

(25) *zijn*            V    'BE ⟨SUBJ,XCOMP⟩'  
                           (↑ SUBJ) = (↑ XCOMP SUBJ)

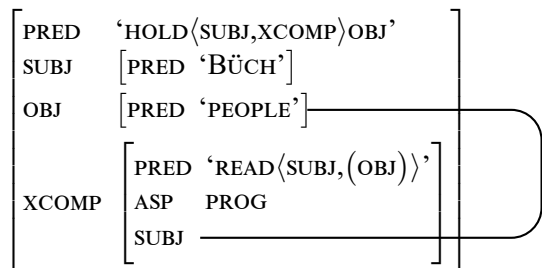
(26) *houden*       V    'HOLD⟨SUBJ,XCOMP⟩ OBJ'  
                           (↑ OBJ) = (↑ XCOMP SUBJ)  
                           ¬(↑ XCOMP OBJ)

Target f-structures for the example sentences (21) and (22) are given at (27) and (28) respectively. In (27), where there is subject control, the object *kranten* 'newspapers' is within the xcomp whereas in (28), where there is object control, the object *de mensen* 'the people' is the object of the matrix clause and the subject of the xcomp.

- (27) Wij zijn kranten aan het lezen  
 We are newspapers AAN HET read.INF  
 ‘We are reading newspapers.’



- (28) Büch houdt de mensen aan het lezen  
 B. holds the people AAN HET read.INF  
 ‘Büch keeps people reading.’



### 3.2 C-structure

The c-structure analysis assumes that *aan het* is treated as a complex verbal inflection. In Section 3.2.1 I propose lexical specifications for *aan het* and for the matrix verbs that license the construction. In Section 3.2.2 I propose a solution to the positional constraints that are unusual for a verb, and the presence of *het* in the construction is discussed further in Section 4.

#### 3.2.1 Lexical specifications

The proposed lexical specification (29) extends the scope of the *VFORM* feature (Butt et al. 1999) by proposing a further value *AAN-HET* to add to the set of possible values *PART*, *INF*, *TE-INF*, and *TENSED* proposed by Kaplan & Zaenen (2003).

This feature is carried not only by the infinitive verb, but also by *aan het*, which is treated as a complex non-projecting particle (Toivonen 2003). When part of the construction, *aan het* is pronounced as a single prosodic word and alternates in the written language with the contraction *aan 't*. The second line of the lexical specification reflects the association of the construction with progressive aspect.

- (29) *aan het/aan 't*  $\widehat{\text{Prt}}$  ( $\uparrow$  *VFORM*) = *AAN-HET*  
 ( $\uparrow$  *ASP*) = *PROG*

The particle *aan het* attaches to a verb according to the phrase structure rule in (30).

- (30)  $V \rightarrow \widehat{\text{Prt}} V^0$   
 $\uparrow=\downarrow \quad \uparrow=\downarrow$

Amended lexical specifications are also given for the governing matrix verbs, which now require *AAN-HET* as the *VFORM* of their complements (31).

- (31) a. *zijn*  $V$  ‘BE(SUBJ,XCOMP)’  
 ( $\uparrow$  *SUBJ*) = ( $\uparrow$  *XCOMP SUBJ*)  
 ( $\uparrow$  *XCOMP VFORM*) =<sub>c</sub> *AAN-HET*

- b. *houden*      V    ‘HOLD⟨SUBJ,XCOMP⟩ OBJ’  
                           (↑ OBJ) = (↑ XCOMP SUBJ)  
                           (↑ XCOMP VFORM) =<sub>c</sub> AAN-HET  
                           ¬(↑ XCOMP OBJ)

### 3.2.2 Constraints with respect to other verbs

Example (20) in Section 2, repeated here, shows the constraints on the position of the *aan het* construction at the second verbal pole.

- (20) a. dat Jan ⟨aan het wandelen⟩ is ⟨\*aan het wandelen⟩ op de hei  
that Jan ⟨at the walking⟩ is ⟨\*at the walking⟩ on the meadow  
‘that Jan is walking on the meadow’  
b. dat Jan ⟨gewandeld⟩ heeft ⟨gewandeld⟩ op de hei  
that Jan ⟨walked⟩ has ⟨walked⟩ on the meadow  
‘that Jan walked on the meadow’ (Broekhuis et al. 2015: p. 152)

This constraint is unusual in Dutch, where there is considerable, though not unconstrained, freedom in the ordering of elements clustered at the second verbal pole. Broekhuis & Corver (2015: ch. 7) has a thorough discussion of constraints and possibilities but there are two particular phenomena that are of interest in our analysis of the *aan het* construction.

The first concerns clauses with participles and either a perfect or passive auxiliary. In cases where the auxiliary appears in the verb cluster, the participle may precede or follow it (32).

- (32) a. dat Jan het boek nog niet ⟨gebracht⟩ heeft ⟨gebracht⟩  
that Jan the book still not ⟨brought⟩ has ⟨brought⟩  
‘that Jan has still not yet brought the book’  
b. dat het boek morgen ⟨gebracht⟩ wordt ⟨gebracht⟩  
that the book tomorrow ⟨brought⟩ becomes ⟨brought⟩  
‘that the book will be brought tomorrow’ (Broekhuis & Corver 2015: p. 1056, ex.18)

Broekhuis & Corver (2015) account for the difference between (20) and (32) by treating the *aan het* construction as a PP complement of the matrix verb. As a result of this, they claim that the ordering freedom in (32) does not apply. However, as our analysis assumes that the *aan het* construction is a verb, this option is not open to us.

The second concerns verb clusters containing verbs from more than one clause. In this situation, the arguments to the clauses are in the midfield, preceding the verbal cluster at the second pole, and resulting in multiple dependencies. Dutch is often described as having crossed dependencies (e.g. Bach et al. 1986), where the order of the clausal arguments in the midfield (N1 N2 N3) and the order of the verbs in the cluster (V1 V2 V3) are similar (33)<sup>6</sup>.

- (33) ...dat Jan<sub>N1</sub> Marie<sub>N2</sub> geneeskunde<sub>N3</sub> wil<sub>V1</sub> laten<sub>V2</sub> studeren<sub>V3</sub>  
 ...that Jan<sub>N1</sub> Marie<sub>N2</sub> medicine<sub>N3</sub> will<sub>V1</sub> let<sub>V2</sub> study<sub>V3</sub>  
  
 ‘...that Jan wants to let Marie study medicine’ (Dutch)

This is in contrast to German, where the embedded dependencies are nested: the order of clausal arguments (N1 N2 N3) and the order of verbs in the cluster (V3 V2 V1) are mirrored (34).

<sup>6</sup>Examples (33)–(39) are taken or adapted from Poortvliet (2015). For clarity, only the dependencies V1–SUBJ V2–OBJ V3–OBJ are shown in (33)–(34).

- (34) ...dass Jan<sub>N1</sub> Marie<sub>N2</sub> Medizin<sub>N3</sub> studieren<sub>V3</sub> lassen<sub>V2</sub> will<sub>V1</sub>  
 ...that Jan<sub>N1</sub> Marie<sub>N2</sub> medicine<sub>N3</sub> study<sub>V3</sub> let<sub>V2</sub> will<sub>V1</sub>
- └────────────────────────────────────────────────────────────────────────────────┘
- ‘...that Jan wants to let Marie study medicine’ (German)

Dutch serial dependencies were used early in the development of LFG to demonstrate the power of the formalism. Bresnan et al. (1982) described the ordering constraints using phrase structure rules, with c-structure functional constraints ensuring unambiguous resolution of the serial dependencies (35).

- (35) a. VP → NP VP V  
 (↑ OBJ) = ↓ (↑ VCOMP) = ↓ ↑=↓  
 b. V' → V V'  
 ↑=↓ (↑ VCOMP) = ↓

This initial analysis was subsequently refined (Zaenen & Kaplan 1995, Kaplan & Zaenen 2003) to account for the behaviour of verbal particles (36) and past participles (37), both of which may appear in any position in the verbal cluster.

- (36) ...dat Jan het liedje ⟨mee⟩ zal ⟨mee⟩ hebben ⟨mee⟩gezongen  
 ...that Jan the song ⟨with⟩ will ⟨with⟩ have ⟨with⟩.sung  
 ‘...that Jan will have sung along with the song’
- (37) ...dat Jan het liedje ⟨gezongen⟩ zal ⟨gezongen⟩ hebben ⟨gezongen⟩  
 ...that Jan the song ⟨sung⟩ will ⟨sung⟩ have ⟨sung⟩  
 ‘...that Jan will have sung the song’

The revised rules proposed by Kaplan & Zaenen are given in (38). Their VP rule (38a) allows a wider range of nominal grammatical functions (NGF: SUBJ, OBJ, OBJ<sub>θ</sub>) before the verbal cluster, and the whole rule distinguishes the constraints on COMP and XCOMP, which Bresnan et al. described as VCOMP. The first two right-hand side elements of the V' rule (38b) allow separable prefixes (category PostP, represented at f-structure as PRT) and participles to appear first in the verb cluster regardless of other orderings, and the final two elements allow for other ordering flexibilities in the cluster.

- (38) a. VP → NP\* V' (VP)  
 (↑ XCOMP\*(COMP) NGF) = ↓ (↑ XCOMP\* COMP) = ↓  
 b. V' → (PostP) (V) [ V , (V') ]  
 (↑ XCOMP<sup>+</sup> PRT) = ↓ (↓ VFORM) = PART (↑ XCOMP) = ↓  
 (↑ XCOMP<sup>+</sup>) = ↓ (↑ XCOMP<sup>+</sup> NGF) ⊃ <<sub>f</sub> (↑ NGF)  
 ↓ ⊃ <<sub>f</sub> (↓ PRT)

Poortvliet (2015) further extended this work to account for a case where there is no flexibility of ordering within the verbal cluster and where nested dependencies, rather than crossed dependencies, are required. Poortvliet describes this construction as the *fourth construction*. It is restricted to cases where a passive participle is embedded within a clause with a verb of perception (39).

- (39) ...dat Jan een lammetje gevoed zag ⟨\*gevoed⟩ worden ⟨\*gevoed⟩  
 ...that Jan a lamb fed saw ⟨\*fed⟩ become ⟨\*fed⟩
- └────────────────────────────────────────────────────────────────────────────────┘
- ‘...that Jan saw a lamb being fed’

Poortvliet proposes further amendments (40) to Kaplan & Zaenen’s rules. In her VP rule, an optional V constituent, constrained to be a participle, is added after nominal arguments and before the rest of the verb cluster. Although it may seem that this is duplicating the second element of Kaplan & Zaenen’s V' rule, it is restricted to one level of embedding. Poortvliet’s amended V' rule maintains the optional V constituent at the start of the verb cluster. However, in the first functional constraint for this constituent, she uses

a constraining equation to ensure that the verb in this position is a participle. In the fourth functional constraint, she disallows passive participles from appearing. Passive participles are thus forced to appear as a daughter of VP rather than a daughter of V'.

- (40) a.  $VP \longrightarrow$   $NP^*$  (V) V' (VP)  
 $(\uparrow \text{XCOMP}^*(\text{COMP}) \text{NGF}) = \downarrow$   $(\downarrow \text{VFORM}) =_c \text{PART}$   $(\uparrow \text{XCOMP}^* \text{COMP}) = \downarrow$   
 $(\uparrow \text{XCOMP}) = \downarrow$
- b.  $V' \longrightarrow$  PostP (V) [ V, (V') ]  
 $(\uparrow \text{XCOMP}^+ \text{PRT}) = \downarrow$   $(\downarrow \text{VFORM}) =_c \text{PART}$   $(\uparrow \text{XCOMP}) = \downarrow$   
 $(\uparrow \text{XCOMP}^+) = \downarrow$   $(\uparrow \text{XCOMP}^+ \text{NGF}) \neg <_f (\uparrow \text{NGF})$   
 $\downarrow \neg <_f (\downarrow \text{PRT})$   
 $\neg(\uparrow \text{PASSIVE})$

The fixed position of the *aan het* construction before its governing matrix verb in the verb cluster has a parallel with Poortvliet's *fourth construction*, and so I take Poortvliet's phrase structure rules as the starting point for this proposal. However, the proposal must take account of the fact that a separable prefix can appear before *aan het*: example (12) is repeated here.

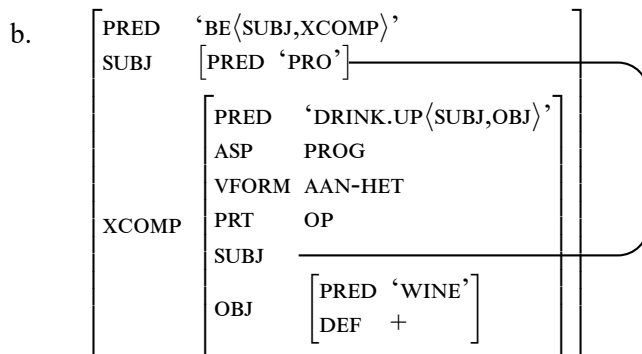
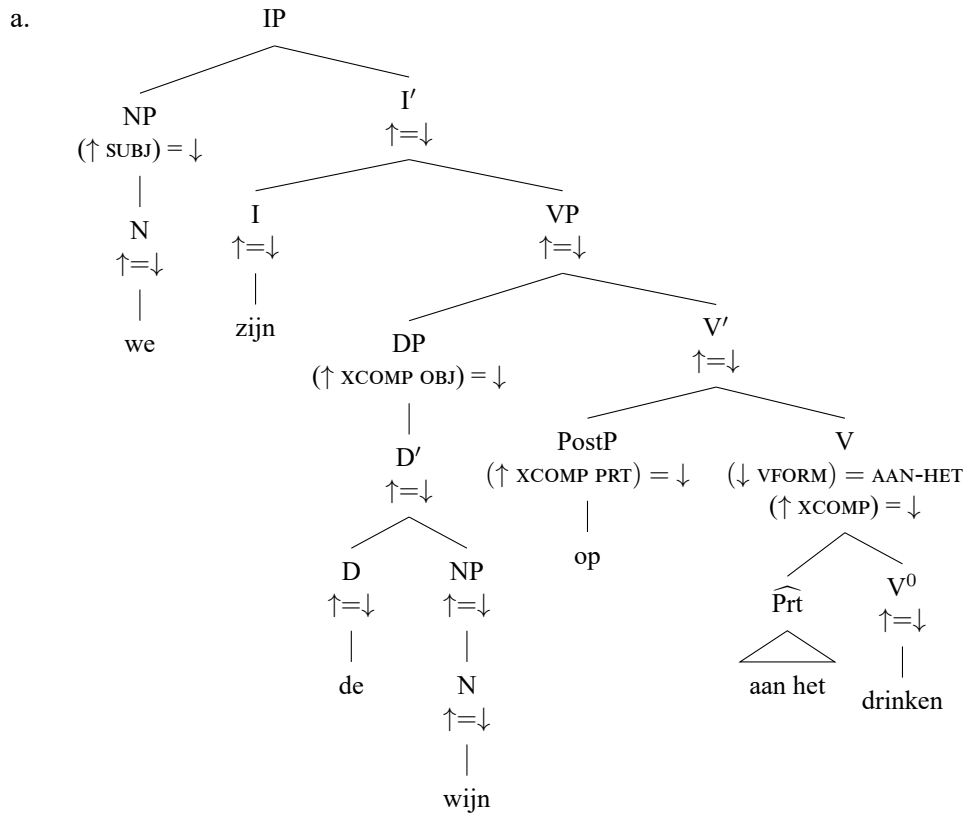
- (12) We zijn de wijn <op> aan het <op>drinken  
 we are the wine <up> AAN HET <up>drink.INF  
 'We are drinking up the wine.'

Because the particle *aan het* sits within a V constituent, this V must be a daughter of V': it is not possible to be a daughter of VP. Accordingly, the constraint  $(\downarrow \text{VFORM}) =_c \text{AAN-HET}$  is a disjunction with the constraint  $(\downarrow \text{VFORM}) =_c \text{PART}$  in Poortvliet's V' rule. The result is shown in (41).

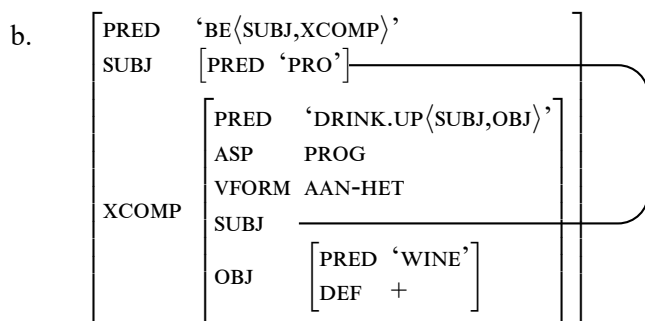
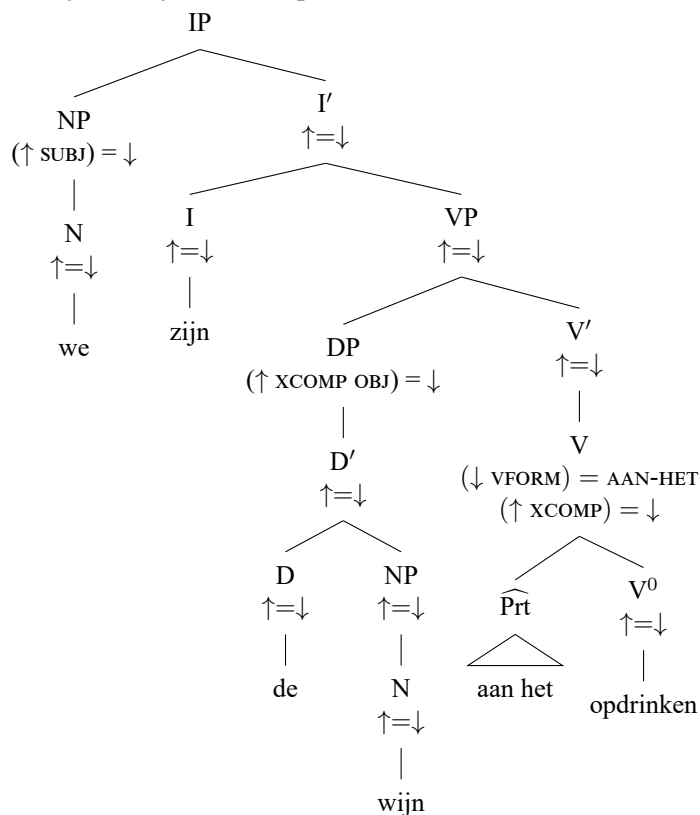
- (41)  $V' \longrightarrow$  PostP V [ V, V' ]  
 $(\uparrow \text{XCOMP}^+ \text{PRT}) = \downarrow$   $\{ (\downarrow \text{VFORM}) =_c \text{PART} \mid$   $(\uparrow \text{XCOMP}) = \downarrow$   
 $(\downarrow \text{VFORM}) =_c \text{AAN-HET} \}$   $(\uparrow \text{XCOMP}^+ \text{NGF}) \neg <_f (\uparrow \text{NGF})$   
 $(\uparrow \text{XCOMP}^+) = \downarrow$   
 $\downarrow \neg <_f (\downarrow \text{PRT})$

Examples (42) and (43) show the pair of full analyses for sentence (12), repeated here. In (42), the separable prefix *op* of *opeten* 'drink up' appears before *aan het*, and in (43) it is attached to the stem at V<sup>0</sup>. For legibility, functional constraints/disjunctions that are not directly relevant to the analysis have been omitted. The matrix clause follows the phrase structure rule assumed by Jones (2020) and I assume that Poortvliet's NP\* in (40a) can be treated as a disjunction {DP | NP}\*.

(42) We zijn de wijn op aan het drinken.



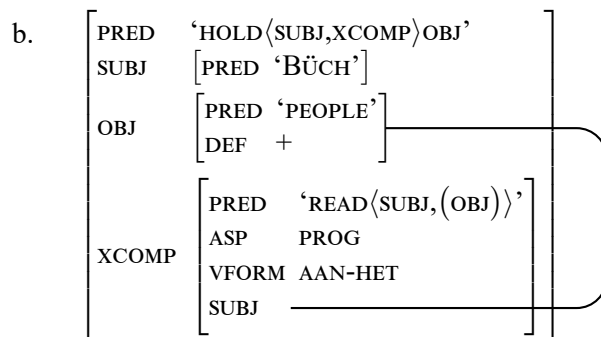
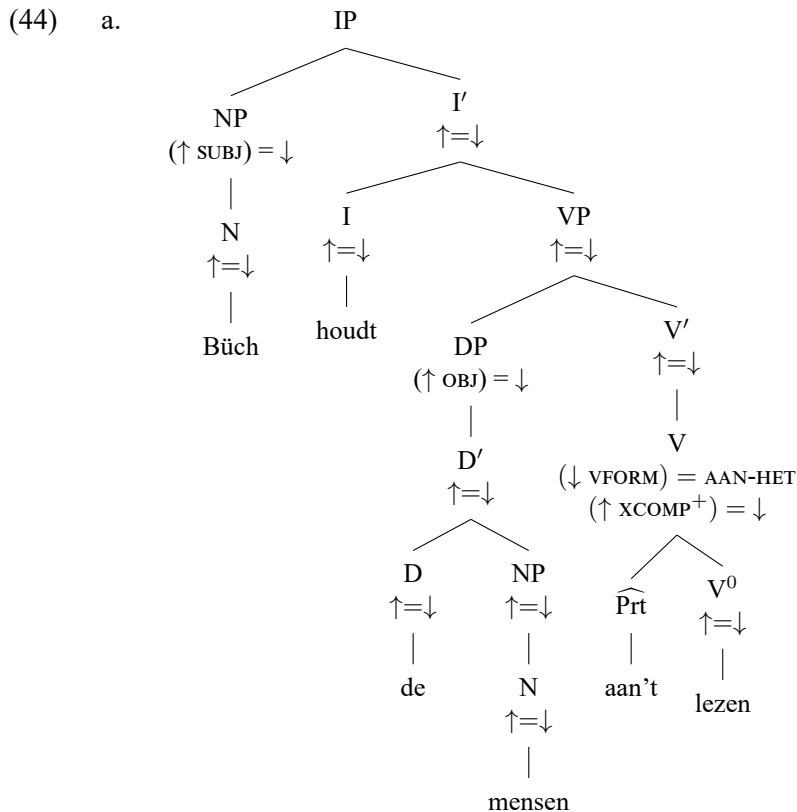
- (43) a. We zijn de wijn aan het opdrinken.



The only difference between the two f-structures in (42b) and (43b) is the absence of the feature PRT in (43b).

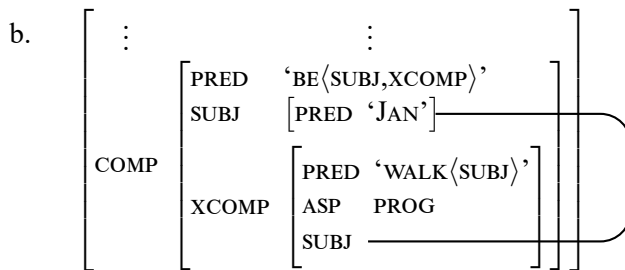
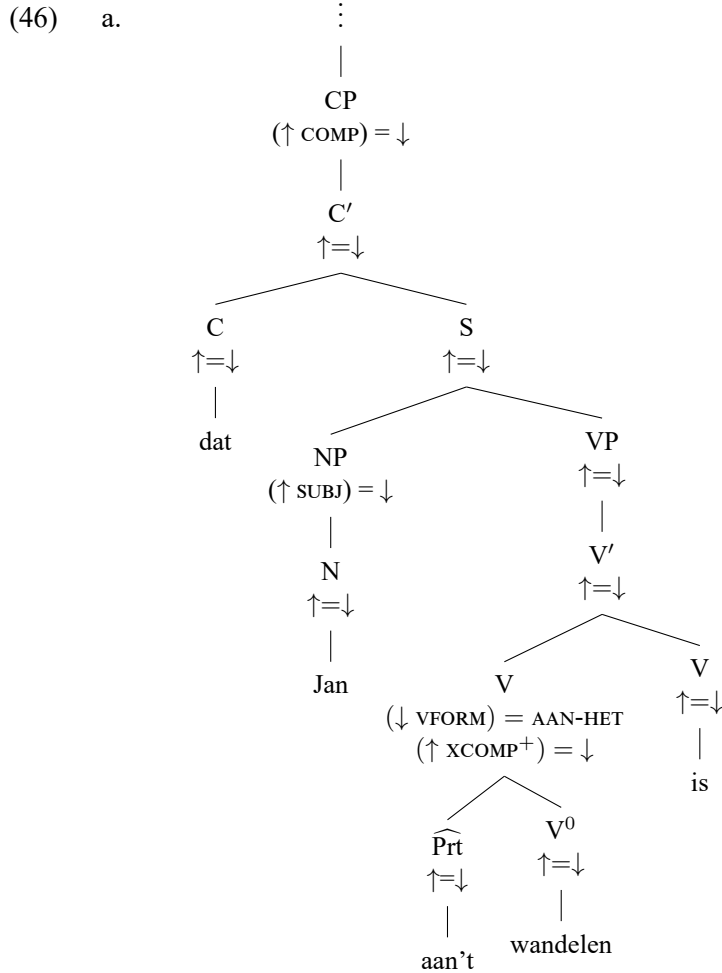
Example (44) shows the full analysis for sentence (22), repeated here. Again, functional constraints/disjunctions that are not directly relevant to the analysis have been omitted.

- (22) Büch houdt de mensen aan't lezen  
 B. holds the people AAN-HET read.INF  
 'Büch keeps people reading.'



The operation of the ordering constraint in the verb cluster is shown in the analysis of (45). Rule (41) prevents the matrix verb *is* from appearing before its complement, as shown at (46).

- (45) ...dat Jan aan't wandelen is  
 ...that Jan AAN.HET walking is  
 '...that Jan is walking'



#### 4 How did the construction arise?

The proposed analysis is able to account for the constraints on the *aan het* construction without assuming that its  $V_{\text{INF}}$  element is a nominalisation. While this may be theoretically satisfactory, it contradicts the strong intuition that the definite article *het* must be followed by an NP, and hence a nominalised verb.

Mortier (2008) describes the history of the construction and notes its development by analogy from other locative PPs that describe activities using non-verbal nouns e.g. *aan de wijn* ‘on the wine’ ‘drinking wine’, giving the examples in (47). The more general *aan het* construction was present in Middle Dutch. Mortier speculates that over time, nominalised forms such as (47c) were reanalysed as infinitives (48), with *aan het* fusing to become a fixed particle.

- (47) a. aen [ den ganc ] zijn  
on [ the going ] be  
‘to be on the go’  
b. aan [ de brand ] zijn  
on [ the fire ] be  
‘to be on fire’  
c. aan [ het smelten ] zijn  
on [ the melt.NMLZ ] be  
‘to be melting’

Examples from Mortier (2008: p. 15)

- (48) [ aan het ] smelten zijn  
[ AAN HET ] melt.INF be  
‘to be melting’

Modern Dutch still uses locative PPs to describe activities: Broekhuis et al. (2015) note that for some actions, non-nominalised nouns are available to describe an action in progress. Where available, these forms compete with, and may be preferred to, the *aan het* construction (49).

- (49) a. Ze waren aan de klets  
they were on the chat  
‘They were chatting.’  
b. Ze waren aan het kletsen  
they were on the chat.INF  
‘They were chatting.’

(Broekhuis et al. 2015: p. 153, ex 330)

Nikitina (2008) describes how language change can result in the emergence of mixed categories, and the nominalised forms described by Mortier can be seen as an example of this. Within LFG there are a number of approaches to mixed categories, including Bresnan & Mugane (2006) and Butt et al. (2020).

Bresnan & Mugane’s account of mixed categories allows the properties of nouns and verbs, including their selection of arguments, to both be present in a lexical item. Lexical specifications for *klets* and *kletsen* from (49) are given at (50).

- (50) a. *klets* N ( $\uparrow$  PRED) = ‘CHAT⟨OBL<sub>θ</sub>⟩<sub>n</sub>’  
 $n$ : NP ∈ CAT((PRED  $\uparrow$ ))  
b. *kletsen* V ( $\uparrow$  PRED) = ‘CHAT⟨SUBJ⟩<sub>v</sub>’  
 $v$ : VP ∈ CAT((PRED  $\uparrow$ ))

Mixed forms carry more than one Cat constraint, which allows them to have the syntactic properties of both nouns and verbs. One example of this is the English gerundive (51) where a nominal form and a mixed form are available (Bresnan & Mugane 2006: p. 34, ex. 80).

- (51) a. *singing* N ( $\uparrow$  PRED) = ‘SING⟨OBL<sub>θ</sub>⟩<sub>n</sub>’  
 $n$ : NP ∈ CAT((PRED  $\uparrow$ ))  
b. *singing* V ( $\uparrow$  PRED) = ‘SING⟨⟨SUBJ, OBJ⟩<sub>v</sub>⟩<sub>n</sub>’  
 $n$ : NP ∈ CAT((PRED  $\uparrow$ ))  
 $v$ : VP ∈ CAT((PRED  $\uparrow$ ))

The two forms in (51) are identical, leading to ambiguity when reading the string. It is possible that the identical forms of *smelten* ‘melt’ in (47c) and (48) previously involved some kind of mixed category similar to the English gerundive. This predicts that both variant forms in (52) would be found in earlier varieties of Dutch. Testing this prediction is left for future work.

- (52) a. Zij is brood aan het bakken  
 She is bread on the bake.INF  
 ‘She is baking bread.’  
 b. Zij is aan het bakken van brood  
 She is on the bake.NMLZ of bread  
 ‘She is baking bread.’

## 5 Conclusion

In this paper, I have shown that LFG can be used to develop an account of a puzzling construction whose mixture of nominal and verbal characteristics has proved resistant to treatment in other frameworks. This account rests on elements of the theory that have been proposed elsewhere. It introduces two new proposals: a value AAN-HET for the VFORM feature introduced by Kaplan & Zaenen (2003), and the reanalysis of the string *aan het* as an inflectional particle.

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# Drift, convergence, and the Ergative Cycle

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## 1 Three problems for the theory of language change

Over a century ago, Meillet (1918) identified as a major problem for historical linguistics the phenomenon he called *convergence* – independent parallel change in different languages, the linguistic counterpart of evolutionary biology’s *homoplasy*. A few years later, Sapir (1921) drew attention to the equally intriguing problem of *drift*, sustained unidirectional change by small increments. More recently, many instances of drift and convergence have been recognized as parts of recurrent long-term *cyclic* trajectories (recently reviewed in Bouzouita et al. 2019, Gelderen 2023, Mosegaard Hansen & Waltireit 2025).

The evolution of Indo-Iranian case and agreement syntax instantiates all three challenges. Indo-Iranian inherited a Nominative/Accusative structural case system from its Indo-European ancestor. Its Indic and Iranian branches replaced it by an Ergative/Nominative system by independent but similar syntactic reanalyses. The languages in each branch then reverted towards a Nominative/Accusative system, step by step, via several different paths, in some cases passing through typologically unusual intermediate stages (Comrie 1978: 378, Stroński 2010). Some of the languages reveal the course of change by extensive dialectal variation in their case and agreement syntax, in others the loss of Ergative case has come to completion in unremarkable systems: Nominative/Accusative in Bangla and Farsi, no case at all in Central Kurdish. The entire two-phase process lasting two millennia is a classic instance of cyclic change. At least its second phase is also a case of drift and convergence. It is not unique to Indo-Iranian: some Pama-Nyungan languages of Australia are thought to have followed a similar trajectory (Bani & Klokaid 1974, McConvell 1981).

The three problems of drift, convergence, and cyclic change can be connected in an explanatory way by moving from *error-driven* models of change to a *bias-driven* model. Error-driven models, consistent with Saussure’s view of change as originating purely in *parole*, attribute language change to reanalysis by imperfect transmission. On this view change should be Brownian motion in typological space. In a bias-driven model, change is triggered and directed by learners’ prior hypotheses (‘expectations’ or ‘preferences’). It is an evolutionary process rooted in the principles that constrain language itself, in line with Jakobson 1929. But instead of the discredited theory of nomogenesis (or orthogenesis) that Jakobson appealed to, an OT-based bias-driven model of acquisition and change provides a non-teleological causal mechanism for the initiation, spread, and completion of linguistic innovations. It formalizes the biases by violable constraints, which define what in biology has been called a *fitness landscape* (Gavrilets 2004), and convergent diachronic paths through it. In Kiparsky 2026 I presented theoretical arguments for the bias-driven model of change and its OT-based implementation, with supporting evidence from word-order change. It explains both why languages drift from SOV to SVO as they acquire an articulated spine of functional projections (Indo-European to English, for example), and why they revert from SVO to SOV as the syntactic heads become lexicalized as inflectional morphology (Austro-Asiatic to Munda, for example). This reconciles contradictory unidirectional drifts as phases of long-term cyclic change.

The present study applies the OT-based bias-driven model of diachronic change to the Indo-Aryan and Iranian dismantling of the Ergative/Nominative case system and the return to Nominative/Accusative morphosyntax. The development turns out to resemble that of word order in interesting ways. As with

the change of SVO to SOV word order, the change of Ergative-Nominative to Nominative-Accusative morphosyntax was very likely caused by changes in the verb morphology, in the latter case specifically in the tense/aspect system (Jügel 2015: 441 ff. Haig 2017, Butt & Deo 2017). Another similarity between the changes is that both involve a bumpy ride from one fairly consistent canonical system to another via cross-linguistically more unusual transitional systems, such as the mix of ergative and nominative syntax in Nepali – still within the typological ballpark, but formally more complex in a precise sense to be defined below. Its analog in the word order domain is the mix of head-finality and head-initiality in older Germanic (and still in modern German) which is reached en route from Indo-European consistent head-finality to English and Scandinavian consistent head-initiality.

After outlining the theoretical assumptions and their consequences in Section 2, I present the basic syntactic developments to be accounted for in Section 3. The Middle Indic starting point is uncontroversially a system where subjects of transitive perfective verbs bear ergative case, while objects and intransitive subjects are nominative, and agree in gender and number with the verb. The case/agreement systems after this initial stage up to and including the modern languages show a broad range of variation and diachronic paths (for Indo-Aryan Butt 2001, Butt & King 2004, Deo & Sharma 2006, Stroński 2010, Butt & Deo 2017, Dahl & Stroński 2016, Butt 2017, Patel-Grosz 2021, for Iranian Haig 2008, 2017, Gündoğdu 2022, Kim 2025). In Section 4 I then formulate a set of constraints whose possible rankings generate a typology, which is a small superset of the attested systems. The changes can be modeled as sequences of optimizing constraint rerankings, in accord with the core hypothesis of bias-driven diachrony.

## **2 Diachronic assumptions**

### **2.1 The OT-based approach**

We assume that grammars are partially ranked constraint systems whose outputs define the grammatical utterances of a language. In such a framework, change is by definition a reranking of constraints. We make two provisional simplifying assumptions: all rankings are a priori equally probable, and reranking proceeds in minimal steps, moving a language to a state that is immediately adjacent to it in typological space.

Constraints constitute prior knowledge that enable language acquisition. This does not necessarily mean that they are innate. They might evolve in part through maturational processes. In the course of acquisition a basic constraint inventory could be systematically expanded into constraint families and stringency hierarchies. Moreover, since Jakobson (1941) babbling and linguistic play have been understood as pre-linguistic explorations of typological space.

The core idea is that learners are biased in favor of the most *probable* language consistent with the Primary Linguistic Data they have processed and internalized.

Optimality Theory provides an exact, simple, and testable definition of the probability of a language (Riggle 2009). The  $r$ -volume of language  $l$  under  $k$  constraints is the number of constraint rankings (grammars) that generate  $l$ , divided by  $k!$ . The probability of a language is equal to its  $r$ -volume. Canonical ('unmarked') systems are  $r$ -volume maxima. This yields a conceptually attractive metric of complexity because it relies on the same ranking principles and constraints that characterize grammars and typological space. It is also a promising metric because it has already proved to be a good predictor of typological distribution (Bane & Riggle 2010) and of the relative frequency of free variants (Kiparsky 1993, Anttila 1997 *et seq.*), including syntax (Bane & Riggle 2010). It in effect defines formal markedness in a way that links typology with diachrony. In the case of word order, a remarkably simple OT constraint system derives the basic typology and an improved version of the Final-over-Final Constraint, and underpins the major diachronic pathways of innovations within that typological envelope (Kiparsky 2026).

The proposal is consistent with several plausible models for the way a learner starts from an initial state and ends with a grammar that outputs the target language. As the learner's starting point we can either suppose a set of unranked constraints, or some fixed ranking. For the learning procedure we can either suppose that the learner generates random hypotheses consistent with the data, or that she at each

stage of acquisition projects the language with the largest  $r$ -volume. The latter learner would obviously learn much faster, but at the price of a large computational overhead. Without committing to any of these alternatives, our abstract model predicts that the rate and time of acquisition of a subsystem or of an entire language will be proportional to its  $r$ -volume. At the same time, in concert with a bias-driven theory of change it derives interesting predictions about linguistic stability and the direction of language change, which in the cases studied so far have proved surprisingly accurate.

To test the hypothesis on a set of historically related grammars, we construct OT analyses for the subsystem of interest, pool the constraints that are active in each of them, and generate the factorial typology. Bias-driven acquisition then predicts that increasing  $r$ -volumes of language types define diachronic pathways. For tiny constraint systems the typology and ranking volumes can be calculated by hand. Larger constraint systems, such as the one investigated in this article, require computational tools, such as PyPhon (Bane et al. 2011).

## 2.2 Acquisition and evaluation metrics

The idea of bias-driven acquisition and change is not entirely new. The biases are comparable to the ‘attractor states’ posited in recent typological and historical work (Haig 2008, Seržant & Moroz 2022, Haider 2023, Gelderen 2023), and to parameter settings (Dresher 1999). Unlike attractor states, they are not specified as grammatical states and configurations, but emerge intrinsically from elementary violable constraints whose rankings characterize a structured landscape of language states. In other words, the biases are not holistic prototypical ideal grammars or features of grammars, but emerge from the building blocks out of which grammar itself is constructed. This compositionality makes OT constraints conceptually more akin to unmarked parameter values than to attractor states. But unlike parameters, constraints are not mutually independent dimensions in typological space, but interact in accord with the principle of constraint domination to define grammars and typologies.

If the biases that drive change reflect OT constraints that the learner brings to the acquisition process, then several things follow. Generalizations about language change and the OT constraint inventory required by grammatical theory, typology, and language acquisition must be mutually consistent. Constraints cannot be stipulated just for the sake of diachrony. Furthermore, we know from typology that constraints are not just about purely formal structure, but have substantive content.

The acquisition literature offers two seemingly incompatible hypotheses about formal learning biases: that learners seek the *simplest* grammar consistent with the data encountered, and that they seek the *most restrictive* grammar. The former hypothesis, known as the simplicity criterion, is based on the idea that simplicity corresponds to generality, so that the search for the simplest grammar leads to the most general grammar that is consistent with their innate UG endowment. This has been a standard assumption since the earliest days of generative grammar (Halle 1962).

The contrary hypothesis that learners select the most restrictive grammar consistent with the data is based on the idea that a conservative learning strategy pays off because undergeneration can be corrected simply by positive evidence, whereas cutting back on overgeneration involves discovering the unacceptability of some structures – a harder task because it requires negative evidence from systematic gaps or explicit corrections. A formal articulation of this idea is the Subset Principle (Berwick 1985, Wexler & Manzini 1987, Clark & Roberts 1993: 304–305), according to which the learner at each stage of the learning procedure seeks the most restricted grammar that is compatible with the input, or more precisely with the intake, the part of the input that is actually processed and internalized. It correctly predicts the frequent pattern of unidirectional historical development towards narrower binding domains, in which pronominals become anaphors, long-distance anaphors become local anaphors, and so on (Kiparsky 2002, 2012b). But it does not extend to the well-documented class of changes that move towards the most general grammar, rather than to the most restricted one.

Our hypothesis reconciles these two opposite hypotheses, and explains how the preferred hypothesis depends on the nature of the constraint. In particular, it explains why the Subset Principle works in Binding Theory, whereas generality is key in case assignment. The explanation is briefly as follows.

Under the standard assumption that cross-linguistic variation in binding domains is governed by a set of constraints that impose disjoint reference on anaphoric elements, or require coreference on them, in a hierarchy of domains (such as the minimal clause, the finite domain, and the sentence), the simplest grammar is the one in which *all* these constraints take effect, which necessarily singles out the narrowest binding domain.

The opposite directionality is predicted for case assignment. In Iranian and Indo-Aryan for example, the case pattern of the present tenses was systematically generalized, in stepwise fashion and by different routes, to the past tenses: “no language changed its present tenses; no language took its past tenses further away from its present tenses” (Haig 2008: 325). The formal analysis presented below directly explains why it was the nominative-accusative case system that prevailed. The conflict between two verb agreement constraints, one requiring nominative agreement, the other requiring subject agreement, makes systems where subjects are ergative and objects are nominative inherently unstable in languages with verb agreement, because only one of these constraints can ever be satisfied in transitive clauses. The theory cashes out this conflict formally as a reduction of *r*-volume. Ergative subjects in languages without verb agreement present no such conflict, so that, other things being equal, ergative case should be more stable in them.

In sum, while pronouns start out free and acquire binding domains that become ever narrower in time, ending up as locally bound reflexives, case patterns are generalized from restricted domains to larger ones. From our perspective, there is no conflict here between two apparently incompatible formal principles – simplest grammar versus most restrictive grammar – for both changes follow a consistently optimizing path.

In contrast, optimization with respect to functionalist constraints on the mental computational system appears to be orthogonal to these formal asymmetries. They include the idea that grammars (and linguistic changes) favor the shortest derivation (which would minimize computation and speaker effort), shortest moves (minimizing long-distance dependencies to reduce burden on short-term memory), and MERGE over MOVE (shorter outputs), as proposed by Chomsky (1995) and in later minimalist work. Other functional criteria, defined specifically for language acquisition and with important implications for language change, would be Fitness (Yang 2000), which promotes the grammar that generates the highest frequency of unambiguous outputs, the Tolerance Principle (Yang 2016), and Hawkins’ (1994, 2004) Minimize Forms principle. Insofar as these preferences are definable on grammars, they can be expressed as constraints, and their import for linguistic change can be empirically explored.

### **3 The diachrony of Indic and Iranian case and agreement systems**

#### **3.1 Forward to the past**

Indic and Iranian had evolved an ergative/nominative case system where Past/Perfective verbs agreed with nominative objects, and much of the case morphology, including accusative case, was lost. They then returned to a nominative/accusative case system, also with nominative subject agreement, broadly similar to that of the original Indo-Aryan languages. The languages moved independently forward to the past, one step at a time. The exit strategy consisted of three distinct and at least in part independent overt changes:

- (1)   a.   Rebuilding accusative case,
- b.   spread of subject agreement,
- c.   loss of ergative case marking.

In all languages we find that case is in the lead and agreement ‘catches up’ – the *agreement lag* noticed by Deo & Sharma (2006): “We never find a system in which the verb agrees with a non-nominative object when a nominative subject is available [even in Gujarati!], but we do find agreement with non-nominative subjects when a nominative object is available”. This generalization has proved to be valid, even in the face of challenges from Marwari and Kutchi Gujarati data, as discussed in Section 4 below.

(2) is a schematic summary of the offramp, starting from the original Middle Indic ergative/nominative system before the loss of accusative case, and ending with vanilla nominative/accusative and caseless languages. The leftmost column shows the *r*-volumes, which rise steeply throughout the trajectory. Section 4.3 below explains how they are computed and presents the full typology.

|     |      |                |     |                  |                  |                  |     |     |                  |
|-----|------|----------------|-----|------------------|------------------|------------------|-----|-----|------------------|
| (2) | .012 | Middle Indic   | Erg | Nom <sub>i</sub> | Agr <sub>i</sub> |                  |     |     |                  |
|     |      |                |     |                  |                  |                  |     |     |                  |
|     | .036 | Gujarati/Hindi | Erg | Acc <sub>i</sub> | Agr <sub>i</sub> | ∅                | Erg | Acc | Agr <sub>0</sub> |
|     |      |                |     |                  |                  |                  |     |     |                  |
|     | .104 | Nepali         |     | Erg <sub>i</sub> | Acc              | Agr <sub>i</sub> |     |     |                  |
|     |      |                |     |                  |                  |                  |     |     |                  |
|     | .292 | Bengali        |     | Nom <sub>i</sub> | Acc              | Agr <sub>i</sub> |     |     |                  |
|     |      |                |     |                  |                  |                  |     |     |                  |

### 3.2 The origin of Indic and Iranian ergative case

The historical source of ergative morphology is controversial, and our analysis is not committed to any particular provenience. An old hypothesis traces it to a Sanskrit instrumental case ending which originally marked the passive agent, but a seductive alternative championed by our honorands derives it from dative *-ē*, presumably directly continued in Gujarati and Assamese *-e* (Genetti 1993, Mohanan 1994, Butt 2001, Butt & King 2004, Butt 2006a,b, Li 2007, Butt & Ahmed Khan 2011). The new clitics, Nepali *=ne* and Marathi, Punjabi and Hindi/Urdu *=le*, might then have arisen by refurbishing *-e* with an onset in order to match the *=CV* shape of the other clitics in those languages.<sup>1</sup>

### 3.3 The rise of a new accusative

In an early phase of the path back to nominative/accusative case marking, perhaps as its first step, an accusative case ending is reintroduced, first for definite/human object arguments. Such a new ending emerged in most Indic and Iranian languages, independently and from etymologically disparate sources. The newly accusative-marked object at first continues to agree with the finite verb. The immediate outcome of this innovation is thus an unusual system where, if the subject is ergative and the object is accusative, the finite verb agrees with the accusative object. This is famously found in Gujarati (Mistry 2004), as well as in the Kuḍaḷi dialect of Marathi (Deo & Sharma 2006).

- (3)    *rāj-e*            *sītā-ne*            *pajāv-ī*  
          Raj.MASC.ERG Sita.FEM.ACC harass-PERF.FEM.SG  
          ‘Raj harassed Sita.’ (Gujarati)

Accusative object agreement is most naturally derived from nominative object agreement as a result of the rise of accusative object marking, for a change from subject agreement to object agreement would be unmotivated.

Hindi, Marathi, Pahari, and some Northern Kurdish dialects deal with the rise of accusative objects in a different way: by introducing 3rd person singular default agreement:

- (4)    *sītā-ne*            *rādhā-ko*            *dekh-ā*  
          Sita.FEM.ERG Radha.FEM.ACC see-PERF.MASC.SG  
          ‘Sita saw Radha.’ (Hindi, Deo & Sharma 2006, Bhatt 2003)

<sup>1</sup>Suffixes can be upgraded to clitics when they are part of a paradigm whose other members are clitics (examples from English, Irish, Mainland Scandinavian, Estonian, Seto, Võru, Saami, Spanish, and Greek in Kiparsky 2012a). The new clitics *=ne* and *=le* emerged in languages in which the other case endings are consistently clitics of the form *=CV(C)*, such as Hindi/Urdu dative/accusative *=ko*, instrumental *=se*, inessive *=mē*, adessive *=par*, Marathi dative/accusative/locative *=la* (earlier *=si*), Nepali *=lāi*, *=ko*, *=mā*.

In Gujarati, where accusative objects agree with the verb, 3rd person neuter singular default agreement appears where the object is dative, as the downstairs agent of the causative in (5b) (Joshi 2020):<sup>2</sup>

- (5) a. priyanka-e ram-ne dawdaivo  
Priyanka.F.SG.ERG ramM.SG.-ACC run.CAUS.PERFECTIVE.M.SG.  
'Priyanka made Ram run.'  
b. priyanka-e ram-ne dawdaivu  
Priyanka.F.SG.ERG ramM.SG.-DAT run.CAUS.PERFECTIVE.N.SG.  
'Priyanka made Ram run.'

### 3.4 Spread of subject agreement

In a further change, the agreement trigger is transferred from nominative objects to ergative subjects. This happened in Nepali (with the abovementioned new ergative ending =le, Masica 1993, Li 2007), Marheṭhi (Deo & Sharma 2006), Eastern Pahāḍī, Shina, Assamese (Verbeke & Clercq 2016) and some Northern Kurdish dialects, even where the object remains nominative:

- (6) a. mai-le mero lugā dho-en  
I-ERG my clothes.NOM wash-perf.1SG  
'I washed my clothes.' (Nepali, Deo & Sharma 2006)  
b. mai-lē pāp garē  
me-ERG sin-NOM did-1SG  
'I sinned.' (Pahāḍī, Chatterji 1926: 969)  
c. wan tu dīt-in  
they-ERG.PL you.SG.NOM see.PAST-3PL  
'They saw you.' (N. Kurdish, Gündoğdu 2017)

### 3.5 Retreat of ergative case marking

A third step towards a nominative-accusative case system is the progressive loss of ergative case endings, beginning with the speech act participant (SAP) pronouns (1. and 2. person). In Punjabi, the 1.Sg. ergative pronoun *mē*, and in some varieties also the 2.Sg. *tū*, are morphologically unmarked (Butt 2017: 823, Dahl & Stroński 2016: 24). The 1.Pl. and 2.Pl. ergative pronouns are unmarked in Old Marathi and Warhaḍhi Brahmanī (Deo & Sharma 2006). Many languages extend this to all SAP pronouns.

This change leads to another fork in the path. Newly stripped of their ergative case endings, and morphologically identical with nominatives, the subject pronouns can either continue to function syntactically as ergative, remaining immune to verb agreement, or they can begin to function syntactically as nominatives and agree with the verb. The former, more conservative solution is more common. It is reported for Punjabi, standard Marathi (e.g. the Pune variety), Marheṭhi, Old Marathi, and Warhaḍhi Brahmanī (Deo & Sharma 2006), Bagri (Gusain 2000, Stroński 2009), and for West Iranian (Haig 2008). The following examples are cited from these sources:

- (7) a. mē lakṛi vaḍ-i  
I.ERG wood.F.Sg.Nom cut-PAST.F.SG  
'I (male or female) cut the wood.' (Punjabi, Butt 2017: 823)  
b. tē á kiṭab koni pəḍi he  
you.ERG this book.FEM.SG NEG read.PPP.FEM.SG be.AUX.2SG  
'You haven't read this book.' (Bagri, Gusain 2000: 62)

<sup>2</sup>As noted by Butt & Ahmed Khan (2011: 555–556), the case variation is analogous to the variation in Sanskrit causatives between accusative and instrumental case; the respective Sanskrit counterparts of (5a) and (5b) are *rāmaṃ dhāvayati* and *rāmeṇa dhāvayati*.

- c. mī sita=lā bagha-to  
I.M.NOM Sita.F-ACC see-PRES.M.SG  
'I see Sita.' (Marathi)
- d. mī ek chimnī baghit-lī  
I.M.ERG one sparrow.F.NOM see-PERF.F.SG  
'I saw a sparrow.' (Marathi)
- e. mī sita-lā baghit-la  
I.M.ERG Sita.F-ACC see-PERF.N.SG  
'I saw Sita.' (Marathi)
- f. hā=chi yogu āmhī vivasvat-ā kathi-lā  
this=emph knowledge.M.NOM we.ERG Vivasvat-DAT relate-PERF.M.SG  
'It is this knowledge (that) we (royal) related to Vivasvat.'  
(13th c. Marathi, *Jñāneśwarī* 4:16)

When the verb cannot agree either with the ergative subject or the accusative object, it defaults to neuter singular.

Some varieties of Marathi show a more advanced stage, in which overtly unsuffixed subject pronouns agree in person, number, and gender with the verb, in effect functioning as nominatives:

- (8) mī devā-javal tu-jhyā-sāmne pāp kelo  
I.M.NOM God-near you-GEN.OBL-before sin.N.NOM do-PERF.1.M.SG  
'I committed a sin near God and in front of you.' (Gowari Marathi, Deo & Sharma 2006).

Unsurprisingly, this stage appears to be diachronically fragile. A more transparent relation of agreement to overt case marking is restored in one of two ways. Modern Hindi has regularized the morphological expression of Ergative case by the ergative clitic =*ne*, which is added even to SAP pronouns.

- (9) mai=ne chiḍiyā dekh-ī  
I.M.ERG sparrow.F.NOM see-PERF.F.SG.  
'I saw a sparrow.' (Hindi, Butt & Deo 2017)

The more radical resolution of the opacity is a generalized Gowari-type restructuring of all bare ergatives as true nominatives, re-establishing the original state in which the verb agrees uniformly with the grammatical subject – the highest nominative – in perfective as well as imperfective verbs. This happens in Bangla, Oriya, and Bhojpuri (and possibly already in Māgadhi Apabhraṃśa, from which they are descended: Chatterji 1926: 971–972), also independently in Dharwari Marathi (Deo & Sharma 2006), and on the Iranian side in Farsi and Gilan Kurdish (Haig 2008: 254).

- (10) a. tu şutur-ê biyaban-ê venda k'ir-î  
2S:DIR camel-OBL desert-OBL losing did-2SG  
'You lost the camel in the desert.' (Gilan Kurdish)
- b. āmī sita-ke dekh-lām  
I.Nom Sita.F-ACC see-PERF.1SG  
'I saw Sita.' (Bangla)

### 3.6 Periphrastic perfectives and the elimination of ergative case marking

The loss of ergative case marking goes to completion in Marwari and some dialects of Gujarati spoken in Northwestern India. The older literature describes Marwari as marking ergative case only in third person pronouns, and some masculine plural nouns, and only optionally at that (Magier 1983: 310 ff. Stroński 2009, Verbeke 2013: 212).

- (11) a. vo ~ uŋ      k̄āi      kariyo  
           he ~ he-ERG what-ACC did  
           ‘What did he do?’  
       b. mhāro beŋo      k̄āi      kariyo  
           My.Ø son.NOM what-ACC did  
           ‘What did my son do?’

Contemporary Marwari has completely lost ergative case marking (Chandra & D'Alessandro 2022), as has the Kutchi dialect of Gujarati (Patel-Grosz 2021).

These dialects have developed a periphrastic perfective in which the auxiliary agrees in person and number with the now nominative subject, and the participle agrees in gender and number with the object, in a construction which Magier (1983) and Patel-Grosz (2021) liken to the Romance periphrastic perfect.

- (12) mhẽ sīta-ne dek<sup>h</sup>ī hū  
I Sita..FEM-ACC seePPP.FEM. be.1.SG.  
'I have seen Sita.'  
(Marwari, Magier 1983: 322)

In the simple past the verb is a bare participle with the auxiliary omitted. It shows no person agreement, only gender and number agreement with the object.

In earlier forms of Western Hindi that retain ergative case, the periphrastic perfective shows complete object agreement when the subject is marked with ergative case. The participle then agrees with the object in gender and number and the auxiliary agrees with the object in person, as in (13).

- (13) te-nē tin dʒəgəhē mē kal pɛ se bəʃʌjə ũ  
 you-ERG three place I death from save.PPP.MASC.SG. be.PRES.1SG.  
 ‘You have saved me from death on three occasions.’  
 (Braj Bhāṣā, Stron̄ski 2009: 100, from Liperovskij 1988 (*non vidi*))

An early stage of the perfective periphrasis with ergative attrition is found as early as in Gandhari Prakrit Niya texts from the 3rd century AD (Jamison 2000, Butt & Deo 2017: 543). A first or second person subject is endingless, and in the past tense it agrees in person and number with the auxiliary that is attached to the perfect participle in *-t(a)*. The third person singular lacks an overt auxiliary, but has an extended variant in *ḡa*.<sup>3</sup>

- |      |    |          |          |
|------|----|----------|----------|
| (14) |    | Singular | Plural   |
|      | 1. | dit-emi  | dita-ma  |
|      | 2. | dit-esi  | dita-tha |
|      | 3. | dita(ǵa) | dita-mti |

Since the third person singular verb has no auxiliary, it shows no agreement. If the subject and object are both human, and the subject is singular, it bears ergative/instrumental case.

- (15) a. ime isa veyā vari-da-ma  
 them here we prevent-PPP-1PL  
 ‘Here we have prevented them.’ (Jamison 2000: 72)
- b. priyavaḡa-sa suḡute-na uṭa di-ta dhamana-ye  
 priyavaḡa-DAT/GEN suḡuta-GEN/DAT camel give-PPP break-in-for  
 ‘Suḡuta gave priyavaḡa a camel to break in.’ (Jamison 2000: 74)

The complete loss of ergative case marking is also reported for the early Hindi of the 15th century poet Kabir, where not only pronouns but also nouns have lost their ergative case endings, while transitive

<sup>3</sup>The 3P null auxiliary is familiar from the Sanskrit periphrastic future in *-tā* (*dātā-smi*, *dātā-si*, *dātā* ‘I/you(s)he will give’, and is cross-linguistically common.

perfective verbs show the participial agreement pattern with the object in number and gender (Butt & Deo 2017: 541).

- (16) dās kabir jatan-se oḍh-i  
 servant Kabir.ERG care-with wrap-PERF.F.SG  
 ‘Your servant Kabir wore it with great care.’ (Early Hindi)

In the next section we present the nine-constraint system that is the basis of the grammatical analysis, the ten-language typology that it generates, and the paths towards increasing *r*-volume through it.

## 4 The grammars and their evolution

### 4.1 Case and argument licensing

To model the case and agreement systems and their evolution from Middle Indic and Iranian to their descendants we use a framework that posits a level of Abstract Case and a level of morphosyntactic case (Butt 2006a, Galbraith 2022).<sup>4</sup> The four Abstract structural Cases are essentially equivalent to the grammatical relations A, S, O, D that have been widely used in descriptive practice and typological work since Dixon (1979). They are assigned to arguments based on their Thematic Roles. Theta-roles (‘who did what to whom’) are mapped into Abstract Case features according to their hierarchical rank. Transitive subjects have underlying Ergative Case and objects have underlying Accusative Case.

- (17) Abstract Cases
- |             |            |                                             |
|-------------|------------|---------------------------------------------|
| Accusative: | [−HR]      | “I’m not a subject”                         |
| Ergative:   | [−LR]      | “I’m not a direct object”                   |
| Dative:     | [−HR, −LR] | “I’m neither a subject nor a direct object” |
| Nominative: | [ ]        | “whatever” (the default case)               |

Ranked violable Faithfulness and Markedness constraints then match Abstract Cases to their morphosyntactic counterparts – ergative, nominative, accusative, and dative morphosyntactic case, to agreement relations, and in some languages to word order. The mapping between Abstract Case and morphosyntactic case is simplified by decomposing both into bundles of the same cross-classifying features [ $\pm$ H(ighest)R(ole)], [ $\pm$ L(owest)R(ole)]. A Faithfulness constraint provides one-to-one mapping as the default; for example, morphosyntactic ergative and accusative case respectively correspond to abstract Ergative Case and abstract Accusative Case. The default correspondences are defeasible by higher-ranked Markedness constraints.

The featural decomposition allows natural classes to be captured by a single feature specification. At the level of morphosyntactic case, the feature [−LR] captures the dative/ergative syncretism observed by DeLancey (1981), Butt (2006b), and Butt & Ahmed Khan (2011: 4.2), and [−HR] captures the dative/accusative syncretism that is ubiquitous in Indic and elsewhere, e.g. Hindi *-ko*, Punjabi *-nū*, Nepali *-lai*, Gujarati *-ne* (Joshi 2020, Deo & Sharma 2006: 379). At the level of Abstract Case, [+LR] specifies the class of internal arguments (direct objects and unaccusative subjects<sup>5</sup>), and [+HR] specifies the class of subjects (transitive and intransitive). For example, Hindi */-ko/*, lexically specified as [−HR], can morphosyntactically unify with Abstract Accusative [−LR, −HR] and with Abstract Dative [+LR, −HR], and when it does, it acquires those respective specifications. Suffixes like Sanskrit *-ta* and English *-ee* (*invitee*, *standee*, *devotee*, *absentee*) are [−HR].

All languages can be assumed to have the same thematic relations, and therefore the same Abstract Cases. Here we concentrate on their morphosyntactic expression as cases and agreement. Word order can also express Abstract Case. Although it is generally free in South Asian languages, it does play a role, as

<sup>4</sup>A very different approach is put forward in Bányai (2018: 161–170).

<sup>5</sup>But not including unergative subjects, if these are analyzed as having a silent cognate object or some other lower silent Theta-role.

shown by the Freezing effect first observed for Hindi by Mohanan (1989). In an ordinary transitive clause, all permutations of the subject, object, and verb are grammatical, with no effect on grammatical relations. But with experiencer predicates, switching the order of arguments changes grammatical relations. The thematically highest argument with dative case is a subject in subject position, and an object in object position. This is shown by the usual subjecthood tests of control, disjoint reference, and anaphoric coreference. In the examples below, the boldfaced argument is the grammatical subject.

(18) Dative experiencer subject

- a. **anuu-ko<sub>i</sub>** niinaa<sub>j</sub> khelte<sub>i,\*j</sub> hue dikhii *control*  
 Anu-DAT Nina.NOM play-NF be-NF appear.PERF  
 ‘Anu saw Nina while (Anu) was playing.’
- b. **anuu-ko<sub>i</sub>** niinaa<sub>j</sub> uskii<sub>\*i,j</sub> bastii-mẽ dikhii *disjoint reference*  
 Anu-DAT Nina.NOM her.GEN neighborhood-LOC appear.PERF  
 Anu saw Nina in her (Nina’s) neighborhood.’
- c. **anuu-ko<sub>i</sub>** niinaa<sub>j</sub> aapnii<sub>i,\*j</sub> bastii-mẽ dikhii *anaphora*  
 Anu-DAT Nina.NOM self.GEN neighborhood-LOC appear-PERF  
 ‘Anu saw Nina in her (Anu’s) neighborhood.’

Without any change in the cases, switching the word order changes the subject from *Anu* to *Nina*:

(19) Dative experiencer object

- a. **niinaa<sub>i</sub>** anuu-ko<sub>j</sub> khelte<sub>i,\*j</sub> hue dikhii *control*  
 Nina.NOM Anu.DAT play-NF be-NF appear.PERF  
 ‘Anu saw Nina while (Nina) was playing.’
- b. **niinaa<sub>i</sub>** anuu-ko<sub>j</sub> uskii<sub>\*i,j</sub> bastii-mẽ dikhii *disjoint reference*  
 Nina.NOM Anu-DAT her.GEN neighborhood-LOC appear.PERF  
 ‘Anu saw Nina in her (Anu’s) neighborhood.’
- c. **niinaa<sub>i</sub>** anuu-ko<sub>j</sub> aapnii<sub>i,j</sub> bastii-mẽ dikhii *anaphora*  
 Nina.NOM Anu-DAT self.GEN neighborhood-LOC appear.PERF  
 ‘Anu saw Nina in her (Anu’s/Nina’s) neighborhood.’

As in many languages, structural case in Indic and Iranian languages is sensitive to tense/aspect features, definiteness, agentivity, animacy, and topicality. Only the two most important factors are included in the present analysis. First, Abstract Ergative corresponds to morphosyntactic ergative in subjects of Past/Perfect clauses, but not in subjects of Present/Imperfective verbs. This does not seem to be simply a matter of semantics or of some flavor of little *v*. Rather, it is determined by the morphological stem. Transitive verbs whose stems are morphologically past but have non-past interpretations still require ergative subjects (Haig 2008, Patel-Grosz 2021: 10).

Secondly, Abstract Accusative Case can correspond to morphosyntactic accusative case and to morphosyntactic nominative case (DOM). Accusative case endings on nominals that have some combination of features variously reported to include animacy, human-ness, lexical category (noun vs. determiner), definiteness, specificity, information structure (primary and secondary topicality), and affectedness (Mohanan 1994, Mistry 1997, Butt & King 2003, Li 2007, Dalrymple & Nikolaeva 2011, Montaut 2018, Witzlack-Makarevich & Seržant 2018, Lahiri 2021; and, for Farsi, Jasbi 2020: 71). A broad generalization is that abstract Accusative tends to correspond to morphosyntactic accusative in nominals that are less likely to be objects (Aissen 2003). Once the details are sorted out, a formal typology of DOM can be

built.<sup>6</sup> For now, I will just cavalierly refer to the relevant combination of features as the DOM (Differential Object Marking) feature, and mark it by a subscript *d* on the relevant nominal.

## 4.2 The constraints

The constraint system comprises a Faithfulness (MAX) constraint for each Abstract Case feature, which requires it to be matched by the featurally identical morphosyntactic case, and a Markedness condition that prohibits that morphosyntactic case altogether. Ranked that way, they generate split case systems such as DOM.

- (20) a. MAX-ERG(Past): Abstract Ergative corresponds to morphosyntactic ergative in clauses headed by Past/Perfect verbs.  
 b. \*ERG: No ergative.  
 c. MAX-DOM(Acc): Abstract Accusative corresponds to morphosyntactic accusative in DOM nominals.  
 d. \*ACC: No accusative.

A full grammar would have to specify the conditions under which overt accusative and ergative case must, may, and cannot appear in the language.

A kind of counterpart to DOM for Ergative case assignment privileges features at the opposite end of the spectrum. For example, in Marathi 1. and 2. person Ergative pronouns have no overt ergative endings, yet function morphosyntactically as ergative. At least in the languages under study this skewed distribution can be treated purely within the morphology. Unsuffixed pronouns that function morphosyntactically as ergatives can be assumed to receive ergative case in the morphology, either by default or by a null suffix. The constraint evaluation then starts with the morphosyntactic ergative case in place.

The details of cross-linguistic variation are in principle treatable in OT by constraint ranking, but there is not enough information to test our frequentistic predictions. Since the varieties of person and number splits do not appear to interact with the major case and agreement parameters, their inclusion would not add much to the analysis, while swelling the typology exponentially. For now, therefore, I just define the MAX constraints on Past/Perfect and the diacritic *d* (mnemonic for ‘DOM’, ‘definite’, or ‘Determiner’), leaving open the specific distribution of *d* in each language.

In the absence of an eligible agreeing subject, some languages allow verb agreement requirements to be satisfied by default. This is treated here as agreement with a silent expletive pronoun that has unmarked case, number, and gender but no meaning and no Theta-role. In Hindi/Urdu the verb then gets third person masculine singular (Mohanen 1994). In accord with the Richness of the Base principle, the input may have expletives inserted freely, but the constraint system guarantees that they will surface in the optimal output of a derivation only where agreement is required and no other trigger of it is available. No ranking of the constraints can generate obligatory expletive objects, or non-nominative expletive subjects. The reason is that expletives in this system are motivated only by the agreement requirement, and other things being equal the constraints always prefer subject agreement over object agreement. This amounts to a formal prediction of the system, so if it turns out to be incorrect, additional constraints would be required, with further empirical consequences.

Our constraints are broadly similar to those of Deo & Sharma (2006). However, we do not use scalar constraints, constraint conjunction, or harmonic alignment, only standard markedness and faithfulness constraints. Our constraints are of two types: undominated well-formedness constraints, which must be satisfied both in input and in output representations, and ranked violable constraints. (In our computational implementation they were part of GEN rather than EVAL). The inviolable well-formedness constraints define basic clause structure:

<sup>6</sup>According to Montaut, the accusative is “obligatory in Hindi only with human individuated objects, and optional with inanimate objects even when individuated”. According to Jasbi, Farsi (formal Tehran variety) has obligatory *rā* on proper nouns, personal and demonstrative pronouns, reflexive pronouns, reciprocal pronouns, demonstrative nouns, superlatives, question-words *which* and *who*, strong quantifiers such as *each*, *all*, *most*, *both*, and plurals marked with *hā*.

- (21) Unviolable dominant constraints
- a. Nominals have case.
  - b. A finite verb agrees with exactly one nominal (overt or expletive).

The action lies in the violable constraints, which are enumerated in (22).

- (22) Ranked violable constraints
- a. \*AGR(Erg): Ergative arguments don't agree with the verb.
  - b. \*AGR(Acc): Accusative arguments don't agree with the verb.
  - c. MAX-PAST(Erg): In Past/Perfect clauses, Abstract Ergative corresponds to morphosyntactic ergative.
  - d. MAX-DOM(Acc): In DOM nominals, Abstract Accusative corresponds to morphosyntactic accusative.
  - e. \*ACC: No accusative.
  - f. \*ERG: No ergative.
  - g. AGR<sub>Nom</sub>: The verb agrees with a nominative.
  - h. AGR<sub>Hi</sub>: The verb agrees with the [+HR] argument (the argument bearing the highest Theta-role).
  - i. \*∅: No expletive.

Each constraint plays an active role in the synchronic grammar of at least one of the languages.

In the theoretical literature ergative case tends to be treated as a special problem, or as somehow more 'marked' than accusative case. This is arguably eurocentric, because about 40% of the languages of the world that have case at all have ergative case. The case theory proposed here normalizes ergative case. Ergative and accusative are formally parallel: each constraint that involves one of them has an identical counterpart that involves the other. The theory would be *more* complex if there were no such thing as ergative case. The normalization also means that 'ergative languages' are just languages that have ergative case, and 'ergativity' is the property of having it. As far as I can tell, these categories have no profound typological significance, any more than 'dativity' and 'dative languages', or 'ablativity' and 'ablative languages' have.

The apparent asymmetry between accusative and ergative case is due to the fact that ergative case and nominative case compete with each other (but not with accusative case) for agreement, but not on a level playing field. This is because of a conflict between two requirements: agreement with the argument that bears the most prominent Theta-role ([+HR]), and agreement with nominative case (enforced by the prohibition of agreement with marked cases accusative, ergative, and dative). Both cannot be satisfied together when transitive subjects are ergative. A grammar must resolve this intrinsic contradiction by ranking, which decreases its *r*-volume, hence by hypothesis decreases its learnability. A language with nominative subjects does not have this complication. The diachronic prediction follows that ergative case and accusative case are equally stable in a language without verb agreement, but ergative case is more vulnerable to loss in a language with verb agreement.

A further caveat before we proceed to the typology. While the constraints are basic and symmetrical, and omitting any of them would lose empirical coverage, some of them could be reformulated to generate the same set of outputs. In particular, the contextual conditions involving Tense/Aspect and DOM can be moved from the Faithfulness constraints to the corresponding antagonistic Markedness constraints. Instead of MAX-ERG(Past), MAX-ACC(DOM), \*ERG, \*ACC as above, we would then have across-the-board MAX-ERG, MAX-ACC, and contextually restricted \*ERG(Non-Past), \*ACC(Non-DOM). I do not know whether there are theoretical and empirical grounds for choosing between these and perhaps other alternative formulations of the constraints.

### 4.3 *r*-volumes and typological space

With this constraint system in hand, we compute the typological space and the ranking volume for the relevant subsystem of each language, which is the number of grammars that generate it. The constraints generate a total of  $9! = 362,880$  grammars, which converge on only ten possible languages, with a wide spread of ranking volumes.

(23) compactly displays five selected input structures and their respective outputs in each of the ten grammars generated by the totality of constraint rankings. They are listed in order of increasing ranking volume (the proposed predictor of frequency/probability/structural simplicity), which is shown in the rightmost column. E, A, and N stand for Ergative, Accusative, and Nominative – as Abstract Case in the input, and as their morphosyntactic correspondents in the ten output languages. Nominals are marked with the subscript <sub>d</sub> (which is specified in the input) to indicate that they bear the DOM feature, and with the subscript <sub>i</sub> (which is derived in the output) marking the nominal that agrees with the finite verb of the clause. The first column shows the structure of Nonpast/Imperfective (I) clauses, in which morphosyntactic ergative case is barred, in which subjects always have nominative case, and in which the verb always agrees with the first or only nominative. The only variation in them involves the morphosyntactic accusative (A) in the case repertoire, absent in two forms of Middle Indo-Aryan and again in Central Kurdish, and present elsewhere. The remaining columns show Past/Perfective (P) clauses, where the intersection of variation in the presence or absence of ergative case, the DOM effect on accusative case, and the different types of agreement fills most of the typological space. Three of the ten output language types are to my knowledge unattested.

#### (23) Skeletal syntactic typology

| Input        | /IEA <sub>d</sub> V/               | /PEAV/               | /PEA <sub>d</sub> V/                | /PE <sub>d</sub> AV/               | /PE <sub>d</sub> A <sub>d</sub> V/                | <i>r</i> -volume |
|--------------|------------------------------------|----------------------|-------------------------------------|------------------------------------|---------------------------------------------------|------------------|
| Undocumented | [IN <sub>i</sub> A <sub>d</sub> V] | [PEN <sub>i</sub> V] | [PN <sub>i</sub> A <sub>d</sub> V]  | [PE <sub>d</sub> N <sub>i</sub> V] | [PN <sub>di</sub> A <sub>d</sub> V]               | .007             |
| MIA          | [IN <sub>i</sub> A <sub>d</sub> V] | [PEN <sub>i</sub> V] | [PEN <sub>di</sub> V]               | [PE <sub>d</sub> N <sub>i</sub> V] | [PE <sub>d</sub> N <sub>di</sub> V]               | .012             |
| Undocumented | [IN <sub>i</sub> A <sub>d</sub> V] | [PEN <sub>i</sub> V] | [PE <sub>i</sub> A <sub>d</sub> V]  | [PE <sub>d</sub> N <sub>i</sub> V] | [PE <sub>di</sub> A <sub>d</sub> V]               | .014             |
| Hindi        | [IN <sub>i</sub> A <sub>d</sub> V] | [PEN <sub>i</sub> V] | [P0 <sub>i</sub> EA <sub>d</sub> V] | [PE <sub>d</sub> N <sub>i</sub> V] | [P0 <sub>i</sub> E <sub>d</sub> A <sub>d</sub> V] | .036             |
| Gujarati     | [IN <sub>i</sub> A <sub>d</sub> V] | [PEN <sub>i</sub> V] | [PEA <sub>di</sub> V]               | [PE <sub>d</sub> N <sub>i</sub> V] | [PE <sub>d</sub> A <sub>di</sub> V]               | .036             |
| MIA          | [IN <sub>i</sub> N <sub>d</sub> V] | [PEN <sub>i</sub> V] | [PEN <sub>di</sub> V]               | [PE <sub>d</sub> N <sub>i</sub> V] | [PE <sub>d</sub> N <sub>di</sub> V]               | .104             |
| (Gandhari)   | [IN <sub>i</sub> N <sub>d</sub> V] | [PE <sub>i</sub> NV] | [PE <sub>i</sub> N <sub>d</sub> V]  | [PE <sub>di</sub> NV]              | [PE <sub>di</sub> N <sub>d</sub> V]               | .104             |
| Nepali       | [IN <sub>i</sub> A <sub>d</sub> V] | [PE <sub>i</sub> NV] | [PE <sub>i</sub> A <sub>d</sub> V]  | [PE <sub>di</sub> NV]              | [PE <sub>di</sub> A <sub>d</sub> V]               | .104             |
| Bangla       | [IN <sub>i</sub> A <sub>d</sub> V] | [PN <sub>i</sub> NV] | [PN <sub>i</sub> A <sub>d</sub> V]  | [PN <sub>di</sub> NV]              | [PN <sub>di</sub> A <sub>d</sub> V]               | .292             |
| C.Kurdish    | [IN <sub>i</sub> N <sub>d</sub> V] | [PN <sub>i</sub> NV] | [PN <sub>i</sub> N <sub>d</sub> V]  | [PN <sub>di</sub> NV]              | [PN <sub>di</sub> N <sub>d</sub> V]               | .292             |

To illustrate the derivations in detail, I present three sample tableaux, followed by summary descriptions of all ten languages that unpack the condensed information in (23).

In Bangla and Farsi, the subject is Nominative, the object is Nominative or (if it bears the DOM feature) Accusative, and the verb agrees with the subject. This very simple system (*r*-volume .292) is generated by 105,840 constraint rankings, one of which is shown in tableau (24):

## (24) Bangla

|      |                                                     | A<br>*ERG | B<br>AGR <sub>Nom</sub> | C<br>MAX-ACC(DOM) | D<br>*AGR <sub>ERG</sub> | E<br>*AGR <sub>ACC</sub> | F<br>AGR <sub>Hi</sub> | G<br>*∅ | H<br>MAX-ERG(Past) | I<br>*ACC |
|------|-----------------------------------------------------|-----------|-------------------------|-------------------|--------------------------|--------------------------|------------------------|---------|--------------------|-----------|
|      | Erg <sub>d</sub> Acc <sub>d</sub> V <sub>Perf</sub> |           |                         |                   |                          |                          |                        |         |                    |           |
| 1.   | Erg <sub>i</sub> Acc Agr                            | *         |                         |                   | *                        |                          |                        |         |                    | *         |
| 2.   | Erg Acc <sub>i</sub> Agr                            | *         |                         |                   |                          | *                        | *                      |         |                    | *         |
| 3.   | ∅ <sub>i</sub> Erg Acc Agr                          | *         |                         |                   |                          |                          |                        | *       |                    | *         |
| 4.   | Erg <sub>i</sub> Nom Agr                            | *         | *                       | *                 | *                        |                          |                        |         |                    |           |
| 5.   | Erg Nom <sub>i</sub> Agr                            | *         |                         | *                 |                          |                          | *                      |         |                    |           |
| 6.   | ∅ <sub>i</sub> Erg Nom Agr                          | *         |                         | *                 |                          |                          |                        | *       |                    |           |
| ⇒ 7. | Nom <sub>i</sub> Acc Agr                            |           |                         |                   |                          |                          |                        |         | *                  | *         |
| 8.   | Nom Acc <sub>i</sub> Agr                            |           | *                       |                   |                          | *                        | *                      |         | *                  | *         |
| 9.   | ∅ <sub>i</sub> Nom Acc Agr                          |           | *                       |                   |                          |                          |                        | *       | *                  | *         |
| 10.  | Nom <sub>i</sub> Nom Agr                            |           |                         | *                 |                          |                          |                        |         | *                  |           |
| 11.  | Nom Nom <sub>i</sub> Agr                            |           | *                       | *                 |                          |                          | *                      |         | *                  |           |

Promotion of \*ACC in (24) yields a caseless system, such as that of Central Kurdish (same *r*-volume of .292).

In the more intricate system of Hindi/Urdu, the Agentive subject of a perfective transitive clause (Erg<sub>Ag</sub>) is Ergative, a definite or animate object (Acc<sub>d</sub>) is Accusative, and in such configurations the verb (V<sub>Perf</sub>) has default 3Sg. Masc. Person/Number agreement, treated here as agreement with a null expletive. One of the 12,951 rankings that output Hindi/Urdu is (25):

## (25) Hindi/Urdu

|      |                                                      | A<br>*AGR <sub>ERG</sub> | B<br>*AGR <sub>ACC</sub> | C<br>MAX-ERG(Past) | D<br>MAX-ACC(DOM) | E<br>*ACC | F<br>*ERG | G<br>AGR <sub>Nom</sub> | H<br>AGR <sub>Hi</sub> | I<br>*∅ |
|------|------------------------------------------------------|--------------------------|--------------------------|--------------------|-------------------|-----------|-----------|-------------------------|------------------------|---------|
|      | Erg <sub>Ag</sub> Acc <sub>d</sub> V <sub>Perf</sub> |                          |                          |                    |                   |           |           |                         |                        |         |
| 1.   | Erg <sub>i</sub> Acc Agr                             | *                        |                          |                    |                   | *         | *         |                         |                        |         |
| 2.   | Erg Acc <sub>i</sub> Agr                             |                          | *                        |                    |                   | *         | *         |                         | *                      |         |
| ⇒ 3. | ∅ <sub>i</sub> Erg Acc Agr                           |                          |                          |                    |                   | *         | *         |                         |                        | *       |
| 4.   | Erg <sub>i</sub> Nom Agr                             | *                        |                          |                    | *                 |           | *         | *                       |                        |         |
| 5.   | Erg Nom <sub>i</sub> Agr                             |                          |                          |                    | *                 |           | *         |                         | *                      |         |
| 6.   | ∅ <sub>i</sub> Erg Nom Agr                           |                          |                          |                    | *                 |           | *         |                         |                        | *       |
| 7.   | Nom <sub>i</sub> Acc Agr                             |                          |                          | *                  |                   | *         |           |                         |                        |         |
| 8.   | Nom Acc <sub>i</sub> Agr                             |                          | *                        | *                  |                   | *         |           | *                       | *                      |         |
| 9.   | ∅ <sub>i</sub> Nom Acc Agr                           |                          |                          | *                  |                   | *         |           | *                       |                        | *       |
| 10.  | Nom <sub>i</sub> Nom Agr                             |                          |                          | *                  | *                 |           |           |                         |                        |         |
| 11.  | Nom Nom <sub>i</sub> Agr                             |                          |                          | *                  | *                 |           |           | *                       | *                      |         |

In Nepali, subjects of perfective transitive clauses, and inanimate subjects even in intransitive clauses, are obligatorily ergative.<sup>7</sup> Animate subjects of imperfective transitives, and subjects of ergative intransitive perfectives, are optionally ergative, with a great deal of interspeaker variation (Li 2007, Verbeke 2013: 4.2, Lindemann 2024). ‘High-animacy’ objects are accusative.<sup>8</sup> Verbs agree with their subjects, irrespective of case-marking. 37,800 constraint rankings yield this output (modulo the above-mentioned idealizations concerning the case marking variation), one of which is (26):

<sup>7</sup>The undominated constraint that bars ergative case thus ends up applying only to animate subjects in Nepali.

<sup>8</sup>Proper names and pronouns obligatorily, nouns with specific reference optionally.

## (26) Nepali

|      |                                                     | A<br>*AGR <sub>Acc</sub> | B<br>MAX-ERG(Past) | C<br>MAX-ACC(DOM) | D<br>*ACC | E<br>*ERG | F<br>AGR <sub>Nom</sub> | G<br>AGR <sub>Hi</sub> | H<br>*∅ | I<br>*AGR <sub>Erg</sub> |
|------|-----------------------------------------------------|--------------------------|--------------------|-------------------|-----------|-----------|-------------------------|------------------------|---------|--------------------------|
|      | Erg <sub>d</sub> Acc <sub>d</sub> V <sub>perf</sub> |                          |                    |                   |           |           |                         |                        |         |                          |
| ⇒ 1. | Erg <sub>i</sub> Acc Agr                            |                          |                    |                   | *         | *         |                         |                        |         | *                        |
| 2.   | Erg Acc <sub>i</sub> Agr                            | *                        |                    |                   | *         | *         |                         | *                      |         |                          |
| 3.   | ∅ <sub>i</sub> Erg Acc Agr                          |                          |                    |                   | *         | *         |                         |                        | *       |                          |
| 4.   | Erg <sub>i</sub> Nom Agr                            |                          |                    | *                 |           | *         | *                       |                        |         | *                        |
| 5.   | Erg Nom <sub>i</sub> Agr                            |                          |                    | *                 |           | *         |                         | *                      |         |                          |
| 6.   | ∅ <sub>i</sub> Erg Nom Agr                          |                          |                    | *                 |           | *         |                         |                        | *       |                          |
| 7.   | Nom <sub>i</sub> Acc Agr                            |                          | *                  |                   | *         |           |                         |                        |         |                          |
| 8.   | Nom Acc <sub>i</sub> Agr                            | *                        | *                  |                   | *         |           | *                       | *                      |         |                          |
| 9.   | ∅ <sub>i</sub> Nom Acc Agr                          |                          | *                  |                   | *         |           | *                       |                        | *       |                          |
| 10.  | Nom <sub>i</sub> Nom Agr                            |                          | *                  | *                 |           |           |                         |                        |         |                          |
| 11.  | Nom Nom <sub>i</sub> Agr                            |                          | *                  | *                 |           |           | *                       | *                      |         |                          |

Recall that the subscript <sub>d</sub> marks an argument that is sufficiently high on the scale of Definiteness, ‘Animacy’, Topicality, etc. to trigger morphosyntactic accusative marking when it is on an Abstract Accusative argument, by constraint MAX-ACC(DOM).

## 4.4 The typology

The constraints generate altogether ten languages, described here with thumbnail sketches, again in order of ascending ranking volume.

- (27) The least probable grammar that is predicted to be possible, unattested
- Ergative, nominative, and accusative.
  - Every sentence has a nominative argument.
  - A finite verb agrees with the most prominent nominative argument.
  - Imperfective: nominative subject, accusative object.  
Perfective: ergative subject if object is nominative, else nominative subject.
  - Ranking Volume:  $2376/9! = 0.006548$
- (28) Middle Indic and Middle Iranian before the loss of accusative case
- Ergative, nominative and accusative.
  - Every sentence has a nominative argument.
  - A verb agrees with the most prominent nominative argument.
  - Perfective: in transitive clauses, ergative subject and nominative object, in intransitive clauses, nominative subject.  
Imperfective: nominative subject, accusative object.
  - Ranking Volume:  $4446/9! = 0.012252$ .
- (29) A low-frequency system, unattested but predicted to be possible
- Ergative, nominative, and accusative.
  - A finite verb agrees with the most prominent nominative argument.
  - If there is no nominative, a finite verb agrees with the (Ergative) subject.
  - Perfective: in transitive clauses, ergative subject, accusative and nominative object (DOM), in intransitive clauses, nominative subject.  
Imperfective: nominative subject, accusative object.
  - Ranking Volume:  $5076/9! = 0.013988$
- (30) Hindi/Urdu
- Ergative, nominative, and accusative.
  - A finite verb agrees with the most prominent nominative argument.

- c. If there is no nominative, the verb agrees with a (3Sg.Masc) expletive subject.
  - d. Perfective: ergative subject, accusative and nominative objects (DOM), in intransitive clauses, nominative subject.  
Imperfective: nominative subject, accusative object.
  - e. Ranking Volume:  $12951/9! = 0.035689$
- (31) Gujarati (after the rise of DOM)
- a. Ergative, nominative, and accusative.
  - b. A finite verb agrees with the most prominent nominative.
  - c. If there is no nominative, a finite verb agrees with the accusative object.
  - d. Perfective: ergative subject, accusative and nominative objects (DOM). Imperfective: nominative subject, accusative and nominative objects (DOM).
  - e. Ranking Volume:  $12951/9! = 0.035689$
- (32) Middle Indic and Middle Iranian after the loss of accusative case, Balochi
- a. Ergative and nominative.
  - b. Every sentence has a nominative argument.
  - c. A finite verb agrees with the most prominent nominative.
  - d. Perfective: ergative subject, nominative object.  
Imperfective: nominative subject, nominative object.
  - e. Ranking Volume:  $37800/9! = 0.104167$
- (33) Gandhari-type, but with restricted ergative marking and agreement, precursor of Nepali?
- a. Ergative and nominative.
  - b. Every sentence has a nominative argument.
  - c. A finite verb agrees with the most prominent argument.
  - d. Perfective: ergative subject, nominative object.  
Imperfective: nominative subject, nominative object.
  - e. Ranking Volume:  $37800/9! = 0.104167$
- (34) Nepali, Assamese, Shina
- a. Ergative, nominative, accusative.
  - b. A finite verb agrees with the most prominent argument.
  - c. Perfective verbs have ergative subjects, imperfective verbs have nominative subjects, though in Nepali ergative is optional in most imperfective contexts.
  - d. Objects are accusative and nominative (DOM).
  - e. Ranking Volume:  $37800/9! = 0.104167$
- (35) Bangla, Farsi
- a. Nominative, accusative.
  - b. A finite verb agrees with the subject (the highest argument = the highest nominative).
  - c. Perfective and imperfective: Nominative subject, accusative and nominative objects (DOM).
  - d. Ranking Volume:  $105840/9! = 0.291667$
- (36) Central Kurdish
- a. No case
  - b. A finite verb agrees with the subject (the highest argument).
  - c. Ranking Volume:  $105840/9! = 0.291667$

As noted at (2), the unattested systems have low *r*-volumes, and the projected historical progression shows a steady increase in *r*-volume. Interestingly, the Middle Indic loss of accusative case was a substantial simplification, increasing the *r*-volume from .012 to .104. This suggests that the dialectal differentiation of the Indic languages started *before* the loss of accusative case.

## 4.5 Generalizations

Certain systems cannot be derived by any ranking of these constraints. These are predicted gaps in the typology. The most important generalization is that there is no language in which subjects are nominative, but finite verb agreement targets objects (whether nominative, accusative, or some other case).

- (37) a. \*Nom Acc<sub>i</sub> Agr<sub>i</sub>  
 b. \*Nom Nom<sub>i</sub> Agr<sub>i</sub>

To my knowledge, no such languages have been found in the Indo-Iranian family, nor anywhere else for that matter. Kutchi Gujarati and Marwari are not exceptions, since their perfective verbs are periphrastic, consisting of a finite auxiliary and a participle. The auxiliary (ellipsed in the simple past) agrees in person with the nominative subject, and the participle that agrees with the object in gender and number is not a finite verb, but a nominal form.

Generalization (37a), that a verb never agrees with a non-nominative object when there is a nominative subject (though it can agree with a non-nominative subject when there is a nominative object) has been frequently formulated in various ways (Anderson 1976, 1977, 1984, Comrie 1978, Dixon 1979, 1994, Bobaljik 2008), but it has never been formally explained. Here it follows, in a generalized form that also covers (37b), as a consequence of the constraints AGR<sub>Nom</sub> and AGR<sub>Hi</sub>, which also play a crucial role in deriving the diachrony.

A diachronic corollary is that nominative subjects never spread first: Erg Nom<sub>i</sub> Agr<sub>i</sub>  $\not\rightarrow$  Nom Nom<sub>i</sub> Agr<sub>i</sub>. Our analysis predicts this, for the constraint system cannot derive agreement pattern (37b): it is *harmonically bounded*, as we have just seen.

The question raised by the historical trajectories is why the ergative/nominative case marking pattern of the perfective/past gives way to the nominative/accusative case marking pattern of the imperfective/present rather than the other way round. One possible answer is that ergative/nominative syntax is somehow unmarked in comparison to nominative/accusative syntax. This is dubious, because ca. 40% of languages that have case at all have an ergative. Another possible answer is that unmarked categories are the privileged basis for formal generalization (Kuryłowicz's 4th Law of Analogy), which in this case means that the imperfective case, which is unmarked, is transferred to the perfective. Our analysis offers a third answer: *nominative/accusative syntax is optimal in a language with verb agreement*. This is because *all* agreement constraints are satisfied by canonical transitive clauses in languages with nominative/accusative case systems, but at most one of them is satisfied by canonical transitive clauses in languages with ergative/nominative case systems. Other things being equal, a language with verb agreement therefore has a necessarily greater *r*-volume if it has a nominative/accusative case system than if it has an ergative/nominative case system, regardless of whether the ergative is split or across the board.

To summarize the theoretical points: change is an evolutionary process governed by the same principles as language itself. Acquisition and change are guided by learners' prior expectations ('biases'). Drift moves towards the grammars privileged by those expectations. Lexical/morphosyntactic change may trigger radical reanalysis that restores the original type. This results in long-term diachronic cycles, in which the stepwise nature of change forces mixed, suboptimal systems to appear at intermediate stages in at least one phase of a cycle.

If our view of change is on the right track, it removes a worrisome paradox. Unidirectional trajectories of change are well documented. Yet historical linguistics reveals no decrease in typological variation at least in the last five millennia or so. How can irreversible changes be reconciled with the overall stability of typological diversity? The problem goes away if apparently unidirectional changes are parts of larger cyclic trajectories. Then we can confidently assume that no structural feature of human language has been irrevocably lost by language change, and any feature that appears in the future is likely to have already existed in the past. Proto-languages were not qualitatively different from existing languages. This is good news for comparative historical grammar, for it means that we can safely continue to use typological generalizations as guidelines and guardrails in linguistic reconstruction.

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# A Scandinavian argument for restructuring in pseudopassives

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## 1 Introduction

The term pseudopassive or prepositional passive is often used of passives in which the subject corresponds to the complement of a preposition in the active. An example is (1).

- (1) John was **talked** about.

Both in traditional and modern grammar, the common opinion on the English pseudopassive is that the verb and the preposition have in some way formed a unit, and this unit takes an object that is passivized. This analysis is often called reanalysis; it will be called restructuring here. (In (1) and following examples, the restructured unit is marked with bold, and the preposition is underlined.)

The restructuring analysis of pseudopassives can be found in different versions (e.g. Jespersen 1969 [1937]: 138–139, Hornstein & Weinberg 1981, Bresnan 1982). It has been criticized (e.g. Postal 1986, Baltin & Postal 1996), and alternatives have been proposed (e.g. Law 2005, Tseng 2006, Truswell 2008, Alsina 2009, Abels 2012, Findlay 2014, 2016, Drummond & Kush 2015, Richards 2017). However, none of them are generally accepted.

The pseudopassive is a rare phenomenon in the world's languages. However, it can be found in the Mainland Scandinavian languages (see e.g. Lødrup 1991, 2023, Engdahl & Laanemets 2015). A Norwegian example is (2).

- (2) Forskning-en **sats-es** på.  
research-DEF focus-PRES.PASS on  
'The research is focused on.'

The restructuring analysis has also been assumed in traditional Scandinavian grammar (e.g. Western 1921: 155–156, 133–137; Körner 1949; Knudsen 1967: 83–85; Lie 1978). The situation is different in modern Scandinavian grammar, understood as grammar from the nineteen eighties. Restructuring is rejected in Lødrup (1985, 1991), Christensen (1986), Hestvik (1986), Åfarli 1989, and Åfarli (1992: 86–88). As in English, alternatives to restructuring have been proposed (Lødrup 1991, Klingvall 2012, Dyvik et al. 2019: 82–83), without being generally accepted. The central argument against restructuring was that Scandinavian, as opposed to English, does not require the verb and the preposition in a pseudopassive to be adjacent. The ungrammatical English (3) could be compared to the grammatical Norwegian (4)–(5), with the preposition preceded by a manner adverb and a subject, respectively.

- (3) \*Everything was **paid** twice **for**. (Bresnan 1982: 54)
- (4) Dette er noe som bør **tenk-es** grundig på nå.  
this be.PRES something that ought.to.PRES think-INF.PASS thoroughly on now  
'This is something that you ought to think of thoroughly now.'

- (5) Slik **snakk-es** han **om** av andre.  
 such talk-PRES.PASS he about by others  
 ‘Other people talk about him in this way.’

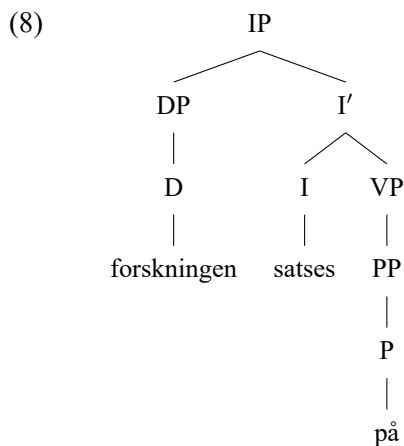
Lødrup (2023) seems to be the first modern work on Scandinavian that argues for restructuring, except for a short discussion in Holmberg & Platzack (1995: 221–222). The basic assumption in Lødrup (2023) is taken from the analysis of the English pseudopassive sketched in Richards (2017): The verb and the preposition constitute one complex predicate. This complex predicate is comparable to a complex predicate consisting of two verbs, as in the Norwegian (6).

- (6) Dette må **forsøk-es** **å** **gjør-es**.  
 this must.PRES try-INF.PASS to do-INF.PASS  
 ‘One must try to do this.’

Example (6) is a so-called long passive. The complex predicate *forsøke å gjøre* ‘try to do’ has been passivized with the internal argument of the second verb realized as subject (Lødrup 2014, 2022).

Sentences in which the verb and the preposition are not adjacent are not problematic in the Lexical Functional Grammar (LFG) analysis of Lødrup (2023). Restructuring does not affect the constituent structure directly. Example (2), repeated as (7), has the constituent structure (8) below. The complex predicate consisting of the verb and the preposition is represented at the level of functional structure, cf. the simplified structure in (9).

- (7) Forskning-en **sats-es** **på**.  
 research.DEF focus-PRES.PASS on  
 ‘The research is focused on.’



- (9)
- |         |                  |
|---------|------------------|
| PRED    | ‘SATSE-PÅ<SUBJ>’ |
| SUBJ    | ‘FORSKNING’      |
| PASSIVE | +                |

The complex predicate analysis of verb + preposition seems to contribute to a better understanding of the pseudopassive – it has found a ‘home’ as a part of the more general phenomenon of complex predicates.

A challenge for this approach, and for competing approaches to the pseudopassive, is the restrictions on possible pseudopassives. The prototypical pseudopassive has a verb that selects a PP. It is well known, however, that both English and Scandinavian to some extent allow other cases of pseudopassives: sentences with a verb that does not select a PP, such as (10), and sentences with a retained indefinite

object, such as (11). These types of pseudopassives were put aside in Lødrup (2023), and they will be put aside here.<sup>1</sup>

(10) This bed has been **slept in** by Napoleon.

(11) She has been **taken advantage of**.

Assuming that both English and Scandinavian have restructuring in pseudopassives, a remaining problem is the difference between them concerning the adjacency of the verb and the preposition. Lødrup (2023) sees this adjacency as a preference – a violable constraint in the sense of Optimality Theory – which can be overruled by higher ranked constraints in Scandinavian. Such higher ranked constraints account for examples (4)–(5) above: the verb second constraint, and the constraint saying that a manner adjunct precedes a selected oblique (Faarlund et al. 1997: 896, see also Teleman et al. 1999: 481, 489–490 on Swedish).

A more or less explicit assumption among followers of a restructuring approach is that there should be no special rule for the pseudopassive – at least in the prototypical cases (e.g. Western 1921: 155–156, 133–137, Jespersen 1969 [1937]: 138–139, Kiparsky 2013). The pseudopassive should be a regular passive of an active object-taking predicate. Ideally, there should be arguments for verb + preposition restructuring that are independent of the pseudopassive. Proposals exist, but they are not without their problems (see e.g. Baltin & Postal 1996 on English, Lie 1978 on Norwegian). One possible argument concerns sentences such as (12), which might be taken to represent raising of a subject to become the complement of a preposition.

(12) Vi se-r på ham spill-e.  
we look-PRES at him play-INF  
'We look at him play.'

It is not clear, however, that raising to prepositional complement is an option that should be allowed by grammatical theory (but see Joseph 1990). An alternative would be to assume that it is the restructured predicate *se på* 'look at' that takes subject-to-object raising. This would give an independent argument for verb + preposition restructuring. It is not a very strong argument, however, because this option only exists with a couple of verbs. The present article will not discuss existing arguments for verb + preposition restructuring. Instead, a new argument will be proposed. This argument is based upon a construction that exists in Mainland Scandinavian, but not in English.

## 2 The PasPrePas

Consider the Norwegian sentences (13)–(14).<sup>2</sup>

(13) Suksess-en sats-es på å gjenta-s.  
success-DEF focus-PRES.PASS on to repeat-INF.PASS  
'One focuses on repeating the success.'

(14) Ur-et=s pakning-er kan fortsett-es med å bruk-es i vann.  
watch-DEF=GEN packing-PL can.PRES continue-INF.PASS with to use-INF.PASS in water  
'One can continue using the watch's packings in water.'

The first verb of (13)–(14) is in the passive. This passive verb is followed by a preposition and an infinitive which is often passive (more in Section 3). The subject of the sentence usually realizes the

<sup>1</sup>I assume that the type (10) requires the verb's argument structure to be extended (see e.g. Alsina 2009: 55, Needham & Toivonen 2011), and that the type (11) requires its object to be 'abstractly' incorporated in the verb (Asudeh & Mikkelsen 2000, Mills 2008, Kiparsky 2013).

<sup>2</sup>Norwegian is here understood as south-eastern urban Norwegian and the Bokmål written standard. Most example sentences are from the Web, in some cases abbreviated.

internal argument of the infinitive (more in Section 3). Such sentences are not difficult to find on the Web. They were mentioned briefly in Lødrup (2014), and discussed in unpublished hand-outs preceding Lødrup (2022, 2023). There is also some relevant information in Havnelid (2015) and Aagaard (2016) (more in Section 3). Unsurprisingly, no term exists for this kind of sentences. For convenience, they will be referred to as PasPrePas here.

The PasPrePas is not a new phenomenon. Examples can be found in Norwegian newspapers from the 19th century, such as (15).<sup>3</sup>

- (15) Dog skal derfor ikke Plan-en **tenk-es** paa at **opgiv-es**...  
yet shall.PRES therefore not plan-DEF think-INF.PASS of to give.up-INF.PASS  
‘Anyway, one should not for this reason consider giving up the plan.’

The PasPrePas can also be found in Swedish and Danish, as in (16)–(17). These languages are not investigated further, however.

- (16) Detta måste **sats-a-s** på att **gör-a-s** rätt. (Swedish)  
this must.PRES focus-INF-PASS on to do-INF-PASS right  
‘One must focus upon doing this the right way.’  
(17) Crem-en kan **fortsætt-es** med at **brug-es**. (Danish)  
cream-DEF may.PRES continue-INF.PASS with to use-INF.PASS  
‘One may continue using the cream.’

The PasPrePas is similar to a regular long passive such as (6) above, repeated as (18), in which a complex predicate has been passivized with the internal argument of the second verb realized as subject.

- (18) Dette må **forsøk-es** å **gjør-es**.  
this must.PRES try-INF.PASS to do-INF.PASS  
‘One must try to do this.’

The difference between a regular long passive and the PasPrePas is that the latter has a preposition preceding the second verb. This preposition is selected by the verb. It must be considered more or less desemanticized. Some of the first verbs involved can alternatively take an infinitive without the preposition, while others cannot. Examples of verb + preposition pairs that can be found in the PasPrePas are the ones in (19), where parentheses around the preposition indicate that the verb can also take an infinitive without it.

- (19) *advare mot* ‘warn against’, *be om* ‘ask for’, *forsøke (på)* ‘attempt (at)’, *fortsette (med)* ‘continue (on)’, *håpe (på)* ‘hope (for)’, *regne med* ‘count on’, *satse på* ‘focus on’, *snakke om* ‘talk about’, *søke om* ‘apply for’, *sørge for* ‘see to’, *tenke (på)* ‘think (of)’, *true med* ‘threaten with’

The verb + preposition pairs in (19) also allow the pseudopassive. Relevant example sentences are (2), (4) and (5) above.

The prepositions in (19) are not verbal particles. Verbal particles can be distinguished from regular prepositions using different criteria (Lundquist 2014a,b, Engdahl & Laanemets 2015: 287–288). In eastern Norwegian, a verbal particle can trigger the so-called word tone 2 (or toneme 2) when cliticized, and it can follow the nominal phrase, cf. (20)–(21). Regular prepositions don’t have these options, cf. (22)–(23).

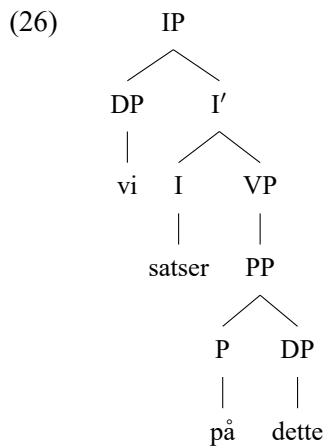
<sup>3</sup>Example (15) is from *Kristianssands Stiftsavis og Adresse-Contors Efterretninger*, May 26, 1858, page 2 (abbreviated). It should be mentioned that this example is not really Norwegian. There was no written Norwegian language at this time, and Norwegians wrote in Danish.

- (20) <sup>2</sup>Ta-på klær-ne!  
take.IMPER-on clothes-DEF  
'Put your clothes on!'
- (21) <sup>2</sup>Ta-dem-på!  
take.IMPER-them-on  
'Put them on!'
- (22) \*<sup>2</sup>Sats-på barn-a!  
focus.IMPER-on child-DEF.PL  
'Focus on the children!' [intended]
- (23) \*<sup>2</sup>Sats-dem-på!  
focus.IMPER-them-on  
'Focus on them!' [intended]

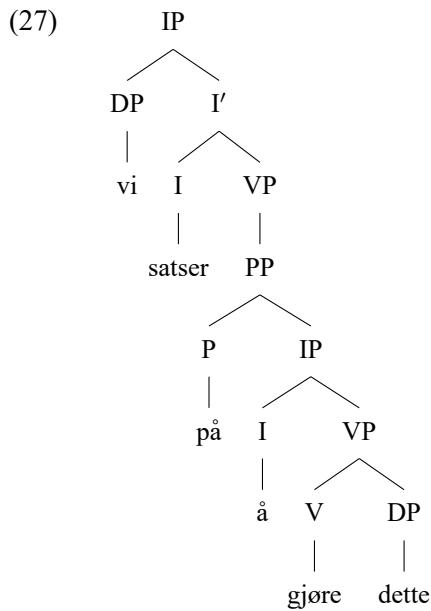
All the verb + preposition combinations in (19) above have prepositions that do not behave like particles.<sup>4</sup>

The preposition following the first verb in a PasPrePas is the head of a PP with the infinitival clause as the complement of the preposition. An infinitival clause with the infinitival marker can have the syntactic positions that a nominal phrase can have in Norwegian, including the complement position in a PP. The sentences (24) and (25) have the same constituent structure above the complement of the preposition, as shown in (26) and (27). (The Norwegian infinitival marker could be considered a C or an I. This choice plays no role here, but I has been assumed.)

- (24) Vi sats-er på dette.  
we focus-PRES on this  
'We focus on this.'
- (25) Vi sats-er på å gjør-e dette.  
we focus-PRES on to do-INF this  
'We focus on doing this.'

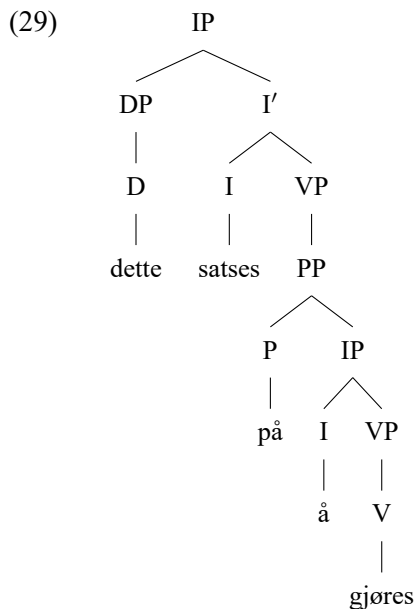


<sup>4</sup>Two deviant cases are *passe på* 'look after, make sure' and *huske på* 'remember', which behave like the ones in (19) in every respect except that the particle can trigger word tone 2.



The constituent structure of the passive (28) must then be as in (29).

- (28) Dette **sats-es**            **på å gjør-es**.  
 this    focus-PRES.PASS on to do-INF.PASS  
 ‘One focuses on doing this.’



### 3 The PasPrePas as a long passive

Lødrup (2014) mentioned the PasPrePas briefly, assuming without discussion that it is a long passive. This means that the first verb + the preposition + the infinitive together constitute a complex predicate. I am not aware of any discussion of this, except in unpublished hand-outs preceding Lødrup (2022, 2023).

An important reason for considering the PasPrePas a long passive is that it chooses its subject argument just like regular long passives: The typical choice for a regular long passive is the internal argument of the second verb, as in (6)/(18) above. However, impersonal sentences and pseudopassives are also possible, cf. (30)–(31).

- (30) Det skal **tillat-es** **å gjør-es** opptak av overlevende.  
EXPL shall.PRES allow-INF.PASS to do-INF.PASS recording.PL of survivor.PL  
'It will be allowed to produce recordings of survivors.'
- (31) Det som er viktig, **unnlatt-es** **å snakk-es** om.  
that which be.PRES important neglect-PRES.PASS to talk-INF.PASS about  
'One neglects talking about what is important.'

The PasPrePas chooses its subject argument in the same way. Most often, the internal argument of the second verb is chosen, as in all examples above. However, impersonal sentences and pseudopassives are again possible (even if the latter might sound somewhat less natural). Examples are (32)–(33).

- (32) Likevel **fortsett-es** det **med å utvikl-es** en rekke form-er.  
yet continue-PRES.PASS EXPL with to develop-INF.PASS a lot form-PL  
'Yet, one continues developing a lot of forms.'
- (33) Dette må **fortsett-es** **med å sats-es** **på**. (constructed)  
this must.PRES continue-INF.PASS with to focus-INF.PASS on  
'One must continue focusing on this.'

PasPrePas shows the same morphological patterns as other long passives. The first verb in a long passive always has passive marking. Norwegian differs from several other languages (e.g. German and Spanish) in that the second verb is usually also passive (Lødrup 2014, 2022, Wurmbrand & Shimamura 2017). The inflectional passive is often used with both verbs, as in (6)/(18) and (30)–(31) above, but some speakers also allow the phrastic passive, as in (34)–(35).

- (34) Sykkel-en skulle **forsøk-es** **å bli reparert**.  
bike-DEF shall.PAST try-INF.PASS to become repair-PTCP  
'One should try to repair the bike.'
- (35) bare de **bli-r** **husk-et** **å etterfyll-es**  
only they become-PRES remember-PTCP to refill-INF.PASS  
'if one only remembers to refill them'

The PasPrePas shows the same options, cf. (36)–(37).

- (36) Stilling-en **sats-es** **på å bli lys-t** ut.  
position-DEF focus-PRES.PASS on to become declare-PTCP out  
'They focus on announcing the position.'
- (37) Dette ble **bed-t** **om å gjør-es** omgående.  
this become.PAST ask-PTCP about to do-INF.PASS immediately  
'They asked them to do this immediately.'

Passive marking on the second verb can be seen as feature agreement with the first verb (Niño 1997, Sells 2004, Lødrup 2014). Some speakers also allow sentences without this agreement, as in (38) (Lødrup 2014, 2022). This is also possible with PasPrePas, cf. (39).

- (38) hva som må **husk-es** **å ta** med  
what that must.PRES remember-INF.PASS to take with  
'what one must remember to bring'
- (39) Det som også bør **tenk-es** **på å ta** med i samme sak er...  
that which also ought.to.PRES think-INF.PASS of to take with in same case be.PRES  
'What one should also think of including in the same case is...'

I am not aware of alternative analyses of the PasPrePas. The first verbs are not subject-to-subject raising verbs. If they were, this would yield problems of its own, because the PP would make the subject raising ‘too long’, compared to standard cases. Standard criteria for subject-to-subject raising involve expletive and idiom chunk subjects. Examples (40)–(41) show that they can be satisfied with a verb such as *antas* ‘assume-INF.PASS’, but not with a PasPrePas.

- (40) Det anta-s / \*snakk-es om / \*tenk-es på å snø på fjell-et.  
EXPL assume-PRES.PASS / talk-PRES.PASS about / think-PRES.PASS of to snow in mountain-DEF  
‘It is assumed / talked about / thought of to be snowing in the mountains.’ [intended]
- (41) Helvete-t antas / \*snakkes om / \*tenkes på å bryte løs.  
hell-DEF assume-PRES.PASS / talk-PRES.PASS about / think-PRES.PASS of to break loose  
‘Hell is assumed / talked about / thought of to break loose.’ [intended]

Another argument against a subject-to-subject raising analysis is given by sentences such as (39) above. The internal argument of the second verb is realized as the subject. They could not be cases of subject-to-subject raising, however. This would presuppose that their internal argument had been made the subject of the second verb ‘before’ undergoing subject-to-subject raising. However, this assumption has no support when the second verb lacks passive marking, as in (39).

An argument for a long passive analysis concerns pronominalization and topicalization. An infinitival verb phrase can usually pronominalize and topicalize, cf. (42)–(44).

- (42) Vi må unngå å gjør-e dette.  
we must.PRES avoid-INF to do-INF this  
‘We must avoid doing this.’
- (43) Vi må unngå det.  
we must.PRES avoid-INF that  
‘We must avoid that.’
- (44) Å gjør-e dette må vi unngå.  
to do-INF this must.PRES we avoid-INF  
‘We must avoid doing this.’

However, a complex predicate does not allow its second verb phrase to pronominalize or topicalize in Norwegian. Example (45) has no grammatical counterpart with pronominalization, cf. (46), or topicalization, cf. (47).

- (45) Dette må unngå-s å gjør-es.  
this must.PRES avoid-INF.PASS to do-INF.PASS  
‘One must avoid doing this.’
- (46) \*Dette må unngå-s det.  
this must.PRES avoid-INF.PASS that
- (47) \*Å gjør-es må dette unngå-s.  
to do-INF.PASS must.PRES this avoid-INF.PASS

The PasPrePas behaves the same way, cf. (48)–(50).

- (48) Dette må tenk-es på å gjør-es.  
this must.PRES think-INF.PASS on to do-INF.PASS  
‘One must think of doing this.’
- (49) \*Dette må tenk-es på det.  
this must.PRES think-INF.PASS of that

- (50) \*Å **gjør-es** må dette **tenk-es** på.  
to do-INF.PASS must.PRES this think-INF.PASS of

More evidence that the first verb + preposition + infinitive in a PasPrePas is a complex predicate can be found in Havnelid (2015) and Aagaard (2016). They discuss verbal feature agreement with imperatives and participles, showing that this is possible in active complex predicates consisting of two verbs, as in (51) with imperative agreement, and (52) with participle agreement.

- (51) **Prøv å tenk** før dere skrik-er!  
try.IMPER to think.IMPER before you scream-PRES  
'Try thinking before screaming!'
- (52) Jeg ha-dde ikke **tor-t** **å bruk-t** white spirit.  
I have-PAST not dare-PTCP to use-PTCP white spirit  
'I would not have dared to use white spirit.'

They also give examples from the NoWaC Web corpus (Guevara 2010) of imperative and participle agreement with active predicates that allow the PasPrePas, cf. (53)–(54).

- (53) **Sørg for å prioriter** de tidligere kommunistland-ene.  
see.IMP for to prioritize.IMP the former communist.country-DEF.PL  
'See to it that the former communist countries are prioritized.'
- (54) Først ville jeg **sørg-et for å luft-et** godt på romm-ene.  
first will.PAST I see-PTCP for to air-PTCP well in room-DEF.PL  
'I would have seen to it that the rooms were aired well.'

Verbal feature agreement is generally considered an important criterion for complex predicates (see e.g. Niño 1997, Sells 2004, Andrews 2023). It should be mentioned, however, that neither Havnelid (2015) nor Aagaard (2016) focus on sentences with a preposition preceding the second verb.

Section 3 has shown that there is evidence for a long passive analysis of the PasPrePas. Section 4 will discuss how it can be accounted for.

#### 4 How to account for the PasPrePas

Section 3 presented evidence that the PasPrePas is a complex predicate construction. Example (28), repeated as (55), has the monoclausal functional structure in (56) (simplified).<sup>5</sup>

- (55) Dette **sats-es** på **å gjør-es**.  
this focus-PRES.PASS on to do-INF.PASS  
'One focuses on doing this.'
- (56) 
$$\left[ \begin{array}{ll} \text{PRED} & \text{'SATSE-PÅ-GJØRE(SUBJ)} \\ \text{SUBJ} & \text{'DETTE'} \\ \text{PASSIVE} & + \end{array} \right]$$

Complex predicate formation is a strictly local process. There are different approaches to restructuring, but the first verb always restructures with the element that is immediately below it in the structure – and never with an element that is embedded further down. What is needed with the PasPrePas is two rounds

<sup>5</sup>A long passive with an active second verb, such as (38)–(39) above, gets the same treatment as a long passive with a passive second verb. When both verbs are passive, the [PASSIVE +] features unify. When the second verb is active, it is an infinitive. The active infinitive is traditionally seen as the unmarked form of the verb, and it can be assumed that it has no features (e.g. Sells 2004, Falk 2008). This means that there will be no feature clash in sentences such as (38)–(39) with a passive first verb and an active second verb. Their functional structures will be the same as they would be with two passive verbs.

of restructuring that give a ‘layered’ complex predicate. There is ‘first’ restructuring creating a smaller complex predicate consisting of verb plus preposition, and ‘then’ restructuring of this verb + preposition predicate with the second verb, creating a larger complex predicate.

Complex predicates with more than two elements seem to be generally possible. This option must be the result of two or more applications of restructuring. One example is complex predicates consisting of more than two verbs, as in (57) from Lødrup (2014: 380).

- (57) Det skjema-et må **forsøk-es** **å husk-es** **å bruk-es.** (constructed)  
 that form-DEF must.PRES try-INF.PASS to remember-INF.PASS to use-INF.PASS  
 ‘One must try to remember to use that form.’

Two applications of restructuring are also needed in sentences such as (31) and (33) above, repeated here as (58)–(59). In (58), a pseudopassive is the second part of a long passive. The second verb and the preposition must be restructured to a complex predicate ‘before’ this complex predicate is restructured with the first verb. In (59), there is a preposition following each passive verb. This requires two applications of verb + preposition restructuring, followed by restructuring of the two new predicates into one.

- (58) Det som er viktig, **unnlat-es** **å** **snakk-es** **om**.  
that which be.PRES important neglect-PRES.PASS to talk-INF.PASS about  
'One neglects talking about what is important.'
- (59) Dette må **fortsett-es** **med** **å** **sats-es** **på**. (constructed)  
this must.PRES continue-INF.PASS with to focus-INF.PASS on  
'One must continue focusing on this.'

Restructuring of a verb and a preposition to a complex predicate can be done in different ways in different frameworks. A traditional Lexical Functional Grammar (LFG) approach is here assumed, cf. Butt (1995), Alsina (1996, 1997), Niño (1997), Sells (2004), Lødrup (2014, 2022, 2023). In this approach, a complex predicate is not one lexical item, and it is not one item in constituent structure. In functional structure, however, a complex predicate is one PRED, as in (9) and (56) above. Restructuring is usually optional. It is often assumed that a verb that can be the first verb in a complex predicate has a special lexical entry for its use as a restructuring verb. It is then an incomplete verb with an argument structure in which the internal argument is not a thematic role, but an open position for the second element of the complex predicate (Alsina 1997: 235–237). When the functional structure is built, a process of predicate composition combines the restructuring verb and the verb below it, creating a complex predicate. The argument structure of the complex predicate is the result of combining the argument structures of the two verbs (Alsina 1997: 235–237). This can be done using the restriction operator (Butt et al. 2003).

The restructuring verb *unngå* ‘avoid’ has the argument structure in (60). There is an open position for the second verb with its argument structure. The complex predicate *unngå a gjøre* ‘avoid to do’ has the argument structure in (61). The external arguments of the verbs are identified, as indicated by the indices, and realized by one syntactic function. (The second line in (61) shows which syntactic functions realize which thematic roles.)

- (60) *unngå* 'avoid'⟨agent⟨P⟨...⟩⟩⟩
- (61) *unngå* 'avoid'⟨ agent<sub>i</sub> ⟨gjøre 'do'⟨agent<sub>i</sub> theme ⟩⟩⟩
- SUBJ OBJ

This kind of analysis could be transferred to the PasPrePas. This requires that the first verb and the preposition are ‘first’ restructured to a complex predicate, as in Lødrup (2023). I assume that verb + preposition form a complex predicate in the same way as verb + verb. When the verb *satse* ‘focus’ is a restructuring verb, it has the argument structure (62). The complex predicate *satse på* ‘focus on’ has the argument structure (63).

- (62) *satse* ‘focus’⟨agent⟨P{...}⟩⟩  
 (63) *satse* ‘focus’⟨ agent ⟨ *pā* ‘on’⟨ theme ⟩ ⟩,  
                 SUBJ                      OBJ

The complex predicate in (63) can be combined with a second verb to a larger complex predicate. The active *satse på å gjøre* ‘focus on to do’ in (64) has the argument structure (65). The external arguments of the verbs are identified, as indicated by the indices, and realized by one syntactic function.

- (64) Vi sats-er på å gjør-e dette.  
we focus-PRES on to do-INF this  
'We focus on doing this.'
- (65) satse 'focus' < agent<sub>i</sub> < på 'on' < gjøre 'do' < agent<sub>i</sub> theme >>>  
SUBJ OBJ

The corresponding passive is (66), with the argument structure (67).

- (67)     *satse* ‘focus’<sub>i</sub> < *på* ‘on’<sub>i</sub> < *gjøre* ‘do’<sub>i</sub> theme >>>  
                        Ø  
                                             SUBJ

We see, then, that the PasPrePas can easily be accounted for within a traditional LFG analysis of restructuring.

## 5 A possible problem with restructuring and complex passives

There is a different type of passive which might seem to give evidence against restructuring of verb + preposition. Norwegian and Danish have the so-called complex passive, as in (68), in which an inflectional passive or a passive participle is followed by a passive participle. This construction is usually seen as a case of subject-to-subject raising (see e.g. Christensen 1991, Ørsnes 2006).

- (68) Dette ble                forsøk-t        gjør-t.  
this    become.PAST attempt-PTCP do-PTCP  
'One tried to do this.'

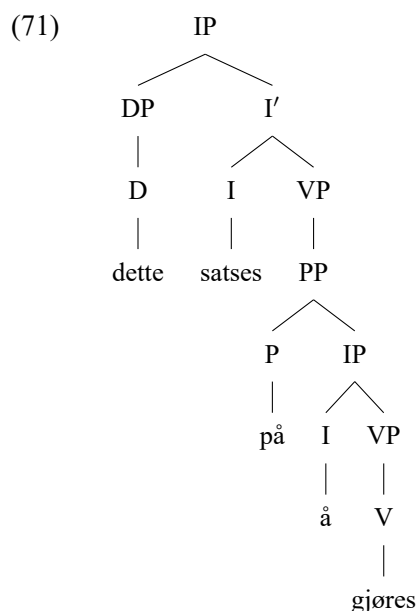
An interesting difference between the long passive and the complex passive concerns verbs that take a PP with a selected preposition, such as *satse på* ‘focus on’. When the preposition is obligatory, these verbs can never be the first verb of a complex passive – neither with nor without the preposition. This is shown in (69), based on an example in Ørnesnes (2006) from Danish, which has the same restriction.

- (69) \*Konkurrans-en bli-r sats-et (på) gjennomfør-t.  
 contest-DEF become-PRES focus-PTCP on complete-PTCP  
 'One focuses on completing the contest.' [intended]

This restriction has been discussed thoroughly in the literature (Christensen 1986, Engh 1994: 111–113, Hellan 2001, Ørsnes 2006). It could follow from a subject-to-subject raising analysis of the complex passive. Informally stated, the raising path would be too long because of the extra layer created by the PP (Ørsnes 2006). However, when we assume that verb + preposition can be restructured to a complex predicate, there seems to be nothing to prevent a prepositional complex passive.

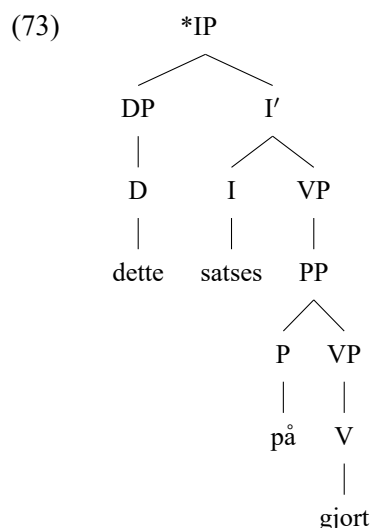
The solution to this problem seems to lie in the type of complement that the preposition takes in constituent structure (cf. Christensen 1986). Restructuring of verb + preposition to a complex predicate is represented in functional structure. In the constituent structure, the preposition is the head of a PP with the infinitival clause as a complement. It was mentioned in Section 2 that an infinitival clause with the infinitival marker is assumed to be an IP. This IP can have the syntactic positions that a nominal phrase can have in Norwegian, including the complement position in a PP. This means that a PasPrePas, such as (28) above, repeated as (70), has an unproblematic constituent structure, namely (29) above, repeated as (71).

- (70) Dette **sats-es**                      **på å gjør-es**.  
 this    focus-PRES.PASS on to do-INF.PASS  
 ‘One focuses on doing this.’



A complex passive with a preposition, on the other hand, has a perfect participle as its second verb. This verb has no functional head, and the category of its phrase must be VP. Example (72) then has the constituent structure (73). This structure is ungrammatical, because the preposition has a VP complement, a complement type that prepositions don't take (Christensen 1986).

- (72) \*Dette sats-es                      på gjør-t.  
 this    focus-PRES.PASS on do-PTCP



We see then that the absence of prepositions with the first verb in the complex passive has an explanation, so the complex passive does not create a real problem for restructuring of verb + preposition.

## 6 Conclusion

The pseudopassive represents a challenge for all grammatical frameworks. The traditional approach involves some version of restructuring: Verb + preposition is restructured into one predicate that takes an object, and this predicate is passivized in the same way as other predicates. This approach requires independent evidence for restructuring. The point of this article is to give a new piece of evidence, based upon the PasPrePas, which exists in Mainland Scandinavian, but not in English. This construction requires the same kind of verb + preposition restructuring as the pseudopassive, even if it does not involve preposition stranding. This gives independent motivation for a restructuring analysis of the pseudopassive. The discussion in this article has been couched in the framework of Lexical Functional Grammar. The conclusion would probably be valid for other frameworks as well, but this has not been investigated.

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# Double control in Sanskrit: An LFG analysis

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## 1 Introduction

Lowe et al. (2021) presented an LFG-based analysis of Sanskrit constructions involving the verb *śak* ‘can’ with a complement infinitival clause.<sup>1</sup> In this paper I offer an alternative perspective on two of the analytical assumptions made by Lowe et al. (2021), and I present a revised and expanded LFG analysis which accounts not only for *śak* but also for all other Sanskrit verbs which govern infinitival complements.

Among the many important contributions by our honorands to LFG and to linguistics more broadly, one of the earliest is their application of LFG to, and indeed their development of the theory of LFG with reference to, modern South Asian languages (e.g. Butt & King 1991, 1996, 1998). In their linguistic work on Hindi/Urdu and other South Asian languages, they follow in the footsteps of the ancient grammarian Pāṇini, whose 5th–3rd century BC grammar of Sanskrit the *Aṣṭādhyāyī* – the first generative grammar of any language (Chomsky 1965: v) – remained the most sophisticated grammar of any language until the twentieth century. In this paper I continue my own work of applying LFG to the study of Sanskrit, a task which cannot but be influenced both by Pāṇini (on the Sanskrit side) and Miriam and Tracy (on the LFG side).

Since at least as early as Pāṇini, infinitival complement constructions in Sanskrit involving verbs like *śak* ‘can’ and *iṣ* ‘want’, as in (1a), have been a source of interest for linguistic analysis.<sup>2</sup> How such complement constructions interact with ergativity and with passivization provides important evidence for their underlying syntax, as we will see; (1b)–(1c) illustrate possible finite passive constructions.<sup>3</sup>

- (1) a. *rāmo rāvaṇaṃ hantum śaknoti / icchati*  
R.NOM R.ACC slay.INF can.3SG / want.3SG  
‘Rāma can / wants to slay Rāvaṇa.’
- b. *rāmeṇa rāvaṇo hantum śakyate / iṣyate*  
R.INS R.NOM slay.INF can.PASS.3SG / want.PASS.3SG  
‘Rāvaṇa can be slain by Rāma.’ / (Lit.) ‘Rāvaṇa is wanted to be slain by Rāma.’

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<sup>1</sup> Abbreviations used in this paper that are not in the Leipzig Glossing Conventions: EMPH ‘emphatic particle’, GDV ‘gerundive’, HON ‘honorific’, OPT ‘optative’.

<sup>2</sup> The focus in this paper is on the Classical Sanskrit language (c. 200 BC on). The phenomena illustrated in (1) are first fully attested in the latter stages of the earlier Vedic Sanskrit period (c. 1000–400 BC), and become common in Classical and Epic Sanskrit. The early Vedic language lacks the passive constructions discussed in this paper, and I do not consider this stage of the language further here. For a periodization of Sanskrit and early Indo-Aryan more generally, see Kulikov (2017: 214–217).

<sup>3</sup> In this paper I use constructed examples to clearly illustrate the relevant patterns. Although in some sense a corpus language, it is possible to construct grammatical sentences in Sanskrit on the basis of Pāṇini’s grammar (and, correspondingly, to rule out at least some ungrammatical sentences). Moreover, the Sanskrit corpus is vast, such that the problems of negative evidence are somewhat attenuated. All constructed examples reflect patterns attested in corpus data (parallel corpus examples are given in Lowe et al. forthcoming[a]), and (unless otherwise indicated) illustrate constructions which the native grammatical tradition present as grammatical Sanskrit.

- c. rāmeṇa rāvaṇaṃ hantūṃ śakyate [not with *iṣ*]  
 R.INS R.ACC slay.INF can.PASS.3SG  
 ‘Rāvaṇa can be slain by Rāma.’

Ex. (1a) illustrates a simple complement structure, with a transitive infinitive and accusative object of that infinitive. In (1b), the logical object of the infinitive is realised in the passive as the nominative subject of the control verb. The verb agrees with the nominative argument, except in (1c), an alternative passive construction found with *śak* ‘can’ and some other verbs, but not with *iṣ*, where there is no nominative argument to agree with, leaving the verb to appear in a default 3sg. form.

The grammaticality claims made here, based on the corpus data presented in Lowe et al. (forthcoming[b]), differ from those claimed by Kiparsky (1982, 2009). According to Kiparsky, with *śak* only the type in (1b) is possible, and the type in (1c) ungrammatical, whereas with *iṣ*, the type in (1b) is ungrammatical, and only the equivalent of (1c), with object of the infinitive remaining in the accusative, is possible. In relation to *śak*, however, the corpus study shows that around 4% of instances show the pattern in (1c): not common, but not ungrammatical. In relation to *iṣ*, the corpus data shows the opposite of Kiparsky’s observations: only the type in (1b) is attested, while an equivalent to (1c) is unattested and, presumably, ungrammatical.

## 2 Control or raising?

In LFG, the traditional categories of ‘raising’ and ‘equi’/‘control’ are subsumed under the term ‘control’; see Lam (2023) for a recent in-depth treatment of control in LFG. There are, however, competing traditions: one approach formalizes both in terms of functional control (e.g. Bresnan 1982a, Asudeh 2005, Bresnan et al. 2016); the other formalizes raising in terms of functional control, but equi in terms of obligatory anaphoric control (e.g. Dalrymple 2001, Dalrymple et al. 2019). In this paper I follow the latter tradition. The main contrast between the two phenomena which both approaches agree on is that the subject of a raising predicate is non-thematic, whereas the subject of an equi predicate is thematic. Cross-theoretically this is the most widely agreed difference between raising and equi predicates (see e.g. the survey in Abeillé 2024: 489–497).

Lowe et al. (2021) provide an initial analysis of control constructions in Sanskrit, treating only the verb *śak* ‘can’, and assuming that *śak* is a raising verb. However, our ongoing work (Lowe et al. forthcoming[a]) led us to alter this assumption, and although clear syntactic evidence, such as use with expletive subjects, is absent, there is indirect evidence that *śak* is better treated as an equi predicate (and therefore here, following the assumptions stated in the previous paragraph, as an anaphoric control verb). In fact, this applies to all, or nearly all, verbs that control infinitival complements in Sanskrit.<sup>4</sup>

In contrast with *śak* ‘can’, the meaning of which is potentially ambiguous between raising and equi, the verb *iṣ* ‘want’ and synonyms (which show only subject control in Sanskrit) are unproblematic, since the meaning ‘want’ necessarily places selectional constraints on its highest argument (the ‘wanter’). The question is whether, or how, *śak* and *iṣ* differ as control verbs. Kiparsky (2009) and Lowe et al. (2021) assume significant syntactic differences in the complement constructions with the two verbs, based partly on the semantic facts (i.e. the potential compatibility of *śak* with raising), and partly on the authority of Pāṇini’s *Aṣṭādhyāyī*, which distinguishes verbs of wanting, like *iṣ*, from all other verbs which govern infinitival complements (including *śak* but also many other verbs), by placing certain additional constraints on verbs of wanting.

However, Pāṇini’s distinction of verbs of wanting from other control verbs cannot amount to a distinction between equi (for verbs of wanting) and raising (for other verbs), because while two of the most common verbs in the latter set, *śak* ‘can’ and *rabh* ‘begin’, have meanings which could be

<sup>4</sup>I will argue below that some Sanskrit constructions involve two control relations; the additional control relation is best treated as functional; assuming anaphoric control for the primary control relation has the added advantage, then, of making it easier to distinguish between them.

compatible with raising, many have meanings which clearly do involve selectional restrictions on their subject arguments, such as *jñā* ‘know’ and *dhr̥ṣ* ‘dare’, and so must be equi verbs.<sup>5</sup>

Moreover, even for *śak* there is no positive evidence for the non-thematic status of the subject. There are no unambiguously non-referential subjects, such as expletive or idiomatic subjects, in Sanskrit which could provide crucial evidence for the non-thematic status of the subject of *śak*. Nor are there, for example, ‘quirky case’ subjects, such as can be used in Icelandic to distinguish raising and equi (e.g. Zaenen et al. 1985, Andrews 1982, 1990). On the other hand, in the earlier stages of the language the meaning of *śak* is more clearly that of an equi verb, ‘have strength, be capable’, and while *śak* does appear to have undergone a degree of semantic bleaching through the history of the language, it need not necessarily be the case that that bleaching resulted in the loss of all selectional restrictions on the subject. The same point applies to perhaps the other best candidate for raising, *rabh* ‘begin’, which at an earlier period meant ‘seize, grasp’.

There are, as we will see, important syntactic differences between *śak* (and similar control verbs) and *iṣ* (and similar control verbs), but it cannot be maintained that the distinction Pāṇini draws between verbs of wanting and other control verbs reflects such differences. The distinction that Pāṇini draws is an additional restriction placed on verbs of wanting, that their highest argument, the *kartr̥*  $\approx$  ‘agent’ (really, the *arg*<sub>1</sub> in Kibortian argument structure terms, see Lowe 2025) must be the controller; that is, that they are subject control verbs. In practice, this applies not only to *iṣ*, but to almost all complement control verbs; indeed Kiparsky (1982: 16–22) claims that it applies to all control verbs in Sanskrit (but see Section 7.1 below for evidence of object control constructions in Sanskrit). The reason why Pāṇini stated such a requirement specifically for verbs of wanting may have to do with his understanding of the desiderative: by making this statement Pāṇini drew an equivalence between complement control constructions with verbs of wanting, like *iṣ*, and the morphological category of desideratives, such that, for example, *kartum icchati* ‘he wants to do’ is treated in the grammar as functionally identical to the synonymous morphological desiderative *cikīrṣati* ‘he wants to do’ (where *kartum* and *cikīrṣati* are both based on the verbal root *kr* ‘do’). This would not then imply any fundamental syntactic difference between verbs of wanting and other control verbs.

Partly driven by the raising analysis they assume, Lowe et al. (2021) also assumed that the voice of the Sanskrit infinitive in *-tum* is variable: active by default, but passive when enforced by certain syntactic conditions, including a morphologically passive governing verb. So, for the example of *śak* in (1b), Lowe et al.’s analysis would be:

$$(2) \quad \left[ \begin{array}{ll} \text{PRED} & \text{'CAN(XCOMP)SUBJ'} \\ \text{SUBJ} & \boxed{1} [\text{PRED 'RĀVAṆA'}] \\ & \left[ \begin{array}{ll} \text{PRED} & \text{'SLAY(SUBJ,OBL}_{\theta})' \\ \text{VOICE} & \text{PASS} \\ \text{SUBJ} & \boxed{1} \\ \text{OBL}_{\theta} & [\text{PRED 'RĀMA'}] \end{array} \right] \\ \text{XCOMP} & \end{array} \right]$$

The morphological passive voice of the control verb is treated as applying within the embedded complement, and not to the control verb itself, which is theoretically less than ideal. The analysis presented in this paper permits a more consistent treatment of the Sanskrit infinitive, as being exclusively active.

This is preferable since in almost all contexts the Sanskrit infinitive is unambiguous in having only an active voice interpretation.<sup>6</sup> That is, an infinitive like *hantum* can mean only ‘to slay’, not ‘to be slain’ (nor even middle ‘to slay oneself’), even if there is no object expressed, and even if a non-active reading

<sup>5</sup>Of the verb classes listed by Pāṇini, only verbs of ‘being’, e.g. *as* ‘be’, must be raising verbs. We have not come across corpus examples of such verbs with infinitival complements, however, so we exclude them from further consideration.

<sup>6</sup>I am considering only the Classical language, which has only the single infinitive, in *-tum*. In the earlier Vedic language, there are infinitives which can or must be interpreted passively, but these do not survive into the Classical language.

would be possible in the discourse context.<sup>7</sup> It is only when the infinitival clause is an argument of a morphologically passive verb, as in (1b)–(1c), that the voice interpretation of the infinitive is superficially less clear. In English translation, as illustrated in (1b)–(1c), a passive infinitive must be used, and indeed the infinitive in such contexts is labeled ‘passive’ in standard grammars such as those of Speijer (1886: 303) and Whitney (1896: 355). But this is a fact about English, not Sanskrit. A passive infinitive must be used in the English translations of (1b)–(1c) because oblique arguments cannot be controllers in English, so the grammatical subject of the verb must be the controller. But as with most other syntactic phenomena in Sanskrit, control targets not the grammatical subject but the thematically highest argument; as I will show below, control is therefore best analysed in Sanskrit with respect to argument structure roles such as  $\text{arg}_1$ , rather than grammatical functions.<sup>8</sup>

### 3 Double control

The formal analysis proposed in this paper builds on the unformalized analysis developed in Lowe et al. (forthcoming[a]). Using the more restrictive sense of the term ‘control’ as used in generative literature, Lowe et al. (forthcoming[a]) propose the term ‘control+raising’ for the constructions discussed here. In LFG terms, ‘control+raising’ means a construction involving two control relations; I maintain the distinction between the two by recourse to the distinction between anaphoric and functional control, as discussed in the previous section.

#### 3.1 Double control in the ergative

I have argued that there is no syntactic difference between the verbs *śak* ‘can’ and *iṣ* ‘want’ in control terms: both are equi verbs, and thus can be analysed in LFG in terms of obligatory anaphoric control. However, there is one significant syntactic difference between these verbs: in the active *śak* is intransitive, while *iṣ* is transitive, as evidenced by agreement patterns in the ergative past participle forms of the verbs.<sup>9</sup> They also differ, as we have seen, in terms of the passives they license (1). The analysis proposed here seeks to derive the differences in control in the passive from the difference in transitivity between the verbs.

For example, in the finite active there is no superficially obvious syntactic difference between *śak* ‘can’ and *iṣ* ‘want’:

- (3)     *rāmo     rāvaṇaṃ hantūṃ śaknoti / icchati*  
         R.NOM.SG R.ACC.SG slay.INF can.3SG / want.3SG  
         ‘Rāma can/wants to slay Rāvaṇa.’

But if the matrix predicate is a past participle, a formation which shows ergative-absolutive alignment, the agreement patterns are crucially different:

- (4)     a.     *rāmo     rāvaṇaṃ hantūṃ śaktaḥ*  
               R.NOM.SG R.ACC.SG slay.INF can.PST.PTCP.NOM.SG  
               ‘Rāma could slay Rāvaṇa.’

<sup>7</sup>One or two counterexamples are attested where a non-active reading cannot be avoided, in texts of less standardized register; cf. Oberlies (2003: 276–278) for Epic Sanskrit.

<sup>8</sup>See Hock (1982, 1986, 1987, 1990, 1991a,b) for arguments that the major subjecthood tests in Sanskrit target the thematically highest argument rather than the grammatical subject. Control by the agent or highest argument corresponds to the understanding of the relation in the Indian grammatical tradition, discussed in detail by Deshpande (1980).

<sup>9</sup>Necessarily all subject control verbs must be at least bivalent, of course, since they select both a subject and an infinitival complement, but this does not mean that all subject control verbs in Sanskrit are transitive. I understand transitivity as involving selection for an object (OBJ) complement specifically; infinitival complements may or may not be object complements. On variation in types of complement clauses, see Dalrymple & Lødrup (2000) and Alsina et al. (2005).

- b. *rāmeṇa rāvaṇo hantum iṣṭaḥ*  
 R.INS.SG R.NOM.SG slay.INF want.PST.PTCP.NOM.SG  
 ‘Rāma wanted to slay Rāvaṇa.’

In (4a), the agreement shows that *śak* is an intransitive verb: the past participle agrees with the subject-like argument, *rāma*, which must here be understood as the S of an intransitive verb. The infinitival clause in (4a) must therefore be a non-object complement.<sup>10</sup> There is, as we would expect, no direct relation between the object of the infinitive, *rāvaṇa*, and the matrix verb. Therefore, although *śak* is bivalent, it must be intransitive in the sense that it does not take an object complement.<sup>11</sup>

The agreement pattern shown by the past participle of *iṣ* (4b) is different: *rāma* is marked with the instrumental case, that is, as the A argument of a transitive verb, and *rāvaṇa* appears in the nominative case, that is marked as the O argument. Thus *iṣ* must be transitive; and not only that, but its object argument is not the infinitival complement (which must be a second, non-object complement), but the object of the infinitival complement.

If *rāvaṇa* is an argument of the matrix predicate in (4b), we must be dealing with a second shared argument between matrix and predicate, since *rāvaṇa* remains the logical object of the infinitive. That is, (4b) shows that alongside the control relation between the subject positions of the matrix verb and the infinitive, we must also recognize a relation between the object of the matrix verb and the object position of the infinitive. Thus, there is a significant difference between the two superficially similar sentences in (3): with *śak*, the word *rāvaṇam* is only the object of the infinitive, and the control verb itself has no object; with *iṣ*, the same word is both the object of the infinitive and the object of the matrix verb.<sup>12</sup>

As the object of the matrix verb in (4b), *rāvaṇa* appears to be a non-thematic argument: Rāvaṇa himself is not something Rāma wanted. This suggests that the relation between the object position of *iṣ* and the object position in the infinitival complement is a raising relation, and consequently must involve functional control.<sup>13</sup>

Naturally, the agreement pattern seen in (4b), and the assumption of functional control of the embedded object, depends upon the infinitival complement having an object. When the infinitive is intransitive, the construction must be different; but the agreement in the past participle remains consistent with *iṣ* being transitive:

- (5) *rāmeṇa svapitum iṣṭam*  
 R.INS.SG sleep.INF want.PST.PTCP.N.SG  
 ‘Rāma wanted to sleep.’

As in (4b), here *rāma* appears in the instrumental, that is marked as the A argument, indicating a transitive phrase. The verb appears in the neuter singular, that is showing default/null agreement. Since the construction is transitive, there must be an object, and the only possible object is the infinitive which, being a clause, lacks agreement features. The past participle in (5) is therefore showing default agreement with its O argument, the infinitival clause.

<sup>10</sup>If the infinitival clause were an object, we would expect the past participle form of the matrix verb to appear in a default nt.sg. form, since infinitives lack agreement features. This is seen below with example (5).

<sup>11</sup>There is a rare alternative past participle form *śakita*, which shows agreement consistent with a transitive verb, i.e. parallel to that seen in (4b). This (the form itself, and its argument alignment) appears to be a secondary creation based on the analogy of the finite passive (discussed below) and morphologically influenced by the causative paradigm; it is the only exception to the otherwise robust generalization that *śak* is fundamentally intransitive. The analysis of *śakita* will parallel that of *iṣṭa*.

<sup>12</sup>The claim that the same argument can serve as both the object of the matrix verb and the object of the complement infinitive can already be found in the indigenous grammatical tradition, at least with regard to verbs of wanting like *iṣ* (Deshpande 1980: 81–92).

<sup>13</sup>The only complication with the assumption of functional control is the mismatch in case assignment: in (4b) *rāvaṇa* shows nominative case, as assigned by the ergative matrix verb, whereas the infinitive would ordinarily assign accusative case to its object. Such a mismatch is used by Dalrymple & King (2000) to argue for anaphoric control in the case of English *tough* constructions. However, a hierarchical model of case in Sanskrit (where, for example, the ergative assigns CASE NOM +, the infinitive CASE ACC +, and only the nominative is compatible with the former) can easily account for such mismatches.

I assume, then, that *iṣ* is fundamentally transitive, that is, it obligatorily selects for a subject and object argument. This is true not only of constructions involving an infinitival complement, but also simple transitive uses of *iṣ*, e.g. *tad icchāmi* ‘I want that’. But *iṣ* also has an alternative trivalent argument structure, selecting for a subject, object and infinitival complement.

### 3.2 Double control in the passive

Double control is also found in passive constructions; here, it is found with both transitive verbs like *iṣ* and intransitive verbs like *śak*. As we saw in (1b)–(1c), *śak* and *iṣ* differ in the passives they license:

- (6) a. *rājabhī rāmo hantum iṣyate*  
king.INS.PL R.NOM.SG slay.INF want.PASS.3SG  
‘The kings want to slay Rāma.’ (Lit. ‘Rāma is wanted to be slain by the kings.’)  
b. *rājabhī rāmo hantum na śakyate*  
king.INS.PL R.NOM.SG slay.INF NEG can.PASS.3SG  
‘Rāma cannot be slain by the kings.’  
c. *rājabhī rāmaṃ hantum na śakyate*  
king.INS.PL R.ACC.SG slay.INF NEG can.PASS.3SG  
‘Rāma cannot be slain by the kings.’

The logical subject (i.e. the subject in the active) of the passive matrix verb in each example appears in the instrumental, the standard case for the passive agent in Sanskrit. In (6a) and (6b), the logical object of the infinitive appears in the nominative case and must therefore be the grammatical subject of the matrix verb. For (6a), this corresponds directly with what we saw in (1b): in the active there is raising of the object of the complement clause to the object position of the matrix, as attested by the agreement in the past participle, and correspondingly when the matrix verb is passive, the argument in question raises to the matrix subject position.

Of the two passive constructions with *śak*, it is (6c) that we would predict, given that *śak* is, as discussed above, an intransitive verb. Subjectless, or ‘impersonal’, passives formed to intransitive verbs are productive in Sanskrit; in such a passive, the verb appears with default/null 3sg. agreement, and the logical subject of the verb appears in the instrumental.<sup>14</sup> This is likely what we see in (6c); the non-object complement clause remains as a non-object complement clause, unaffected by the passive alternation. Alternatively, it would be possible to assume (as does Deshpande 1980) that the infinitival clause itself is the subject in (6c); however, I see no positive evidence for this.

However we treat (6c), it is important to note that it is significantly less common than the passive in (6b), where the logical object of the infinitive appears in nominative case agreeing with the matrix verb as its subject.<sup>15</sup> (6b) appears parallel, on the surface, to the passive of *iṣ* in (6a), but the underlying syntax must be different: we have seen that *śak* is intransitive in the active, and so has no object, and no object-to-object raising need or can be assumed. It appears rather problematic, then, that the logical object of the infinitive appears as the subject of the passive matrix verb in (6b). That is, the passive in (6a) falls out directly from the assumptions already made about the active, whereas the passive in (6b) cannot.

Lowe et al. (forthcoming[a]) propose a solution based on the evident preference for clauses to have subjects. Although, as discussed above, impersonal passives are productive in Sanskrit and therefore there is no ‘Subject Condition’ constraint ruling out subjectless clauses (or, dummy subjects are easily licensed), most Sanskrit clauses do still have subjects, and this tendency could be understood as a preference. In the case of an impersonal passive, there is simply no argument available to supply a SUBJ. But where the passive of an intransitive governs an infinitival complement with an object, there is such an argument. So,

<sup>14</sup>See Berman (1999) and Kibort (2006) for analyses of impersonal passives in LFG, and more widely Kiparsky (2013).

<sup>15</sup>In the corpus search reported in Lowe et al. (forthcoming[b]), 451 tokens of the type in (6b) were identified, compared with only 20 tokens of the type in (6c).

in sentences like (6b), Lowe et al. (forthcoming[a]) argue that the object of the infinitival complement is pressed into service as the matrix subject.

To account for this formally, here I assume that in the passive, and only in the passive, there is an alternative argument structure available to *śak* which parallels the passive of *iṣ* in licensing a non-thematic SUBJ argument identified with the embedded object.

#### 4 Not complex predication

One obvious alternative to ‘double control’ would be that we are dealing rather with complex predication: a monoclausal structure, where the apparent sharing of arguments between main and embedded predicate would be unproblematic, since there would be no embedding. This is, in fact, the analysis put forward by Deshpande (1980) and Kiparsky (2009) for *śak* ‘can’. Kiparsky bases his analysis on *Aṣṭādhyāyī* 3.4.1, which specifies a relation of *dhātusambandha* ‘connection with (another) verbal root’ for infinitives used with predicates like *śak*; Kiparsky (2009: 60) interprets Pāṇini here as specifying a “verb union process” whereby combinations of *śak* and dependent infinitive “are treated exactly like a single predicate for purposes of the grammar’s licensing constraints”. Similarly, Deshpande (1980: 102) claims that *śak* and its dependent infinitive are “increasingly bracketed” together, “creating a sort of “compound verb” like *kar saknā* [‘able to do’] in Hindi”.

*Aṣṭādhyāyī* 3.4.1 in fact governs a wide range of relations between predicates, the vast majority of which cannot possibly involve any notion of ‘compounding’ or ‘verb union’. Nevertheless, the question is whether we should treat *śak*, and perhaps *iṣ* and other similar verbs, not as control verbs but as light verbs. The sharing of arguments between matrix and embedded clause does demonstrate a close syntactic relation between verbs like *śak* and *iṣ* and their infinitival complements. But there is crucial evidence for the syntactic independence of matrix and embedded verbs. As discussed by Butt (2010: 57–59; 2014: 171), tests for complex predicate-hood are crucially language-specific. So, while clitic climbing is a crucial test for complex predicates in Romance (Aissen & Perlmutter 1976), in Korean this test does not apply, but e.g. the use of NPIs can distinguish between monoclausal and biclausal structures (Choi 2005). For Sanskrit control structures, the best evidence against a complex predicate analysis comes from negation.

In the constructions under discussion, it is possible to negate both/either matrix verb and/or infinitive. Crucially, negation of the matrix verb alone is semantically distinct from negation of the infinitive alone; moreover, negation of both elements does not correspond with the restrictions on double negation in single clauses. The following examples, both from the clear Classical prose of Patañjali’s *Mahābhāṣya*, illustrate the semantic distinction between negation of main and embedded clause:<sup>16</sup>

- (7)    *tasmān na evaṃ śakyam kartum*  
          therefore NEG thus can.GDV.N.SG do.INF  
          ‘Therefore it cannot be done thus.’
- (8)    *adhātur iti śakyam a-kartum*  
          ‘adhātuḥ’ QUOT can.GDV.N.SG NEG-do.INF  
          ‘(The specification) *adhātuḥ* (‘not a verbal root’) does not need to be made.’

When non-finite verbs, including infinitives, are negated in Sanskrit, it is standard for the negative marker to appear compounded with the verb in the form *a(n)-*, rather than appearing as a separate word.

<sup>16</sup> As seen in (7) and (8), evidence for passive control constructions comes not only from the morphological (finite, tense-stem) passive, but also from gerundives. Gerundives are morphologically adjectival verb forms; they are most common as main clause predicates, and in this use show the same ‘passive’ argument alignment as finite passive verbs. That is, gerundives agree with the patient/object-like argument (O) if formed to a transitive verb, while the agent/subject-like argument (A), if explicit, appears in the instrumental; if formed to an intransitive verb, a gerundive appears in the default impersonal form (nt.sg., equivalent to the 3sg. finite impersonal passive), and the single subject-like argument (S), if explicit, appears in the instrumental (genitive marking of the agent is also possible when the gerundive is used adjectivally or as a substantive; Speijer 1886: 50). Jamison (1984) argues that the gerundive is a paradigmatic passive, specifically a suppletive passive optative, in Vedic Sanskrit.

Semantically such a sequence is transparent, identical to the possible, but rare, sequence of independent negative with non-finite verb. Following the syntactic approach to Sanskrit compounding advanced by Lowe (2015), it is best to understand the compound negation marker here as a non-projecting adverb adjoined to V.

Granted, then, that the *a-* in *a-kartum* in (8) is a syntactically independent negative like the *na* in (7), we see a clear difference in scope. In (7), the negative marker scopes over the matrix clause: the sense is that the action of the infinitival clause is not possible. In (8), on the other hand, the negative marker scopes only over the infinitival clause, the sense being that the action of the infinitival clause (here, making a particular specification or emendation) is not necessary (rather than not possible): that is, it is possible not to do the action expressed by the infinitival clause. We can represent the difference formally:  $\neg\Diamond x$  (for (7)) vs.  $\Diamond\neg x$  (for (8)). In LFG terms, two separate f-structures are required to distinguish the contributions of the two negatives, necessitating a biclausal structure.

In addition, in Sanskrit double negation within a single clause is subject to a restriction: it is only possible to have two negatives in the same clause if one of them appears in an emphatic position at the left-edge of the clause scoping over the whole clause, the resulting interpretation being a strong affirmation.<sup>17</sup> For example:

- (9) na hi tvām na utsahe hantum  
NEG EMPH you.ACC NEG can.1SG kill.INF  
'I most certainly can kill you.'  
(*Mahābhārata* 12.220.79)

We might translate this example more literally as ‘(it is) certainly not (the case that) I cannot kill you’. The initial negative functions almost as an extraclausal negation, expressing denial of the whole meaning of the (negative) main clause. Crucially, it is not possible to have two ordinary negations in a single clause in Sanskrit; if there are two, one must be clause-initial. Yet we find control constructions with both main verb and infinitive negated, where neither negative is clause-initial. For example:

- (10) balābalaṃ                      a-vijñātuṃ                      anenātra                      na śakyate  
strength.and.weakness.ACC NEG-distinguish.INF him.INS=here NEG can.PASS.3SG  
'On this point it is not possible for him to fail to distinguish strength and weakness.'  
*(Viṣṇupurāṇa 5,20.47\*33:2)*

Here there is both an independent negative *na* preceding the matrix verb, and also a negation adjoined to the infinitive; neither negation is clause initial or emphatic, and there is no strong affirmative sense. Once again, then, this provides evidence for a biclausal structure.<sup>18</sup>

Furthermore, Deshpande's (1980) reference to Hindi-Urdu *kar saknā* 'be able to do' as "a sort of compound verb", which if correct could offer some diachronic support to a complex predicate analysis of Sanskrit *śak*, cannot be accepted. While complex predicates are widespread and productive in Hindi-Urdu, according to Bhatt et al. (2011) and Butt (2014) the verb *saknā* 'can' is a standard raising verb. There is no light verb version of *saknā* in Hindi-Urdu, and there is no standard grammaticalization path whereby a light verb would be expected to develop into a raising verb; as Butt & Lahiri (2013) show, light verbs are diachronically remarkably stable and tend not to undergo further diachronic development. As the direct descendant of old Indo-Aryan *śak*, the fact that Hindi-Urdu *saknā* is a raising verb either argues against, or at the least provides no support for, a complex predicate analysis of *śak* in Sanskrit. None of the other Sanskrit verbs discussed in this paper have descendants which can function as light verbs in modern Indo-Aryan, and since it is *śak* which is the semantically most bleached of these verbs, and the one which is most frequent in the relevant constructions, if even *śak* cannot be taken as a light verb then it seems even less likely that any of the other verbs involved could be.

<sup>17</sup>Double negation in Sanskrit is discussed by Verpoorten (1997), and noted by Speijer (1886: 319) and Oberlies (2003: 189).

<sup>18</sup>Cf. Wurmbrand (2001: 115–118), who shows that “reduced non-restructuring clauses” (TP complements) allow embedded

## 5 Parallels

Perhaps the closest parallel in the existing literature to the double control proposed here is the analysis proposed by Arka (2014) for so-called ‘crossed control’ in Indonesian. The following Indonesian sentence (originally from Polinsky & Potsdam 2008: 1618) has two readings:

- (11) Anak itu mau/ingin [ – di-cium oleh ibu]  
 child that want PASS-kiss by mother  
 EITHER ‘The child wanted to be kissed by mother.’  
 OR ‘Mother wanted to kiss the child.’

The second reading is called the ‘crossed control’ reading, and shows a kind of backward control: ‘mother’ has a role in the main clause, equivalent to subject, but appears in the embedded clause, while ‘child’ is evidently also an argument of both predicates. A similar pattern is seen with other verbs (Arka 2014: 31):

- (12) Mobil mana yang di-coba di-curi (oleh) orang?  
 car which REL PASS-try PASS-steal by person  
 ‘Which car<sub>i</sub> was tried (by e<sub>j</sub>) e<sub>i</sub> to be stolen by somebody<sub>j</sub>?’

Polinsky & Potsdam (2008) discuss the ‘crossed control’ construction with verbs meaning ‘want’, offering an analysis which involves only a single raising relation (with the double sharing of arguments between main and embedded predicate effected only at the semantic level). A rather different analysis is proposed by Kroeger & Frazier (2019), who dispute some of the grammaticality judgments relied on by Polinsky & Potsdam (2008), and also disagree with their rejection of a complex predicate analysis.

The analysis of Arka (2014) differs from that of both Polinsky & Potsdam (2008) and Kroeger & Frazier (2019), involving the same kind of double control construction proposed here for Sanskrit. Arka rejects the complex predicate analysis, and proposes that we are dealing with simple control verbs which with certain types of embedded predicate, including passives, derive an alternative ‘pragmatically-induced’ argument structure which involves simultaneous control and raising. This results in a (backward) control relation between the agent of the matrix verb and the agent of the embedded passive predicate (‘mother’ in (11), and ‘person’ in (12)); at the same time, the subject / logical object of the embedded passive predicate raises to matrix subject position.

Beyond LFG literature, Ndayiragije (2012) presents a rather similar analysis of simultaneous control and raising in the Bantu language Kirundi. Both the Indonesian (under Arka’s analysis) and the Kirundi data involve one thematic, and one non-thematic, argument of the matrix predicate, both controlling argument positions in the embedded clause. This is precisely parallel to the analysis of the Sanskrit data advanced here.

A less precise parallel is offered by English *tough* constructions. Dalrymple & King (2000) distinguish *tough* constructions from *need x-ing* constructions in English. The latter they analyse as complex predicates, but the former as involving an anaphoric long-distance dependency, mediated by an embedded topic position. For example (Dalrymple & King 2000: 11–12):

- (13) Moths are tough to kill.
- $$\left[ \begin{array}{l} \text{PRED} \text{ ‘TOUGH’} \langle \text{SUBJ, COMP} \rangle \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘MOTH’}_I \right] \\ \text{COMP} \left[ \begin{array}{l} \text{TOPIC } \boxed{1} \left[ \text{PRED} \text{ ‘PRO’}_I \right] \\ \text{PRED} \text{ ‘KILL’} \langle \text{SUBJ, OBJ} \rangle \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘PRO’}_{\text{ARB}} \right] \\ \text{OBJ} \boxed{1} \end{array} \right] \end{array} \right]$$

English *tough* constructions can also involve a *for*-phrase as the ‘overt controller’ of the complement subject. Although Dalrymple & King do not provide an explicit analysis, they presumably envisage a double anaphoric dependency such as:

- (14) This race is tough for me to finish.
- $$\left[ \begin{array}{l} \text{PRED} \quad \text{'TOUGH'} \langle \text{SUBJ}, \text{OBL}_{\theta}, \text{COMP} \rangle' \\ \text{SUBJ} \quad \left[ \begin{array}{l} \text{PRED} \quad \text{'RACE'}_1 \\ \text{DEIXIS} \quad + \end{array} \right] \\ \text{OBL}_{\text{for}} \quad \left[ \begin{array}{l} \text{PRED} \quad \text{'ME'}_j \end{array} \right] \\ \text{COMP} \quad \left[ \begin{array}{l} \text{TOPIC} \quad \boxed{1} \quad \left[ \text{PRED} \quad \text{'PRO'}_i \right] \\ \text{PRED} \quad \text{'FINISH'} \langle \text{SUBJ}, \text{OBJ} \rangle' \\ \text{SUBJ} \quad \left[ \text{PRED} \quad \text{'PRO'}_j \right] \\ \text{OBJ} \quad \boxed{1} \end{array} \right] \end{array} \right]$$

The major difference from the analysis advanced in this paper is that both control relations in (14) are anaphoric, and (correspondingly) that both controlling arguments are thematic arguments of the matrix predicate. However, the proposal that the control relation between the subject and embedded object is mediated by a TOPIC position is an attractive one, since it brings the analysis in line with the “fundamental distributional property of control” (Landau 2015: 27), that the controlled *pro* must be either a subject or a topic.<sup>19</sup> I therefore adopt this aspect of Dalrymple & King’s proposal into my analysis of the Sanskrit data (using DIS in place of TOPIC, following Dalrymple et al. 2019: 680–683).

## 6 Formal analysis

In this section I detail the formal analysis of the Sanskrit constructions introduced above.

### 6.1 Active

The active constructions are relatively unproblematic. In the case of *śak*, we are dealing with an intransitive verb, that is a verb that does not select for an object argument. The infinitive can therefore be assumed to head a COMP, with obligatory anaphoric control of the embedded subject:

- (15) rājāno            rāmaṃ hantum na śaknuvanti  
king.NOM.PL R.ACC slay.INF NEG can.3PL  
‘The kings cannot slay Rāma.’

- (16) 
$$\left[ \begin{array}{l} \text{PRED} \quad \text{'CAN'} \langle \text{SUBJ}, \text{COMP} \rangle' \\ \text{NEG} \quad + \\ \text{SUBJ} \quad \left[ \begin{array}{l} \text{PRED} \quad \text{'KINGS'}_1 \end{array} \right] \\ \text{COMP} \quad \left[ \begin{array}{l} \text{PRED} \quad \text{'SLAY'} \langle \text{SUBJ}, \text{OBJ} \rangle' \\ \text{SUBJ} \quad \left[ \text{PRED} \quad \text{'PRO'}_i \right] \\ \text{OBJ} \quad \left[ \text{PRED} \quad \text{'RĀMA'} \right] \end{array} \right] \end{array} \right]$$

When we turn to transitive control verbs like *iṣ*, the analysis must be slightly different. As we saw above, there is evidence that an intransitive infinitival complement is an object with *iṣ*, since with the main verb in the past participle we see ergative agreement.

<sup>19</sup>See Landau (2015: 27ff.) for “the subjecthood of PRO” as the “fundamental distributional property of control”, and Landau (2015: ch. 5) for the loosening of this constraint to include topicalized (non-subject) PRO, which he admits to explain Actor control in Tagalog.

- (17) *rāmaḥ svapitum icchatī*  
 R.NOM sleep.INF want.3SG  
 ‘Rāma wants to sleep.’
- (18) *rāmeṇa svapitum iṣṭam*  
 R.INS.SG sleep.INF want.PST.PTCP.N.SG  
 ‘Rāma wanted to sleep.’

- (19) 
$$\left[ \begin{array}{l} \text{PRED} \text{ ‘WANT} \langle \text{SUBJ}, \text{OBJ} \rangle \text{’} \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘RĀMA’}_I \right] \\ \text{OBJ} \left[ \begin{array}{l} \text{PRED} \text{ ‘SLEEP} \langle \text{SUBJ} \rangle \text{’} \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘PRO’}_I \right] \end{array} \right] \end{array} \right]$$

Although an OBJ argument, the complement does not become the SUBJ in the passive. This constraint will be effected in the argument structure, below.

In order to account for ergative agreement when the complement verb has an object (and also the passive of the same) we must assume a second argument structure for *iṣ* in the active:

- (20) *rājāno rāmaṃ hantum icchanti*  
 king.NOM.PL R.ACC slay.INF want.3PL  
 ‘The kings want to slay Rāma.’

- (21) 
$$\left[ \begin{array}{l} \text{PRED} \text{ ‘WANT} \langle \text{SUBJ}, \text{XCOMP} \rangle \text{OBJ’} \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘KINGS’}_I \right] \\ \text{OBJ} \left[ \boxed{1} \left[ \text{PRED} \text{ ‘RĀMA’} \right] \right] \\ \text{XCOMP} \left[ \begin{array}{l} \text{DIS} \left[ \boxed{1} \right] \\ \text{PRED} \text{ ‘SLAY} \langle \text{SUBJ}, \text{OBJ} \rangle \text{’} \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘PRO’}_I \right] \\ \text{OBJ} \left[ \boxed{1} \right] \end{array} \right] \end{array} \right]$$

Here *iṣ* shows simultaneous anaphoric and functional control: anaphoric control of the embedded subject by the matrix subject, and functional control of the embedded object (via the DIS) by the matrix object.

## 6.2 Passive

For the most part, the passive falls out unproblematically given the active structures proposed above. Since *śak* is intransitive, it should form an impersonal passive, and the accusative passive construction can be unproblematically analysed in this way:

- (22) *rājabhī rāmaṃ hantum na śakyate*  
 king.INS.PL R.ACC slay.INF NEG can.PASS.3SG  
 ‘Rāma cannot be slain by the kings.’

- (23) 
$$\left[ \begin{array}{l} \text{PRED} \text{ ‘CAN} \langle \text{OBL}_\theta, \text{COMP} \rangle \text{’} \\ \text{NEG} + \\ \text{OBL}_\theta \left[ \text{PRED} \text{ ‘KINGS’}_I \right] \\ \text{COMP} \left[ \begin{array}{l} \text{PRED} \text{ ‘SLAY} \langle \text{SUBJ}, \text{OBJ} \rangle \text{’} \\ \text{SUBJ} \left[ \text{PRED} \text{ ‘PRO’}_I \right] \\ \text{OBJ} \left[ \text{PRED} \text{ ‘RĀMA’} \right] \end{array} \right] \end{array} \right]$$

Following the argument structure model of Kibort (2001, 2004, 2006, 2007), as adopted by Dalrymple et al. (2019: 338–351), we can represent the passive as the addition of the specification [+R] to the  $\text{arg}_1$ , which causes it to map to  $\text{OBL}_\theta$ :

|      |           |       |   |                     |                |   |
|------|-----------|-------|---|---------------------|----------------|---|
| (24) |           | ‘can’ | ⟨ | $\text{arg}_1$      | $\text{arg}_3$ | ⟩ |
|      | [default] |       |   | [−O]                | [+O,+C]        |   |
|      | [passive] |       |   | [+R]                |                |   |
|      | Mapping:  |       |   | $\text{OBL}_\theta$ | COMP           |   |

For *śak*, the same analysis will apply whether the embedded infinitive is transitive or intransitive. But for *iṣ*, I proposed above two different argument structures for the active, depending on whether the embedded infinitive is transitive or intransitive.

The intransitive case is simpler. I proposed that an intransitive infinitival complement of *iṣ* is an OBJ, but an OBJ that does not become SUBJ in the passive.<sup>20</sup> This can be effected neatly in argument structure terms by treating the OBJ complement clause as an  $\text{arg}_3$ . It will therefore have the default feature specification [+O], and so cannot map to SUBJ; the highest grammatical function it can map to is OBJ.<sup>21</sup>

|      |           |        |   |                     |                |   |
|------|-----------|--------|---|---------------------|----------------|---|
| (25) |           | ‘want’ | ⟨ | $\text{arg}_1$      | $\text{arg}_3$ | ⟩ |
|      | [default] |        |   | [−O]                | [+O]           |   |
|      | [passive] |        |   | [+R]                |                |   |
|      | Mapping:  |        |   | $\text{OBL}_\theta$ | OBJ            |   |

This will produce the f-structure in (27) for the sentence in (26).

- (26) *rāmeṇa svapitum iṣyate*  
 R.INS.SG sleep.INF want.PASS.3SG  
 ‘Rāma wants to sleep.’

|      |                                                                                                                                                                                                                                                                                                                                                                     |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (27) | $\left[ \begin{array}{l} \text{PRED } \text{‘WANT’} \langle \text{OBL}_\theta, \text{OBJ} \rangle \\ \text{OBL}_\theta \left[ \text{PRED } \text{‘RĀMA’}_1 \right] \\ \text{OBJ} \left[ \begin{array}{l} \text{PRED } \text{‘SLEEP’} \langle \text{SUBJ} \rangle \\ \text{SUBJ} \left[ \text{PRED } \text{‘PRO’}_1 \right] \end{array} \right] \end{array} \right]$ |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

When *iṣ* takes a transitive infinitival complement clause, I assume that the trivalent argument structure applies, as in (21). The passive will again fall out unproblematically:

- (28) *rājabhī rāmo hantum iṣyate*  
 king.INS.PL R.NOM.SG slay.INF want.PASS.3SG  
 ‘(Lit.) Rāma is wanted to be slain by the kings.’

|      |           |        |   |                     |                |   |                |
|------|-----------|--------|---|---------------------|----------------|---|----------------|
| (29) |           | ‘want’ | ⟨ | $\text{arg}_1$      | $\text{arg}_3$ | ⟩ | $\text{arg}_2$ |
|      | [default] |        |   | [−O]                | [+O]           |   | [−R]           |
|      | [passive] |        |   | [+R]                |                |   |                |
|      | Mapping:  |        |   | $\text{OBL}_\theta$ | OBJ            |   | SUBJ           |

<sup>20</sup>If the infinitival clause itself were the subject in the passive, we would have to admit control into the subject, which has been claimed to exist in some languages (see Arka & Simpson 1998, Stiebels 2007, Patejuk & Przepiórkowski 2021), but is usually considered problematic.

<sup>21</sup>Furthermore, the only difference between the COMP of the intransitive *śak* and the OBJ complement clause of *iṣ* is the [+C] feature of the former.

$$(30) \left[ \begin{array}{l} \text{PRED 'WANT'} \langle \text{OBL}_\theta, \text{OBJ} \rangle \text{SUBJ}' \\ \text{OBL}_\theta \left[ \text{PRED 'KINGS'}_1 \right] \\ \text{SUBJ } \boxed{1} \left[ \text{PRED 'RĀMA'} \right] \\ \text{OBJ } \left[ \begin{array}{l} \text{DIS } \boxed{1} \\ \text{PRED 'SLAY'} \langle \text{SUBJ}, \text{OBJ} \rangle' \\ \text{SUBJ } \left[ \text{PRED 'PRO'}_1 \right] \\ \text{OBJ } \boxed{1} \end{array} \right] \end{array} \right]$$

The subject in the passive corresponds to the object of the active construction, while the subject of the active appears as an oblique. Thus the object of the infinitive – which is also the non-thematic object of the matrix verb – is the nominative subject in the passive. The anaphoric control relation still holds between the agent of the matrix verb and the subject of the infinitive.

Turning now to the agreeing passive with *śak* (32), the situation is similar but slightly different. Essentially we have the same construction as with *iṣ*, but the matrix verb has no object in the active. As discussed above, I propose that the passive of *śak* has an alternative argument structure available, paralleling that for the passive of *iṣ*, which licenses an additional argument:

$$(31) \begin{array}{rcccl} & \text{'can-pass'} & \langle & \text{arg}_1 & \text{arg}_3 & \rangle & \text{arg}_2 \\ \text{[default]} & & & [-O] & [+O],[+C] & & [-R] \\ \text{[passive]} & & & [+R] & & & \\ \text{Mapping:} & & & \text{OBL}_\theta & \text{XCOMP} & & \text{SUBJ} \end{array}$$

$$(32) \begin{array}{lllll} \text{rājabhī} & \text{rāmo} & \text{hantum} & \text{na} & \text{śakyate} \\ \text{king.INS.PL} & \text{R.NOM.SG} & \text{slay.INF} & \text{NEG} & \text{can.PASS.3SG} \\ \text{'Rāma cannot be slain by the kings.'} \end{array}$$

$$(33) \left[ \begin{array}{l} \text{PRED 'CAN'} \langle \text{OBL}_\theta, \text{XCOMP} \rangle \text{SUBJ}' \\ \text{NEG } + \\ \text{OBL}_\theta \left[ \text{PRED 'KINGS'}_1 \right] \\ \text{SUBJ } \boxed{1} \left[ \text{PRED 'RĀMA'} \right] \\ \text{XCOMP } \left[ \begin{array}{l} \text{DIS } \boxed{1} \\ \text{PRED 'SLAY'} \langle \text{SUBJ}, \text{OBJ} \rangle' \\ \text{SUBJ } \left[ \text{PRED 'PRO'}_1 \right] \\ \text{OBJ } \boxed{1} \end{array} \right] \end{array} \right]$$

## 7 The control relations

We must now consider the constraints on the two control relations: the anaphoric relation between the thematic argument of the matrix verb and its corresponding embedded argument, and the functional control relation between the non-thematic argument of the matrix and its corresponding embedded argument.

### 7.1 The anaphoric control relation

The primary control relation, that between e.g. the active subject and the subject of the complement clause, has to be modelled in a way that transcends the active-passive alternation. That is, the same control relation holds between two arguments in the active and the passive; the only difference is the grammatical function of the argument in the matrix clause: SUBJ in the active, OBL<sub>θ</sub> in the passive.

It is worth noting that the continuity of this control relation across active and passive supports, indeed requires, a demotional approach to the passive in Sanskrit, whereby the active subject appears as an

oblique argument in the passive; in contrast, a suppressional approach to the passive would see the argument role underlying the active subject eliminated in the passive, leaving it unable to control.

For the control relation to hold across both active and passive, we must state the control relation in terms of underlying argument position in the matrix clause rather than grammatical functions. That is:<sup>22</sup>

$$(34) \quad \mathcal{R}((\uparrow \text{COMP SUBJ})_{\sigma} \text{INDEX}) = (\uparrow_{\sigma} \text{ARG}_1 \text{INDEX}).$$

The position in the complement clause can be referred to in terms of the grammatical function SUBJ, since it does not vary.

In this paper I have considered subject control verbs, or more properly  $\text{arg}_1$  control verbs. Although it is not a widely recognized possibility, object control is also possible in Sanskrit, for example:<sup>23</sup>

$$(35) \quad \begin{array}{llllll} \text{yadi mām} & \text{anujānīyād} & \text{bhavān} & & \text{gantum} & \text{tapo-vanam} \\ \text{if} & \text{me.ACC permit.OPT.3SG} & \text{you.HON.NOM} & \text{go.INF} & \text{ascetic-grove.ACC} \\ \text{'If your honour would allow me to go to the ascetic's grove...'} & & & & & \text{(Mahābhārata 14.2.12ab)} \end{array}$$

Object control interacts with the ergative past participle construction (36), and the passive (37), entirely as expected: the controlling argument is marked nominative in both, as the ergative object in the former, and the passive subject in the latter.

$$(36) \quad \begin{array}{llllll} \text{bhavaty} & \text{upādhyāyena} & \text{asmy} & \text{anujñāto} & & \text{gṛhaṃ} & \text{gantum} \\ \text{you.HON.VOC.F} & \text{master.INS} & \text{be.PRS.1SG} & \text{permit.PST.PTCP.NOM.SG} & \text{home.ACC} & \text{go.INF} \\ \text{'Lady, your master has permitted me to go home.'} & & & & & \text{(Mahābhārata 1.3.99b)} \end{array}$$

$$(37) \quad \begin{array}{llllll} \text{idānīm itaḥ} & \text{pratyāsanne} & \text{kusumapure na ko 'py} & & \text{amudrālāñchito} \\ \text{now} & \text{from\_here} & \text{nearby.LOC K.LOC} & \text{not anyone.NOM.SG} & \text{not-ring-marked.NOM.SG} \\ \text{nirgantum praveṣṭum vānumodyate} & & & & & \\ \text{exit.INF enter.INF or=permit.PASS.3SG} & & & & & \\ \text{'Now from here no one is permitted to enter or exit nearby Kusumapura without the mark of the} & & & & & \\ \text{signet-ring.'} & & & & & \text{(Mudrārākṣasa 5)} \end{array}$$

For such verbs, then, the control relation will make reference to the  $\text{arg}_2$  position in the s-structure:

$$(38) \quad \mathcal{R}((\uparrow \text{COMP SUBJ})_{\sigma} \text{INDEX}) = (\uparrow_{\sigma} \text{ARG}_2 \text{INDEX}).$$

## 7.2 The functional control relation

For *iṣ*, again, the relation is independent of the active-passive alternation so must be stated with reference to the s-structure. The relation holds between the matrix OBJ and the embedded OBJ in the active, and the matrix SUBJ and the embedded OBJ in the passive.<sup>24</sup>

$$(39) \quad (\uparrow_{\sigma} \text{ARG}_2)_{\sigma-1} = (\uparrow \text{OBJ DIS})$$

For *śak* it only applies in the passive, so could be stated in purely f-structural terms:

$$(40) \quad (\uparrow \text{SUBJ}) = (\uparrow \text{COMP DIS})$$

But if we refer to s-structure here too, we can combine these two equations into one:

$$(41) \quad (\uparrow_{\sigma} \text{ARG}_2)_{\sigma-1} = ((\uparrow_{\sigma} \text{ARG}_3)_{\sigma-1} \text{DIS})$$

<sup>22</sup>For the formalism, see Dalrymple et al. (2018) and Dalrymple et al. (2019: 517–528).

<sup>23</sup>For more details see Lowe et al. (forthcoming[b]).

<sup>24</sup>On accounting for potential case mismatch, see fn. 13.

## 8 An alternative analysis

The analysis presented above requires somewhat parallel, but ultimately different, analyses for double control with intransitive (e.g. *śak*) and transitive (e.g. *iṣ*) control verbs. It requires positing two distinct argument frames for *iṣ* in the active, the choice between which depends on the transitivity of its complement, a feature more typical of complex predication than control constructions (Dalrymple & King 2000: 4, referencing Butt 1995). A second argument frame is also posited for *śak*, but only in the passive.

This analysis, in particular the double argument frame for *iṣ*, is suggested by the evidence of the ergative, given in (4b) above, repeated below:

- (42) *rāmeṇa rāvaṇo hantum iṣṭaḥ*  
 R.INS.SG R.NOM.SG slay.INF want.PST.PTCP.NOM.SG  
 ‘Rāma wanted to slay Rāvaṇa.’

Granted that we are dealing with a control structure, and not a complex predication, the case of *rāvaṇa* here can only be accounted for by assuming object-to-object raising, as detailed above. The only way we could avoid assuming two argument frames for *iṣ* in the active would be to provide an alternative explanation of the ergative agreement pattern.

It should not need emphasizing that the ergative past participle construction is not a passive. Although informal accounts often describe the past participle as ‘passive with transitive verbs, active with intransitive verbs’, it is better described simply as (morphosyntactically) ergative: the participle agrees with the S argument of an intransitive verb, and the O argument of a transitive verb. The past participle does not function as the passive of any active paradigm, even only with transitive verbs, and its morphosyntactic similarity with the passive (including the instrumental case of the A argument) is in a sense accidental, or at least secondary. Nor is it the case, as often assumed (e.g. Patel-Grosz 2021), that the past participle derives historically from a passive construction; it is ergative, not passive, as far back as we can reconstruct.

On the other hand, the morphosyntactic similarity with the passive evidently led to a degree of interaction between the ergative past participle and the passive (as discussed by Lowe et al. 2024: 34–38). For example, while the past participle formed to an intransitive base normally agrees with the S argument, occasionally constructions are found where the participle appears in the default (non-agreeing) neuter singular form, with the S argument in the instrumental; that is, identical to the passive of an intransitive. So, beside the finite passive of the intransitive verb *sthā* ‘stand, remain’, shown in (43b) (beside the simple finite active in (43a)), one occasionally finds uses of the past participle as in (43d), contrasting with the usual and regular construction in (43c).

- (43) a. *devadattaḥ tiṣṭhati*  
 D.NOM stand.ACT.3SG  
 ‘Devadatta stands/remains.’  
 b. *devadattena sthīyate*  
 D.INS stand.PASS.3SG  
 ‘Devadatta stands/remains.’ (Lit. ‘It is stood by D.’)  
 c. *devadattaḥ sthitaḥ*  
 D.NOM stand.PST.PTCP.NOM  
 ‘Devadatta stood/remained.’  
 d. *devadattena sthitam*  
 D.INS stand.PST.PTCP.N.SG  
 ‘Devadatta stood/remained.’ (Lit. ‘It was stood by D.’)

This shows that the usually ergative past participle can, albeit rarely, function as a passive with intransitive verbs. With transitive verbs, since there is no morphosyntactic difference between passive and ergative, one cannot be sure, but logically it must be the close similarity of passive and ergative with transitive verbs which underlies the reinterpretation of the ergative as passive with intransitive verbs.

One might conceive, then, that the ergative past participle when formed to transitive verbs was, at some point, at least optionally, reinterpreted as passive. That is, speakers might have lost the distinct morphosyntactic alignment rules of the ergative when formed to transitive verbs, instead treating such past participles with reference to the rules for passivization. Given that the rules for passivization are required elsewhere in the grammar, while distinct rules for the formation of the ergative to transitive verbs are not, this is on some level a simplification of the grammar.

If we can treat the past participle, when formed to transitive verbs, as a passive, then we can explain examples like (42) by reference to the passive, and we do not require two argument frames for transitive control verbs like *iṣ* in the active. That is, we could treat transitive control verbs like *iṣ* almost identically to intransitive verbs like *śak* in the active, the only difference between them being the difference in the GF of their complement clause (as seen above).

There remains the difference that intransitive verbs like *śak* are attested with two possible passive constructions, while transitive verbs like *iṣ* are attested with only one; cf. (1b)–(1c). Under the alternative approach developed in this section, this difference could be accounted for by a relatively small difference between the verb classes. The secondary argument frame for *śak*, given in (31), would in fact apply to all control verbs, being the only means of licensing a nominative case argument with the passive of a control verb (whether transitive or intransitive). Then, we would simply have to say that this alternative argument frame is optional (though by far most common) with *śak*, but obligatory with *iṣ*. Why this argument frame should be obligatory with some (transitive) control verbs and not others is another question (perhaps reflecting the transitive nature of the control verb).

Overall, such an approach would involve fewer stipulations, and would crucially avoid having to assume two argument frames for transitive control verbs, the choice between which must depend on the transitivity of the complement. However, the major disadvantage is that it fails to properly distinguish the ergative past participle construction from the passive; whether the trade-off is worth it is a question for future research.

## 9 Conclusion

In this paper I have presented an LFG analysis of control constructions in Sanskrit. I have argued that all relevant verbs in Sanskrit are equi verbs, and adopted an anaphoric control analysis of this. At the same time, at least in the passive, and for underlyingly transitive verbs like *iṣ* ‘want’ also in the active, there is a second control relation holding between the matrix and embedded predicates. As a non-thematic argument of the matrix verb, the control relation here is a functional control relation. Such double control constructions are rarely described in the literature, but are found in a number of unrelated languages, to the select inventory of which Sanskrit may now be added.

## Acknowledgements

The analysis presented here has built in different ways on the work of Miriam and Tracy, as almost all work in LFG necessarily does. Whether or not the analysis can withstand their critical eye, I offer the attempt, at least, in honour of their manifold contributions to LFG and theoretical syntax more broadly.

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# Let's talk about case in PPs...

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## 1 Introduction

This paper offers an implemented LFG analysis of a coordination phenomenon occurring in Polish, where two (or more) prepositions requiring different cases can be coordinated, but their nominal complement bears case that is appropriate for only one of the prepositions: the closest one. This phenomenon presents an interesting challenge as it cannot be explained by case syncretism: the shared object cannot be interpreted as being marked for each of the cases required by the coordinated prepositions.

## 2 Data

Let us start with an attested example from Polish. According to existing analyses of case and coordination, examples such as (1) should not be acceptable, because the shared object of coordinated prepositions, *wyborach* ‘election’, is unambiguously locative – it is not a syncretic locative/instrumental form:

- (1) mające ograniczać możliwość korupcji partii przed i po wyborach  
having restrict.INF possibility corruption party before.INST and after.LOC elections.LOC/\*INST  
‘intended to restrict the possibility of party corruption before and after the election’ (NKJP)<sup>1</sup>

The prepositions in (1) are glossed with cases that they select for – each preposition is glossed with one case, even though each of these prepositions can in principle require more than one case. While *PRZED* can also occur with accusative case, it must take instrumental case in order to express the temporal meaning of *before the election*.<sup>2</sup> Similarly, *PO* can also occur with accusative case, but it must take locative case to express the temporal meaning of *after the election*. As shown below, *PRZED* ‘before’ cannot take locative case and *PO* ‘after’ cannot take instrumental case:

- |                                                                                          |                                                                                    |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| (2) przed wyborami/*wyborach<br>before.INST elections.INST/*LOC<br>‘before the election’ | (3) po wyborach/*wyborami<br>after.LOC elections.LOC/*INST<br>‘after the election’ |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|

Apart from examples such as (1), it is also possible to find examples with these prepositions in a reversed order, as in (4) where the shared nominal object is unambiguously instrumental. Such examples seem to be less frequent, possibly due to pragmatic reasons whereby chronological order is preferred.

- (4) po i przed wyborami  
after.LOC and before.INST elections.INST/\*LOC  
‘after and before the election’ (NKJP)

<sup>1</sup>Example from the National Corpus of Polish (NKJP; <https://nkjp.pl/>; Przepiórkowski et al. 2012).

<sup>2</sup>However, it is not the case that instrumental case is only used to express the temporal meaning with *PRZED*: it can also be used to express location, as in *Stała przed sklepem* ‘she was standing in front of the shop’. Furthermore, *PRZED* can also be used with accusative case to express location: *Wyszła przed sklep* ‘she went out in front of the shop’.

Let us now consider example (5) where the preposition PRZED 'before' which requires instrumental case to express the temporal meaning (as discussed above) is coordinated with the preposition PODCZAS 'during' which always requires genitive case – the shared object is marked below for genitive case:

- (5) przed i podczas mszy  
before.INST and during.GEN mass.GEN/\*INST  
'before and during the mass' (NKJP)

As shown below, PRZED 'before' cannot take genitive case and PODCZAS 'during' cannot take instrumental case:

- (6) przed mszą/\*mszy  
before.INST mass.INST/\*GEN  
'before the mass'
- (7) podczas mszy/\*mszą  
during.GEN mass.GEN/\*INST  
'during the mass'

Apart from examples such as (5), it is also possible to find these prepositions in a reversed order (again, such an order is less frequent) – this time the shared nominal object is marked for instrumental case:

- (8) podczas i przed kampanią wyborczą  
during.GEN and before.INST campaign.INST/\*GEN electoral.INST/\*GEN  
'during and before the election campaign' (NKJP)

So far we have seen attested evidence that it is possible to coordinate prepositions PRZED 'before' and PO 'after', as well as PRZED 'before' and PODCZAS 'during'. Given this, one may expect that it should be possible to coordinate PODCZAS 'during' and PO 'after' – indeed, this is possible, as shown in (9) where the shared object is marked for locative case:

- (9) podczas i po wojnie  
during.GEN and after.LOC war.LOC/\*GEN  
'during and after the war' (NKJP)

As shown below, PODCZAS 'during' cannot take locative case and PO 'after' cannot take genitive case:

- (10) podczas wojny/\*wojnie  
during.GEN war.GEN/\*LOC  
'during the war'
- (11) po wojnie/\*wojny  
after.LOC war.LOC/\*GEN  
'after the war'

The reversed order of prepositions is also possible (though less frequent), with the shared object marked for genitive case – the example in (12) is particularly interesting, because while the noun *meczu* is a syncretic form (genitive/locative), its adjectival modifier *niedzielnego* is genitive, but not locative:

- (12) po (i podczas) niedzielnego meczu  
after.LOC and during.GEN Sunday.GEN/\*LOC match.GEN/LOC  
'after (and during) the Sunday match' (Google)<sup>3</sup>

As shown below, even though the nominal form *meczu* is ambiguous between genitive and locative case, the adjective *niedzielnym* is locative but not genitive, so it can only be used with the preposition PO that requires a locative object, as in (13), while the adjective *niedzielnego* is genitive but not locative, so it can only be used with the preposition PODCZAS that requires a genitive object, compare (14):

- (13) po niedzielnym/\*niedzielnego meczu  
after.LOC Sunday.LOC/\*GEN match.GEN/LOC  
'after the Sunday match'

<sup>3</sup>Example found using Google.

- (14) podczas niedzielnego/\*niedzielnym meczu  
 during.GEN Sunday.GEN/\*LOC match.GEN/LOC  
 ‘during the Sunday match’

Finally, it is possible to coordinate the 3 different prepositions discussed above, even though each of these has different case requirements – as mentioned earlier, in order to express the temporal meaning, PRZED ‘before’ takes instrumental case, PODCZAS ‘during’ takes genitive case, and PO ‘after’ takes locative case, but their shared object is marked for locative case in (15):

- (15) przed, podczas i po wydarzeniu  
 before.INST during.GEN and after.LOC event.LOC/\*GEN/\*INST  
 ‘before, during and after the event’ (NKJP)

As shown below, the form *wydarzeniu* is not compatible with prepositions requiring instrumental or genitive case, the form *wydarzenia* is not compatible with prepositions that take instrumental or locative case, and the form *wydarzeniem* is not compatible with prepositions requiring genitive or locative case:

- (16) przed wydarzeniem/\*wydarzenia/\*wydarzeniu  
 before.INST event.INST/\*GEN/\*LOC  
 ‘before the event’
- (17) podczas wydarzenia/\*wydarzeniem/\*wydarzeniu  
 during.GEN event.GEN/\*INST/\*LOC  
 ‘during the event’
- (18) po wydarzeniu/\*wydarzenia/\*wydarzeniem  
 after.LOC event.LOC/\*GEN/\*INST  
 ‘after the event’

These 3 prepositions may also be coordinated in a different order, as in (19)<sup>4</sup> where the shared nominal object is unambiguously instrumental, even though, as shown below, this form is appropriate only for the closest preposition in (19), while it is incompatible with the remaining prepositions:

- (19) Pomimo, iż badania były wykonywane podczas czy po lub przed treningami  
 even though tests were carried out during.GEN or after.LOC or before.INST training.INST  
 ‘Even though the tests were carried out during or after or before training sessions...’ (NKJP)
- (20) podczas treningów/\*treningami/\*treningach  
 during.GEN training.GEN/\*INST/\*LOC  
 ‘during training sessions’
- (21) po treningach/\*treningów/\*treningami  
 after.LOC training.LOC/\*GEN/\*INST  
 ‘after training sessions’
- (22) przed treningami/\*treningów/\*treningach  
 before.INST training.INST/\*GEN/\*LOC  
 ‘before training sessions’

Summing up: as shown above on the basis of attested data, when prepositions with different case requirements are coordinated in Polish, it is possible for their shared nominal object to bear the case that is appropriate only for the closest preposition, while it is not compatible with the more distant prepositions. Interestingly, this does not cause ungrammaticality – such examples are acceptable. By contrast, outside of coordination, violating case requirements of a preposition results in stark ungrammaticality.

<sup>4</sup>(19) involves embedded coordination – this is discussed in detail in Section 5.2.

### 3 Case in LFG: why is this problematic?

There have been various proposals for representing case in LFG. This includes modelling the value of case as an atom, as a set, and as a complex feature structure – let us take a look at these proposals.

#### 3.1 Atom as a value of case

Under the most straightforward analysis the attribute CASE has an atomic value. Such an approach has been challenged by phenomena that involve case syncretism, as in the example below discussed in Dalrymple & Kaplan (2000) (originally from Dylą 1984):

- (23) Kogo Janek lubi a Jerzy nienawidzi?  
 who.ACC/GEN Janek.NOM likes and Jerzy.NOM hates  
 ‘Who does Janek like and Jerzy hate?’ (Dalrymple & Kaplan 2000: ex. (40))

As Dalrymple & Kaplan (2000) point out, *kogo* is the shared object of two verbs in (23): LUBIĆ ‘like’ which requires its object to be marked for accusative case (as a value of structural case appropriate in the absence of sentential negation; see Patejuk & Przepiórkowski 2014, Przepiórkowski & Patejuk 2015), while NIENAWIDZIĆ ‘hate’ requires its object to be marked for genitive case. Since the form *kogo* is syncretic between accusative and genitive case, it can satisfy both these case requirements.

However, examples such as (23) cannot be modelled by an analysis where the CASE attribute has an atomic value, because an attribute can only have one value. Let us first consider the lexical entry in (24) that corresponds to the noun *Janek* which is unambiguously nominative, see the f-structure in (25):

- (24) *Janek* N (↑ PRED)=‘JANEK’  
 (↑ CASE)= NOM (25)  $\begin{bmatrix} \text{PRED ‘JANEK’} \\ \text{CASE NOM} \end{bmatrix}$

Since CASE can have only one value, the lexical entry for *kogo* in (26) uses a disjunctive specification of case (as accusative or genitive), which is equivalent to having two separate lexical entries (one with accusative case, one with genitive case). As a result, the grammar produces two different f-structures for the string *kogo*: (27) with accusative case and (28) with genitive case.

- (26) *kogo* N (↑ PRED)=‘WHO’  
 { (↑ CASE)= ACC  
 | (↑ CASE)= GEN } (27)  $\begin{bmatrix} \text{PRED ‘WHO’} \\ \text{CASE ACC} \end{bmatrix}$  (28)  $\begin{bmatrix} \text{PRED ‘WHO’} \\ \text{CASE GEN} \end{bmatrix}$

Let us consider what happens when trying to analyse (23) using a grammar with such an approach to case. If *kogo* is analysed as accusative (as a result of resolving the disjunction in the lexical entry in (26) to ACC), it cannot satisfy the requirements of NIENAWIDZIĆ which takes a genitive object (as in (30)): assigning genitive case to accusative *kogo* results in inconsistency due to conflicting values of CASE, as shown in the f-structure in (31). By contrast, if *kogo* is analysed as genitive (the disjunction in the lexical entry in (26) is resolved to GEN), it cannot satisfy the requirements of LUBIĆ that takes an accusative object (in absence of sentential negation; see (29)), also due to the inconsistent value of CASE, see (31):

- (29) (↑ OBJ CASE)= ACC (30) (↑ OBJ CASE)= GEN

- (31)  $\left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED ‘LIKE’} \langle \boxed{1}, \boxed{2} \rangle \\ \text{SUBJ } \boxed{1} \left[ \begin{array}{c} \text{PRED ‘JANEK’} \\ \text{CASE NOM} \end{array} \right] \\ \text{OBJ } \boxed{2} \left[ \begin{array}{c} \text{PRED ‘WHO’} \\ \text{CASE ACC} \neq \text{GEN} \end{array} \right] \end{array} \right] , \left[ \begin{array}{c} \text{PRED ‘HATE’} \langle \boxed{3}, \boxed{2} \rangle \\ \text{SUBJ } \boxed{3} \left[ \begin{array}{c} \text{PRED ‘JERZY’} \\ \text{CASE NOM} \end{array} \right] \\ \text{OBJ } \boxed{2} \end{array} \right] \end{array} \right] \right]$

### 3.2 Set as a value of case

In order to account for case syncretism phenomena such as shown in (23), Dalrymple & Kaplan (2000) propose to make the CASE attribute set-valued: in unambiguous forms such as *Janek* the value of CASE is a singleton set (containing just NOM: see the lexical entry in (32) and the corresponding f-structure in (33)), while in syncretic forms such as *kogo* the set contains all values of case appropriate for this form, compare the lexical entry in (34). As a result, the grammar produces one f-structure corresponding to *kogo* where CASE is specified as ACC and GEN, as shown in (35).

$$(32) \quad \textit{Janek} \quad N \quad (\uparrow \text{PRED}) = \text{'JANEK'} \\ (\uparrow \text{CASE}) = \{\text{NOM}\}$$

$$(33) \quad \begin{bmatrix} \text{PRED} & \text{'JANEK'} \\ \text{CASE} & \{\text{NOM}\} \end{bmatrix}$$

$$(34) \quad \textit{kogo} \quad N \quad (\uparrow \text{PRED}) = \text{'WHO'} \\ (\uparrow \text{CASE}) = \{\text{ACC}, \text{GEN}\}$$

$$(35) \quad \begin{bmatrix} \text{PRED} & \text{'WHO'} \\ \text{CASE} & \{\text{ACC}, \text{GEN}\} \end{bmatrix}$$

The lexical entries of verbs check that appropriate values of case belong to the CASE set of the relevant argument (the object): *LUBIĆ* ‘like’ checks that ACC is an element of this set (assuming there is no sentential negation), see (36), while *NIENAWIDZIĆ* ‘hate’ checks that GEN is an element of this set, as in (37). The shared object *kogo* in (23) can satisfy both these requirements at the same time, because its lexical entry in (34) specifies its value of CASE as {ACC, GEN}, so there is no violation of consistency and the f-structure in (38)<sup>5</sup> generated by the grammar for (23) is well-formed.

$$(36) \quad \text{ACC} \in (\uparrow \text{OBJ CASE})$$

$$(37) \quad \text{GEN} \in (\uparrow \text{OBJ CASE})$$

$$(38) \quad \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED} & \text{'LIKE'} & \langle \boxed{1}, \boxed{2} \rangle \\ \text{SUBJ} & \boxed{1} & \begin{bmatrix} \text{PRED} & \text{'JANEK'} \\ \text{CASE} & \{\text{NOM}\} \end{bmatrix} \\ \text{OBJ} & \boxed{2} & \begin{bmatrix} \text{PRED} & \text{'WHO'} \\ \text{CASE} & \{\text{ACC}, \text{GEN}\} \end{bmatrix} \end{array} \right] \\ \text{CONJ AND} \end{array} \right], \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED} & \text{'HATE'} & \langle \boxed{3}, \boxed{2} \rangle \\ \text{SUBJ} & \boxed{3} & \begin{bmatrix} \text{PRED} & \text{'JERZY'} \\ \text{CASE} & \{\text{NOM}\} \end{bmatrix} \\ \text{OBJ} & \boxed{2} & \begin{bmatrix} \text{PRED} & \text{'WHO'} \\ \text{CASE} & \{\text{ACC}, \text{GEN}\} \end{bmatrix} \end{array} \right] \end{array} \right]$$

The set-based approach to case of Dalrymple & Kaplan (2000) is a significant improvement over the atom-based approach as it can account for case syncretism, but there are some outstanding issues, including situations when a modifier can further restrict the value of case of the head that it modifies. This aspect is discussed in Dalrymple et al. (2009) as part of the motivation to represent case as an attribute whose value is a feature structure, which makes it possible to accurately model such phenomena.

### 3.3 Feature-structure as a value of case

Under the analysis of Dalrymple et al. (2009), the CASE attribute of a specific nominal form is modelled as a complex feature structure in the following way: if this form cannot be analysed as corresponding to a given case, the attribute corresponding to this case (such as NOM for nominative, ACC for accusative, GEN for genitive, etc.) is assigned a negative value (−). For the remaining values of case, it is specified positively (+) in different ways, depending on whether a given form is syncretic or not.

Let us consider some examples. (39) is the lexical entry of the noun *Janek* which is unambiguously nominative, leading to the f-structure in (40). By contrast, when a given form is syncretic (it can correspond to more than one case), a more complex solution is used: its value of CASE is specified positively using functional uncertainty, as a disjunction of values of case that are possible for this form. (41) is the lexical entry of *kogo*, a syncretic accusative/genitive form, which gives rise to the f-structure in (42).

<sup>5</sup>This f-structure is different than in Dalrymple & Kaplan (2000).

$$(39) \quad \text{Janek} \quad N \quad \begin{array}{l} (\uparrow \text{PRED}) = \text{'JANEK'} \\ (\uparrow \text{CASE ACC}) = - \\ (\uparrow \text{CASE DAT}) = - \\ (\uparrow \text{CASE GEN}) = - \\ (\uparrow \text{CASE INST}) = - \\ (\uparrow \text{CASE LOC}) = - \\ (\uparrow \text{CASE NOM}) = + \\ (\uparrow \text{CASE VOC}) = - \end{array}$$

$$(40) \quad \left[ \begin{array}{c} \text{PRED 'JANEK'} \\ \left[ \begin{array}{c} \text{ACC} - \\ \text{DAT} - \\ \text{GEN} - \\ \text{CASE INST} - \\ \text{LOC} - \\ \text{NOM} + \\ \text{VOC} - \end{array} \right] \end{array} \right]$$

$$(41) \quad \text{kogo} \quad N \quad \begin{array}{l} (\uparrow \text{PRED}) = \text{'WHO'} \\ (\uparrow \text{CASE \{ACC|GEN\}}) = + \\ (\uparrow \text{CASE DAT}) = - \\ (\uparrow \text{CASE INST}) = - \\ (\uparrow \text{CASE LOC}) = - \\ (\uparrow \text{CASE NOM}) = - \\ (\uparrow \text{CASE VOC}) = - \end{array}$$

$$(42) \quad \left[ \begin{array}{c} \text{PRED 'WHO'} \\ \left[ \begin{array}{c} \text{DAT} - \\ \text{INST} - \\ \text{CASE LOC} - \\ \text{NOM} - \\ \text{VOC} - \end{array} \right] \end{array} \right]$$

Since functional uncertainty is non-constructive, the constraint  $(\uparrow \text{CASE \{ACC|GEN\}}) = +$  in (41) does not introduce any attribute-value pair (unlike defining equations such  $(\uparrow \text{CASE NOM}) = +$  in (39)). Instead, constraints with functional uncertainty are interpreted as constraining equations: the lexical entry in (41) introduces a constraint that requires *kogo* to be marked elsewhere for accusative or genitive case. This is why (42) contains negative case specifications, but no positive specifications for ACC or GEN.

The relevant verbs specify their object's case as in (43) and (44), leading to the f-structure in (45)<sup>6</sup> produced by the grammar implemented in XLE:

$$(43) \quad (\uparrow \text{OBJ CASE ACC}) = +$$

$$(44) \quad (\uparrow \text{OBJ CASE GEN}) = +$$

$$(45) \quad \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'LIKE' } \langle \boxed{1}, \boxed{2} \rangle \\ \text{SUBJ } \boxed{1} \left[ \begin{array}{c} \text{PRED 'JANEK'} \\ \text{CASE [NOM +]} \end{array} \right] \\ \text{OBJ } \boxed{2} \left[ \begin{array}{c} \text{PRED 'WHO'} \\ \text{CASE } \left[ \begin{array}{c} \text{ACC +} \\ \text{DAT -} \\ \text{INST -} \\ \text{LOC -} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \end{array} \right] \end{array} \right], \left[ \begin{array}{c} \text{PRED 'HATE' } \langle \boxed{3}, \boxed{4} \rangle \\ \text{SUBJ } \boxed{3} \left[ \begin{array}{c} \text{PRED 'JERZY'} \\ \text{CASE [NOM +]} \end{array} \right] \\ \text{OBJ } \boxed{4} \left[ \begin{array}{c} \text{PRED 'WHO'} \\ \text{CASE } \left[ \begin{array}{c} \text{DAT -} \\ \text{GEN +} \\ \text{INST -} \\ \text{LOC -} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \end{array} \right] \end{array} \right] \end{array} \right] \left[ \begin{array}{c} \text{CONJ AND} \end{array} \right]$$

Note that while *kogo* is a shared object of the two coordinated verbs in (23), in the f-structure representation in (45) each verb has an object with a different index: LIKE has  $\boxed{2}$ , while HATE has  $\boxed{4}$ . This is due to the fact that the f-description in (41) that corresponds to the shared object *kogo* is distributed over coordinated verbs and each of these verbs assigns a different value of CASE to its object: LIKE assigns accusative case (see (43)), while HATE assigns genitive case (see (44)). As a result of these different positive case specifications introduced by different verbs, the shared object *kogo* is assigned to two different f-structure indices:  $\boxed{2}$  with accusative case and  $\boxed{4}$  with genitive case. However, even though it is not represented<sup>7</sup> in

<sup>6</sup>Due to limited space, unambiguously nominative subjects such as *Janek* and *Jerzy* only have the positive specification for nominative case represented in (45), even though these forms have negative specifications for all remaining cases, as in (39).

<sup>7</sup>Other f-structures with implicit subsumption in this paper: (48), (57), (58), (60), (65), (68), (75), (97), (109).

(45), XLE uses an implicit subsumption<sup>8</sup> relation to express the fact that the partial f-structure in (42) that contains PRED and negative values of CASE is the shared part of the different objects of the two coordinated verbs: (42) subsumes [2] and [4] in (45).

Let us now consider how adjectival modifiers can restrict the interpretation of syncretic forms, starting with (46), a modified version of (23) where the adjective is also syncretic:

- (46) Kogo znanego Janek lubi a Jerzy nienawidzi?  
 who.ACC/GEN famous.ACC/GEN Janek.NOM likes and Jerzy.NOM hates  
 ‘Which famous person does Janek like and Jerzy hate?’ (literally: ‘Who famous does Janek like and Jerzy hate?’)

The lexical entry of the adjectival form *znanego* ‘famous’ in (47) specifies that the head that it modifies (the path to the head, (ADJ ↑), is assigned to the local name %A) can be accusative or genitive – it can have positive values for these attributes – and that it must have negative specifications for the remaining cases. As a result, this adjective can be used to modify accusative and genitive nominals,<sup>9</sup> so it does not restrict the case specification of the syncretic form *kogo* which can be accusative or genitive (see (42)).

- (47) *znanego* A (↑ PRED)=‘FAMOUS’  
 (ADJ ↑)= %A  
 (%A CASE {ACC|GEN})= +  
 (%A CASE DAT)= –  
 (%A CASE INST)= –  
 (%A CASE LOC)= –  
 (%A CASE NOM)= –  
 (%A CASE VOC)= –

As a result, the grammar produces the well-formed f-structure in (48) as the representation of (46).

- (48) 
$$\left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'LIKE' } \langle [1], [2] \rangle \\ \text{SUBJ } [1] \left[ \begin{array}{c} \text{PRED 'JANEK'} \\ \text{CASE [NOM +]} \end{array} \right] \\ \text{OBJ } [2] \left[ \begin{array}{c} \text{PRED 'WHO'} \\ \text{CASE } \left[ \begin{array}{c} \text{ACC +} \\ \text{DAT -} \\ \text{INST -} \\ \text{LOC -} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \\ \text{ADJ } \{ [5] \text{ [PRED 'FAMOUS']} \} \end{array} \right] \end{array} \right] \\ \text{CONJ AND} \end{array} \right], \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'HATE' } \langle [3], [4] \rangle \\ \text{SUBJ } [3] \left[ \begin{array}{c} \text{PRED 'JERZY'} \\ \text{CASE [NOM +]} \end{array} \right] \\ \text{OBJ } [4] \left[ \begin{array}{c} \text{PRED 'WHO'} \\ \text{CASE } \left[ \begin{array}{c} \text{DAT -} \\ \text{GEN +} \\ \text{INST -} \\ \text{LOC -} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \\ \text{ADJ } \{ [5] \} \end{array} \right] \end{array} \right] \end{array} \right]$$

Let us now consider an example where a case restriction is possible. The example in (49) uses the nominal form *kiwi* ‘kiwifruit’ which is syncretic for all 7 cases used in Polish, as specified in (50):

- (49) Janek lubi a Jerzy nienawidzi kiwi  
 Janek.NOM likes and Jerzy.NOM hates kiwifruit.ACC/GEN  
 ‘Janek likes and Jerzy hates kiwifruit.’

<sup>8</sup>See [https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/xle\\_toc.html#N4.2.7](https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/xle_toc.html#N4.2.7)

<sup>9</sup>This is a greatly simplified account. In reality, while Polish adjectival modifiers typically have the same case as the nominal head that they modify, this is not always the case (as in, for instance: *coś ciekawego* ‘something.NOM/ACC interesting.GEN’, *piękne/pięknych pięć kobiet* ‘beautiful.ACC/GEN five.ACC women.GEN’).

- (50) *kiwi* N (↑ PRED)=‘KIWIFRUIT’  
(↑ CASE {ACC|DAT|GEN|INST|LOC|NOM|VOC})= +

However, when *kiwi* is used with an adjectival modifier, different forms are used: the form of the modifier suitable for accusative case is *kwaśne* (syncretic with nominative and vocative), while the genitive form is *kwaśnego*. As shown below, these forms are not interchangeable:

- (51) Janek lubi kwaśne/\*kwaśnego kiwi  
Janek.NOM likes sour.ACC/\*GEN kiwifruit.ACC  
‘Janek likes sour kiwifruit.’
- (52) Janek nienawidzi kwaśnego/\*kwaśne kiwi  
Janek.NOM hates sour.GEN/\*ACC kiwifruit.GEN  
‘Janek hates sour kiwifruit.’

In order to account for these differences, the lexical entries of these adjectives impose relevant constraints on the case of the modified nominal: *kwaśne* in (53) requires the modified nominal to be accusative, nominative or vocative, while the remaining values of case (including genitive) are specified negatively.

- (53) *kwaśne* A (↑ PRED)=‘SOUR’  
(ADJ ↑)= %A  
(%A CASE {ACC|NOM|VOC})= +  
(%A CASE DAT)= –  
(%A CASE GEN)= –  
(%A CASE INST)= –  
(%A CASE LOC)= –

By contrast, *kwaśnego* in (54) requires the modified nominal to be genitive, while all other values of case (including accusative) have a negative specification.

- (54) *kwaśnego* A (↑ PRED)=‘SOUR’  
(ADJ ↑)= %A  
(%A CASE ACC)= –  
(%A CASE DAT)= –  
(%A CASE GEN)= +  
(%A CASE INST)= –  
(%A CASE LOC)= –  
(%A CASE NOM)= –  
(%A CASE VOC)= –

As a consequence, the grammar does not accept the following sentences:

- (55) \*kwaśnego kiwi Janek lubi a Jerzy nienawidzi  
sour.GEN/\*ACC kiwifruit.ACC/GEN Janek.NOM likes and Jerzy.NOM hates  
‘Sour kiwifruit, Janek likes and Jerzy hates.’
- (56) \*Janek lubi a Jerzy nienawidzi kwaśne kiwi  
Janek.NOM likes and Jerzy.NOM hates sour.ACC/\*GEN kiwifruit.ACC/GEN  
‘Janek likes and Jerzy hates sour kiwifruit.’

These examples were constructed so as to rule out the possibility where the sentence might be accepted because the shared dependent satisfies the requirements of the closer verbal conjunct. In (55) the shared object *kwaśnego kiwi* containing an unambiguously genitive modifier *kwaśnego* is on the left edge of the sentence, so it is closer to the verb *lubi* that requires accusative case from its object (as structural case in absence of sentential negation). By contrast, in (56) the shared object *kwaśne kiwi* containing the

modifier *kwaśne* that cannot be interpreted as genitive is placed on the right edge of the sentence, so the shared object is closer to the verb *nienawidzi* which requires genitive case from its object.

When the noun *kiwi* is modified by the adjective *kwaśnego*, as in (55), *kiwi* gets a positive value of GEN, while all remaining cases get a negative value, as specified in (54). As a result, the NP *kwaśnego kiwi* cannot satisfy the requirements of LUBIĆ which takes an accusative object (when sentential negation is absent). As shown in (57), this results in inconsistency: ACC has two conflicting values.

$$(57) \left[ \left[ \begin{array}{l} \text{PRED 'LIKE' } \langle \boxed{1}, \boxed{2} \rangle \\ \text{SUBJ } \boxed{1} \left[ \begin{array}{l} \text{PRED 'JANEK'} \\ \text{CASE } [\text{NOM } +] \end{array} \right] \\ \text{OBJ } \boxed{2} \left[ \begin{array}{l} \text{PRED 'KIWIFRUIT'} \\ \text{CASE } \left[ \begin{array}{l} \text{ACC } + \neq - \\ \text{DAT } - \\ \text{GEN } + \\ \text{INST } - \\ \text{LOC } - \\ \text{NOM } - \\ \text{VOC } - \end{array} \right] \\ \text{ADJ } \{ \boxed{5} [\text{PRED 'SOUR'}] \} \end{array} \right] \end{array} \right], \left[ \begin{array}{l} \text{PRED 'HATE' } \langle \boxed{3}, \boxed{4} \rangle \\ \text{SUBJ } \boxed{3} \left[ \begin{array}{l} \text{PRED 'JERZY'} \\ \text{CASE } [\text{NOM } +] \end{array} \right] \\ \text{OBJ } \boxed{4} \left[ \begin{array}{l} \text{PRED 'KIWIFRUIT'} \\ \text{CASE } \left[ \begin{array}{l} \text{ACC } - \\ \text{DAT } - \\ \text{GEN } + \\ \text{INST } - \\ \text{LOC } - \\ \text{NOM } - \\ \text{VOC } - \end{array} \right] \\ \text{ADJ } \{ \boxed{5} \} \end{array} \right] \end{array} \right] \right] \right] \\ \text{CONJ AND}$$

Similarly, when *kiwi* is modified by *kwaśne*, as in (56), *kiwi* can have a positive value of NOM, ACC or VOC, while all remaining cases get a negative value, as specified in (53). As a consequence, the NP *kwaśne kiwi* cannot satisfy the requirements of NIENAWIDZIĆ which takes a genitive object. As shown in (58), this also results in inconsistency: this time GEN has two conflicting values.

$$(58) \left[ \left[ \begin{array}{l} \text{PRED 'LIKE' } \langle \boxed{1}, \boxed{2} \rangle \\ \text{SUBJ } \boxed{1} \left[ \begin{array}{l} \text{PRED 'JANEK'} \\ \text{CASE } [\text{NOM } +] \end{array} \right] \\ \text{OBJ } \boxed{2} \left[ \begin{array}{l} \text{PRED 'KIWIFRUIT'} \\ \text{CASE } \left[ \begin{array}{l} \text{ACC } + \\ \text{DAT } - \\ \text{GEN } - \\ \text{INST } - \\ \text{LOC } - \end{array} \right] \\ \text{ADJ } \{ \boxed{5} [\text{PRED 'SOUR'}] \} \end{array} \right] \end{array} \right], \left[ \begin{array}{l} \text{PRED 'HATE' } \langle \boxed{3}, \boxed{4} \rangle \\ \text{SUBJ } \boxed{3} \left[ \begin{array}{l} \text{PRED 'JERZY'} \\ \text{CASE } [\text{NOM } +] \end{array} \right] \\ \text{OBJ } \boxed{4} \left[ \begin{array}{l} \text{PRED 'KIWIFRUIT'} \\ \text{CASE } \left[ \begin{array}{l} \text{ACC } + \\ \text{DAT } - \\ \text{GEN } + \neq - \\ \text{INST } - \\ \text{LOC } - \end{array} \right] \\ \text{ADJ } \{ \boxed{5} \} \end{array} \right] \end{array} \right] \right] \right] \\ \text{CONJ AND}$$

Finally, in order to better understand how this analysis of case works, it is worth noting that the grammar will accept the sentence in (59), producing the well-formed f-structure representation in (60). This is due to the fact that while the nominal object *kiwi* is shared by coordinated verbal phrases in (59), the adjectival modifiers that have conflicting case requirements belong to different clauses headed by the relevant verbs – unlike in (55)–(56) where the shared object included a shared modifier.

- (59) Kiwi Janek lubi słodkie a Jerzy nienawidzi kwaśnego  
 kiwifruit.ACC/GEN Janek.NOM likes sweet.ACC/\*GEN and Jerzy.NOM hates sour.GEN/\*ACC  
 ‘Kiwifruit, Janek likes sweet and Jerzy hates sour.’

$$(60) \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'LIKE' } \langle \boxed{1}, \boxed{2} \rangle \\ \text{SUBJ } \boxed{1} \left[ \begin{array}{c} \text{PRED 'JANEK'} \\ \text{CASE [NOM +]} \end{array} \right] \\ \text{OBJ } \boxed{2} \left[ \begin{array}{c} \text{PRED 'KIWIFRUIT'} \\ \text{CASE } \left[ \begin{array}{c} \text{ACC +} \\ \text{DAT -} \\ \text{GEN -} \\ \text{INST -} \\ \text{LOC -} \end{array} \right] \\ \text{ADJ } \left\{ \left[ \text{PRED 'SWEET'} \right] \right\} \end{array} \right] \end{array} \right] \\ \text{CONJ AND} \end{array} \right], \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'HATE' } \langle \boxed{3}, \boxed{4} \rangle \\ \text{SUBJ } \boxed{3} \left[ \begin{array}{c} \text{PRED 'JERZY'} \\ \text{CASE [NOM +]} \end{array} \right] \\ \text{OBJ } \boxed{4} \left[ \begin{array}{c} \text{PRED 'KIWIFRUIT'} \\ \text{CASE } \left[ \begin{array}{c} \text{ACC -} \\ \text{DAT -} \\ \text{GEN +} \\ \text{INST -} \\ \text{LOC -} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \\ \text{ADJ } \left\{ \left[ \text{PRED 'SOUR'} \right] \right\} \end{array} \right] \end{array} \right] \end{array} \right]$$

According to the lexical entry of *kiwi* in (50), this form is compatible with any case: it does not introduce any negative case constraints. The adjective *słodkie* introduces the same case constraints as *kwaśne* in (53), so it can be used to modify accusative nominals, while it cannot modify genitive nominals. Since in (59) this adjectival modifier exclusively belongs to the clause headed by the verb *lubi* which requires accusative case from its object (as structural case in absence of sentential negation), there is no conflict with case requirements of the second verb, *nienawidzi*, which requires a genitive object that would not be compatible with accusative *słodkie*. Similarly, the unambiguously genitive adjective *kwaśnego* (see the lexical entry in (54)) exclusively belongs to the clause headed by the verb *nienawidzi* that requires genitive case from its object, so there is no conflict with the positive specification for accusative case required by the verb *lubi* in the first conjunct, which would not be compatible with modification by genitive *kwaśnego*.

### 3.4 The challenge: coordinated prepositions with a shared object

Let us now consider this state-of-the-art analysis of case (Dalrymple et al. 2009) in the context of the phenomenon which is the focus of this paper: coordination of prepositions in Polish with a shared object.

Let us start with (61), which is a modified version of (12) (without the modifier):

- (61) po (i podczas) meczu  
 after.LOC and during.GEN match.GEN/LOC  
 'after (and during) the match'

Even though the coordinated prepositions select for different cases (locative and genitive), (61) is grammatical, because the shared object *meczu* is a syncretic form (genitive/locative/vocative), which is formalised in its lexical entry in (62):

- (62) *meczu* N (↑ PRED)='MATCH'  
 (↑ CASE ACC)= -  
 (↑ CASE DAT)= -  
 (↑ CASE {GEN|LOC|VOC})= +  
 (↑ CASE INST)= -  
 (↑ CASE NOM)= -

Let us assume the following lexical entries for semantic prepositions used in (61):

- (63) *podczas* P (↑ PRED)='DURING<(↑ OBJ)>'  
 (↑ OBJ CASE GEN)= +

- (64) *po* P ( $\uparrow$  PRED)=‘AFTER<( $\uparrow$  OBJ)>’  
 ( $\uparrow$  OBJ CASE LOC)= +

The analysis of case of Dalrymple et al. (2009) can account for examples such as (61) out of the box, producing the f-structure in (65):

- (65) 
$$\left[ \left[ \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \\ \text{CASE } \begin{bmatrix} \text{ACC} - \\ \text{DAT} - \\ \text{INST} - \\ \text{LOC} + \\ \text{NOM} - \end{bmatrix} \end{array} \right] \left[ \begin{array}{c} \text{PRED 'MATCH'} \\ \text{ACC} - \\ \text{DAT} - \\ \text{GEN} + \\ \text{INST} - \\ \text{NOM} - \end{array} \right] \right], \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \boxed{2} \rangle \\ \text{OBJ } \boxed{2} \\ \text{CASE } \begin{bmatrix} \text{ACC} - \\ \text{DAT} - \\ \text{GEN} + \\ \text{INST} - \\ \text{NOM} - \end{bmatrix} \end{array} \right] \right] \right] \\ \text{CONJ AND}$$

However, the original example, (12) repeated below as (66), cannot be handled by this analysis out of the box, because the adjective *niedzielnego* ‘Sunday’ specifies the nominal head that it modifies as unambiguously genitive (see the lexical entry in (67)) – this clashes with the constraint imposed by the preposition *po* which specifies its object as locative (see (64)), resulting in inconsistency due to the fact that LOC has two conflicting values (+ from (64) and – from (67)), as shown in the f-structure in (68):

- (66) *po (i podczas) niedzielnego meczu*  
 after.LOC and during.GEN Sunday.GEN/\*LOC match.GEN/LOC  
 ‘after (and during) the Sunday match’ (Google)

- (67) *niedzielnego* A ( $\uparrow$  PRED)=‘SUNDAY’  
 (ADJ  $\uparrow$ )= %A  
 (%A CASE ACC)= –  
 (%A CASE DAT)= –  
 (%A CASE GEN)= +  
 (%A CASE INST)= –  
 (%A CASE LOC)= –  
 (%A CASE NOM)= –  
 (%A CASE VOC)= –

- (68) 
$$\left[ \left[ \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \\ \text{CASE } \begin{bmatrix} \text{ACC} - \\ \text{DAT} - \\ \text{GEN} + \\ \text{INST} - \\ \text{LOC} + \neq - \\ \text{NOM} - \\ \text{VOC} - \end{bmatrix} \\ \text{ADJ } \{ \boxed{3} [\text{PRED 'SUNDAY'}] \} \end{array} \right] \left[ \begin{array}{c} \text{PRED 'MATCH'} \\ \text{ACC} - \\ \text{DAT} - \\ \text{GEN} + \\ \text{INST} - \\ \text{NOM} - \\ \text{VOC} - \end{array} \right] \right], \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \boxed{2} \rangle \\ \text{OBJ } \boxed{2} \\ \text{CASE } \begin{bmatrix} \text{ACC} - \\ \text{DAT} - \\ \text{GEN} + \\ \text{INST} - \\ \text{LOC} - \\ \text{NOM} - \\ \text{VOC} - \end{bmatrix} \\ \text{ADJ } \{ \boxed{3} \} \end{array} \right] \right] \right] \\ \text{CONJ AND}$$

This is problematic, because the modifier imposing the relevant case constraints cannot be analysed as syncretic (so that it could be compatible with the nominal that it modifies which can satisfy constraints imposed by both prepositions, as in (61)). This phenomenon seems to show that in Polish it is acceptable

for a nominal (and, by extension, its modifiers) to satisfy only the case constraints imposed by the nearest preposition, as in (66), while the case requirements of the more distant prepositions can be ignored.

It does not seem feasible to claim that such examples involve a grammaticality illusion: the distance between the prepositions is negligible, so the speaker/hearer definitely remembers both prepositions which are immediately followed by the shared object.

Also, it does not seem feasible to claim that such examples are acceptable due to the fact that certain combinations of prepositions (such as *PO* and *PODCZAS*) are grammatical with certain nominals (such as *meczu* in (61)) that are syncretic between relevant cases required by these prepositions. As shown in (66), modifiers with unambiguous case requirements do not make such examples ungrammatical.

Furthermore, such examples are acceptable with nominals which do not display case syncretism (without the need to use a modifier to disambiguate the case of the head it modifies), as shown below:

- (69) *po (i podczas) spotkania*  
 after.LOC and during.GEN meeting.GEN/\*LOC  
 'after (and during) the meeting'
- (70) *po spotkaniu/\*spotkania*  
 after.LOC meeting.LOC/\*GEN  
 'after the meeting'
- (71) *podczas spotkania/\*spotkaniu*  
 during.GEN meeting.GEN/\*LOC  
 'during the meeting'

Next, there are combinations of prepositions (such as in (72), repeated from (1), where *PRZED* requires instrumental case and *PO* requires locative case) that do not have any matching syncretic nominal forms apart from a relatively small group of nouns such as *kiwi* 'kiwifruit' or *emu* 'emu' which are syncretic for all cases. Since relevant examples with nouns belonging to this small group are relatively rare, it would be difficult to claim that speakers learn that such combinations of prepositions requiring different cases are acceptable on the basis of their use with such highly syncretic nominal forms.

- (72) *przed i po wyborach*  
 before.INST and after.LOC elections.LOC/\*INST  
 'before and after the election' (NKJP)

While the lexical entry of the preposition *PRZED* requires its object to be marked for instrumental case, as in (73), the lexical entry of the preposition *PO* requires a locative object, see (64).

- (73) *przed* P (↑ PRED)='BEFORE<(↑ OBJ)>'  
 (↑ OBJ CASE INST)= +

Since the form *wyborach* is unambiguously locative, its lexical entry given in (74) contains a positive specification for locative, while all other cases have negative specifications.

- (74) *wyborach* N (↑ PRED)='ELECTION'  
 (↑ CASE ACC)= –  
 (↑ CASE DAT)= –  
 (↑ CASE GEN)= –  
 (↑ CASE INST)= –  
 (↑ CASE LOC)= +  
 (↑ CASE NOM)= –  
 (↑ CASE VOC)= –

As a consequence, the f-structure corresponding to (72) is inconsistent because *INST* has two conflicting values (+ from (73) and – from (74)), as shown in (75):

$$(75) \left[ \left[ \left[ \begin{array}{c} \text{PRED 'BEFORE' } \langle 1 \rangle \\ \text{OBJ } [1] \\ \text{CASE } \left[ \begin{array}{c} \text{ACC } - \\ \text{DAT } - \\ \text{GEN } - \\ \text{INST } + \neq - \\ \text{LOC } + \\ \text{NOM } - \\ \text{VOC } - \end{array} \right] \end{array} \right] \text{PRED 'ELECTION' } \right] \text{PRED 'AFTER' } \langle 2 \rangle \right] \text{OBJ } [2] \text{CASE } \left[ \begin{array}{c} \text{ACC } - \\ \text{DAT } - \\ \text{GEN } - \\ \text{INST } - \\ \text{LOC } + \\ \text{NOM } - \\ \text{VOC } - \end{array} \right] \text{PRED 'ELECTION' } \right] \text{CONJ AND} \right]$$

#### 4 A similar case: single conjunct agreement?

Examples presented so far seem to show that in Polish it is possible for the shared nominal object to be marked for the case which is appropriate only for the closest preposition – rather than for each of the coordinated prepositions. Similar phenomena are well-known in the domain of agreement, namely single conjunct agreement (SCA; Kuhn & Sadler 2007, Dalrymple & Hristov 2010) where the agreement target can agree not only with the resolved features of the entire coordinate phrase, but also with a single conjunct, typically the closest conjunct (CCA).

When discussing SCA and agreement in general, the element which controls agreement is referred to as the agreement controller, while the element which displays the relevant agreement effects is referred to as the agreement target. In the context of subject-verb agreement, the subject is the agreement controller and the verb is the agreement target. In Polish, when the subject is coordinated, the verb can agree with a single conjunct of the subject, as in (76) where *szedł* is a third person singular masculine form which agrees with *Janek*, or with the resolved features of the entire coordinated subject (*Janek i Marysia*), as shown in (77) where *szli* is a third person plural masculine form.

- (76) Szedł Janek i Marysia.  
 walked.3.SG.M1 John.NOM.SG.M1 and Mary.NOM.SG.F  
 ‘Janek and Marysia walked.’
- (77) Szli Janek i Marysia.  
 walked.3.PL.M1 John.NOM.SG.M1 and Mary.NOM.SG.F  
 ‘Janek and Marysia walked.’

##### 4.1 Formalisation: rightmost/leftmost conjunct

In LFG, there is abundant literature on single conjunct agreement, presenting many different approaches to this phenomenon (Sadler 1999, Kuhn & Sadler 2007, Dalrymple & Hristov 2010). At a high level, simplifying greatly, an LFG analysis of SCA involves selecting an appropriate conjunct of the agreement controller for the agreement target to agree with. Since in most cases SCA involves agreeing with the closest conjunct, let us focus on this. In order to select the conjunct closest to the agreement target, their relative positions must be taken into consideration – this is schematically shown below:

- (78) [CONTROLLER<sub>L</sub> & CONTROLLER<sub>R</sub>] TARGET
- (79) TARGET [CONTROLLER<sub>L</sub> & CONTROLLER<sub>R</sub>]

When the agreement controller precedes the agreement target, as in (78), the rightmost conjunct of the agreement controller (CONTROLLER<sub>R</sub>) is closest to the agreement target. By contrast, when the agreement target precedes the agreement controller, as in (79), the leftmost conjunct of the agreement controller (CONTROLLER<sub>L</sub>) is closest to the agreement target.

In LFG, coordination is modelled using sets: conjuncts are elements of a set corresponding to the coordinate structure as a whole. Since sets are unordered, part of the difficulty in accounting for single conjunct agreement is selecting the appropriate element of the set. As the  $\in$  designator picks an element of the set non-deterministically, it is not possible to select the first or last set element in this way. In order to achieve this, state-of-the-art analyses of SCA such as Dalrymple & Hristov (2010) use f-precedence (functional precedence),<sup>10</sup> which makes it possible to state that a certain f-structure precedes another f-structure based on their relative c-structure positions. In the context of SCA, f-precedence is used to establish precedence relations between elements of a set: it makes it possible to select the leftmost element of the set (one that is not preceded by any set element:  $f_L$  defined in (80)), as well as the rightmost element (one that is not followed by any set element:  $f_R$  defined in (81)).

$$(80) \quad f_L \equiv f \quad \in^* \quad : \neg(f_L \in) \\ \neg[(\leftarrow \in) <_f \rightarrow]$$

$$(81) \quad f_R \equiv f \quad \in^* \quad : \neg(f_R \in) \\ \neg[(\leftarrow \in) >_f \rightarrow]$$

In (80)  $f$  is a path, the designator  $\in$  non-deterministically picks a set element belonging to the f-structure  $f$ . Since  $\in$  is followed by  $*$  (Kleene star), the picked set element can be embedded. For instance, in a schematic example of embedded coordination such as  $[[A \text{ and } B] \text{ and } [C \text{ and } D]]$ <sup>11</sup> represented as in (82),  $\in$  can only pick one of two complex set elements: (83), the set containing A and B, or (84), the set containing C and D. By contrast,  $\in \in$  can pick one of 4 simple set elements in (82): A, B, C or D.

$$(82) \quad \left[ \left\{ \left[ \begin{array}{c} \{A, B\} \\ \text{CONJ AND} \end{array} \right], \left[ \begin{array}{c} \{C, D\} \\ \text{CONJ AND} \end{array} \right] \right\} \right] \quad (83) \quad \left[ \begin{array}{c} \{A, B\} \\ \text{CONJ AND} \end{array} \right] \quad (84) \quad \left[ \begin{array}{c} \{C, D\} \\ \text{CONJ AND} \end{array} \right]$$

In (80) the line below  $\in^*$ , namely  $\neg[(\leftarrow \in) <_f \rightarrow]$ , is an off-path constraint that applies to the picked set element: it states that there must not be another element of the same set ( $(\leftarrow \in)$ ) that precedes ( $<_f$ ) the picked element ( $\rightarrow$ ) – this constraint ensures that it is the leftmost element of the set. Finally, the constraint following “:”, namely  $\neg(f_L \in)$ , states that the picked set element must not be a coordinate f-structure – this ensures that if coordination is embedded, the leftmost element will be the most deeply embedded element (so A, rather than [A and B], in the schematic example of coordination in (82)).

(81) is used to pick the rightmost element of the set in an analogous way: the off-path constraint  $\neg[(\leftarrow \in) >_f \rightarrow]$  states that there must not be another element of the same set ( $(\leftarrow \in)$ ) that follows ( $>_f$ ) the picked element ( $\rightarrow$ ) – this ensures that it is the rightmost element. Finally, the constraint  $\neg(f_R \in)$  ensures that the picked element is not a coordinate structure – if coordination is embedded, the rightmost element will be the most deeply embedded element (so D, rather than [C and D] in (82)).

## 4.2 Formalisation: CCA in subject-verb agreement

Let us now briefly consider how the method of selecting the leftmost and rightmost conjuncts presented in (80) and (81) respectively can be used in a formalisation of closest conjunct agreement in the context of subject-verb agreement.

In Polish, the past verb form *szedł* ‘walked’ introduces agreement constraints on number and gender of its subject – the subject must be singular, masculine gender (more precisely M1), as specified below:

$$(85) \quad (\uparrow \text{SUBJ NUM}) =_c \text{SG} \\ (\uparrow \text{SUBJ GEND}) =_c \text{M1}$$

<sup>10</sup>Since f-precedence ( $<_f$ ) is not implemented in XLE, implemented grammars use head precedence ( $<_h$ ) for SCA: <https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/notations.html#N4.2.9>.

<sup>11</sup>A less abstract example would be  $[[\text{Marge and Homer}] \text{ and } [\text{Lisa and Bart}]]$ , where Marge=A, Homer=B, Lisa=C, Bart=D.

The constraint in (85) would be satisfied by the sentence in (86) below, but it would not be satisfied by (76), because the resolved features of the coordinate subject include plural number, as shown in (77).

- (86) Szedł Janek.  
 walked.3.SG.M1 John.NOM.SG.M1  
 ‘Janek walked.’

It is possible to account for closest conjunct agreement in examples such as (76) by modifying the lexical entry of the verb so that agreement constraints such as in (85) can target not only the entire subject (which accounts for resolved agreement under coordination), but also the closest conjunct. This is formalised in (87), where ( $\uparrow$  SUBJ) used in (85) was replaced with the local name %s, whose value can be assigned in 3 different ways, which corresponds to 3 possible ways of selecting the agreement controller:

- (87) (%S NUM)=<sub>c</sub> SG  
 (%S GEND)=<sub>c</sub> M1  
 { %s = ( $\uparrow$  SUBJ)  
 | [%s = ( $\uparrow$  SUBJ)<sub>L</sub>  $\wedge$   $\uparrow$  <<sub>f</sub> ( $\uparrow$  SUBJ  $\in$ )]  
 | [%s = ( $\uparrow$  SUBJ)<sub>R</sub>  $\wedge$  ( $\uparrow$  SUBJ  $\in$ ) <<sub>f</sub>  $\uparrow$ ] }

The value of %s is provided by a disjunction with 3 disjuncts: the first one provides ( $\uparrow$  SUBJ) as the value of %s, so its effect is equivalent to (85) – it triggers agreement with the features of the entire subject, so resolved agreement under coordination, as in (77). The next two disjuncts handle closest conjunct agreement – as mentioned in Section 4.1, which conjunct is the closest depends on the relative position of the subject with respect to the selecting verb. When the verb precedes the subject ( $\uparrow$  <<sub>f</sub> ( $\uparrow$  SUBJ  $\in$ )), the leftmost conjunct is the closest one: %s is ( $\uparrow$  SUBJ)<sub>L</sub> – it is the result of applying (80) to the path ( $\uparrow$  SUBJ). This disjunct makes it possible to account for examples such as (76), selecting *Janek* as the agreement controller. By contrast, when the subject precedes the verb (( $\uparrow$  SUBJ  $\in$ ) <<sub>f</sub>  $\uparrow$ ), the rightmost conjunct is the closest one, so %s is ( $\uparrow$  SUBJ)<sub>R</sub> – it is the result of applying (81) to the path ( $\uparrow$  SUBJ).

### 4.3 Welsh prepositions and CCA

Before we proceed to discussing how data from Polish can be analysed in LFG, it is worth mentioning that prepositions have been discussed in LFG in the context of closest conjunct agreement. As discussed in Sadler (1999), most prepositions in Welsh inflect to agree with their pronominal object; when the object is a coordinate structure, prepositions agree with the closest conjunct – when it is a pronoun, see below:

- (88) Roedd Wyn yn siarad amdanat ti a Siôn.  
 was.3.SG Wyn PROG speak about.2.SG 2.SG and Siôn  
 ‘Wyn was talking about you and Siôn.’ (Sadler 1999: ex. (5a))
- (89) Roedd Wyn yn siarad am Siôn a thithau.  
 was.3.SG Wyn PROG speak about Siôn and 2.SG  
 ‘Wyn was talking about Siôn and you.’ (Sadler 1999: ex. (5b))
- (90) Roedd Wyn yn siarad amdanom ni a hwy.  
 was.3.SG Wyn PROG speak about.1.PL 1.PL and 3.PL  
 ‘Wyn was talking about us and them.’ (Sadler 1999: ex. (5c))

Such examples can be handled by using (80) as a way to pick the leftmost conjunct as the closest conjunct of the object for the inflected preposition to agree with (if the picked item is a pronoun).

While Polish examples which are the focus of this paper also involve prepositions and a phenomenon similar to closest conjunct agreement, this is where the similarities end. In Welsh prepositions can inflect to agree in person with their object when it is a pronoun; in Polish prepositions require a certain value of case from their object. In Welsh examples given above there is one preposition, while its nominal

object involves coordination of nouns and pronouns. In Polish examples, what is coordinated are different prepositions that require different values of case from their shared object – a single nominal phrase.

## 5 Analysis

Let us now consider how we can analyse examples such as (15), repeated below as (91):

- (91) przed, podczas i po wydarzeniu  
 before.INST during.GEN and after.LOC event.LOC/\*GEN/\*INST  
 'before, during and after the event' (NKJP)

Lexical entries of prepositions PRZED, PODCZAS and PO used in (91) were given in Section 3.4 in (73), (63) and (64), respectively – these are repeated in (93)–(95) below; they all use the schematic lexical entry for semantic prepositions in (92) where the value of CASE is a feature structure (as discussed in Section 3.3):

- (92) *form* P (↑ PRED)=‘LEMMA<(↑ OBJ)>’  
 (↑ OBJ CASE VALUE)= +
- (93) *przed* P (↑ PRED)=‘BEFORE<(↑ OBJ)>’  
 (↑ OBJ CASE INST)= +
- (94) *podczas* P (↑ PRED)=‘DURING<(↑ OBJ)>’  
 (↑ OBJ CASE GEN)= +
- (95) *po* P (↑ PRED)=‘AFTER<(↑ OBJ)>’  
 (↑ OBJ CASE LOC)= +

(96) is the lexical entry of the nominal form *wydarzeniu* which can be dative or locative:

- (96) *wydarzeniu* N (↑ PRED)=‘EVENT’  
 (↑ CASE ACC)= –  
 (↑ CASE {DAT|LOC})= +  
 (↑ CASE GEN)= –  
 (↑ CASE INST)= –  
 (↑ CASE NOM)= –  
 (↑ CASE VOC)= –

As shown in the resulting f-structure representation of (91) in (97), while the positive specification for LOC in (96) is compatible with the CASE constraint introduced by the preposition PO in (95), the negative specifications for GEN and INST in (96) clash with positive specifications for GEN introduced by the preposition PODCZAS in (94) and for INST introduced by the preposition PRZED in (93).

- (97) 
$$\left[ \left[ \left[ \begin{array}{c} \text{PRED 'BEFORE' } \langle \text{[1]} \rangle \\ \text{OBJ [1]} \left[ \begin{array}{c} \text{PRED 'EVENT'} \\ \text{CASE} \left[ \begin{array}{c} \text{ACC -} \\ \text{GEN -} \\ \text{INST } + \neq - \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \end{array} \right] \right] \end{array} \right], \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \text{[2]} \rangle \\ \text{OBJ [2]} \left[ \begin{array}{c} \text{PRED 'EVENT'} \\ \text{CASE} \left[ \begin{array}{c} \text{ACC -} \\ \text{GEN } + \neq - \\ \text{INST -} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \end{array} \right] \right] \end{array} \right], \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \text{[3]} \rangle \\ \text{OBJ [3]} \left[ \begin{array}{c} \text{PRED 'EVENT'} \\ \text{CASE} \left[ \begin{array}{c} \text{ACC -} \\ \text{GEN -} \\ \text{INST -} \\ \text{LOC +} \\ \text{NOM -} \\ \text{VOC -} \end{array} \right] \end{array} \right] \right] \end{array} \right] \right] \right] \text{ CONJ AND }$$

While under CCA discussed in Section 4 the agreement target can select the closest conjunct of the agreement controller to agree with it (instead of agreeing with the resolved features of the entire coordinate phrase), in Polish examples with coordinated prepositions such as (91) it is the closest preposition whose

case constraints are satisfied by the shared nominal object, while case requirements of the remaining, more distant prepositions can be ignored – without causing ungrammaticality.

This insight can be modelled in LFG using a solution inspired by existing analyses of CCA<sup>12</sup> – the schematic lexical entry for semantic prepositions in (98) is a modified version of (92):

- (98) *form*      P    (↑ PRED)=‘LEMMA<(↑ OBJ)>’  
                               { (↑ OBJ CASE VALUE)= +  
                               | %S = (∈ ↑)  
                               (%S CONJ)  
                               ↑ <<sub>h</sub> (%S ∈)  
                               (↑ OBJ)= (%S OBJ) }

The lexical entry in (98) has two disjuncts: the first one, (↑ OBJ CASE VALUE)= +, is the same as in (92) – it makes it possible for the preposition to assign the relevant value of case to its object. By contrast, the second disjunct does not assign any case – instead, it assigns the path (∈ ↑) to the local name %S and introduces three constraints that restrict when this disjunct can be used: all three must be satisfied. The first constraint, (%S CONJ), ensures that the preposition is part of a coordinate structure (rather than a member of the ADJUNCT set) by checking that there is a conjunction in the hybrid f-structure (%S) containing the set with the preposition. The second constraint, ↑ <<sub>h</sub> (%S ∈), uses head precedence (<<sub>h</sub>)<sup>13</sup> to ensure that the preposition precedes some other element of the set – it follows that the preposition introducing this constraint is not closest to its object. The last constraint, (↑ OBJ)= (%S OBJ), ensures that the object of the preposition introducing this constraint is the object of the coordinate structure (%S) that contains this preposition – as a result, this disjunct can only be used when prepositions are coordinated (so it cannot be used when prepositional phrases are coordinated).

After modifying the lexical entries of all semantic prepositions as in (98), the example in (91) gets the well-formed f-structure representation in (99):

- (99) 
$$\left[ \begin{array}{c} \left\{ \left[ \begin{array}{c} \text{PRED 'BEFORE' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \end{array} \right] \\ \text{CONJ AND} \end{array} \right]$$

In order to produce the f-structure in (99), the lexical entries of the prepositions PRZED and PODCZAS use the second disjunct in the schematic lexical entry in (98) – this is possible because each of these prepositions is followed by another preposition in (91). By contrast, the preposition closest to the shared object in (91), uses the first disjunct of (98) – there are no constraints restricting its use. The case requirements of PO are compatible with its locative object *wydarzeniu* (see (96)), making it possible to produce a well-formed f-structure (instead of the inconsistent f-structure in (97)).

<sup>12</sup> A reviewer suggested an alternative analysis based on c-structure (rather than f-structure) that would use complex categories such as P[right] for the rightmost (or only) preposition that assigns case and P[left] for all prepositions more distant from the object whose case requirements are ignored. While such an analysis could be simpler and less problematic in terms of ambiguity, it seems that it would not be capable of expressing case syncretism in examples such as (61) where the shared object satisfies the case requirements of both prepositions, or examples that involve embedded coordination discussed in Section 5.2.

<sup>13</sup> As mentioned earlier, implemented grammars use <<sub>h</sub> (head precedence) because <<sub>f</sub> (f-precedence) is not implemented in XLE (<https://ling.sprachwiss.uni-konstanz.de/pages/xle/doc/notations.html#N4.2.9>).

## 5.1 Modification

Let us now consider how the analysis proposed in (98) interacts with adjectival modification discussed in Section 3.4 on the basis of example (66), repeated below as (100):

- (100) po (i podczas) niedzielnego meczu  
 after.LOC and during.GEN Sunday.GEN/\*LOC match.GEN/LOC  
 ‘after (and during) the Sunday match’ (Google)

As mentioned in Section 3.4, while the form *meczu* is syncretic between genitive and locative case (see the lexical entry in (62)), the unambiguously genitive adjective *niedzielnego* further restricts the case of the modified noun (as shown in the lexical entry in (67)), which causes a clash with the requirements of the preposition *PO* that takes a locative object (see the lexical entry in (64)). As shown in the f-structure in (68), this leads to inconsistency resulting from the fact that the attribute *LOC* has two conflicting values in the representation of the noun *meczu*: + from the preposition *PO* and – from the modifier *niedzielnego*.

The analysis in (98) does not require any additional mechanisms in order to handle examples with modifiers such as (100). Under the analysis of case as a feature structure discussed in Section 3.3–3.4, adjectives impose restrictions on the value of case of the noun that they modify (see the lexical entry in (67)), so the restricted value of case is directly represented on the noun. As mentioned when discussing the formalisation of the proposed analysis in (98), it makes it possible to ignore case requirements of prepositions that are not closest to their object: this is sufficient to handle examples such as (100) where it is the adjectival modifier, rather than the nominal head itself (compare (61)), that causes incompatibility of case constraints with the preposition that is more distant from the shared nominal object.

As a result, the grammar that uses (98) in the lexical entries of semantic prepositions produces the well-formed f-structure shown in (101) for (100), instead of the inconsistent f-structure in (68):

- (101) 
$$\left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \boxed{1} \rangle \\ \text{OBJ } \boxed{1} \\ \text{CASE } \left[ \begin{array}{c} \text{PRED 'MATCH' } \\ \text{ACC } - \\ \text{DAT } - \\ \text{GEN } + \\ \text{INST } - \\ \text{LOC } - \\ \text{NOM } - \\ \text{VOC } - \end{array} \right] \\ \text{ADJ } \left\{ \boxed{2} \left[ \text{PRED 'SUNDAY' } \right] \right\} \end{array} \right] \right] \end{array} \right]$$
  
 CONJ AND

## 5.2 Embedded coordination

Let us now consider (102), an example that involves embedded coordination, repeated from (19):

- (102) [...] badania były wykonywane podczas czy po lub przed treningami  
 tests were carried out during.GEN or after.LOC or before.INST training.INST  
 ‘[...] the tests were carried out during or after or before training sessions...’ (NKJP)

While both *CZY* and *LUB* are glossed as ‘or’ in (102), because both are used to express disjunction,<sup>14</sup> these are distinct conjunctions that cannot be used interchangeably – this is why these are not translated in the f-structures below. Since *CZY* and *LUB* are distinct conjunctions, it is not possible to analyse (102) as flat

<sup>14</sup>To make things even more interesting, Polish has one more conjunction that can be used to express disjunction: *albo*.

coordination of 3 prepositions (compare (91) and its f-structure in (99)). Instead, coordinated prepositions in (102) must be analysed as embedded coordination that can be structured in two ways.

One possibility is to treat the prepositions *PODCZAS* and *PO* as embedded conjuncts, coordinated using the conjunction *CZY*, while the preposition *PRZED* is a top-level conjunct, coordinated with embedded coordination using the conjunction *LUB*. This possibility is shown using bracketing in (103), while the corresponding f-structure representation is given in (104).

- (103) [[*podczas* *czy* *po*] *lub* *przed*] *treningami*  
           *during.GEN or after.LOC or before.INST training.INST*

- (104) 
$$\left[ \begin{array}{c} \left[ \begin{array}{c} \left\{ \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \text{I} \rangle \\ \text{OBJ } \text{I} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \text{I} \rangle \\ \text{OBJ } \text{I} \end{array} \right] \right\} \\ \text{CONJ CZY} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'BEFORE' } \langle \text{I} \rangle \\ \text{OBJ } \text{I} \end{array} \right] \\ \text{CONJ LUB} \end{array} \right] \left[ \begin{array}{c} \text{PRED 'TRAINING'} \\ \text{CASE} \begin{array}{c} \text{ACC } - \\ \text{DAT } - \\ \text{GEN } - \\ \text{INST } + \\ \text{LOC } - \\ \text{NOM } - \\ \text{VOC } - \end{array} \end{array} \right] \right]$$

The second way of structuring coordinated prepositions in (102) is to treat *PODCZAS* as a top-level conjunct coordinated using the conjunction *CZY* with embedded coordination, where the prepositions *PO* and *PRZED* are coordinated using the conjunction *LUB*. This possibility is shown using bracketing in (105), with the corresponding f-structure given in (106).

- (105) [*podczas* *czy* [*po* *lub* *przed*]] *treningami*  
           *during.GEN or after.LOC or before.INST training.INST*

- (106) 
$$\left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \text{I} \rangle \\ \text{OBJ } \text{I} \end{array} \right], \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \text{I} \rangle \\ \text{OBJ } \text{I} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'BEFORE' } \langle \text{I} \rangle \\ \text{OBJ } \text{I} \end{array} \right] \\ \text{CONJ LUB} \end{array} \right] \\ \text{CONJ CZY} \end{array} \right] \left[ \begin{array}{c} \text{PRED 'TRAINING'} \\ \text{CASE} \begin{array}{c} \text{ACC } - \\ \text{DAT } - \\ \text{GEN } - \\ \text{INST } + \\ \text{LOC } - \\ \text{NOM } - \\ \text{VOC } - \end{array} \end{array} \right] \right]$$

As shown above, (102) involves embedded coordination of prepositions that can be structured in two ways, resulting in two different well-formed f-structures given in (104) and (106). While the analysis formalised in (98) does not require any modifications to produce the f-structure in (106), it cannot<sup>15</sup> produce the f-structure in (104) because the constraints in the second disjunct of (98) only make it possible to reach members of the set that contains the given preposition.

This is not an issue in (106): the first preposition, *PODCZAS* is a member of the top-level set whose other member is a set that contains two other prepositions, *PO* and *PRZED*, so the constraint in (98) requiring that there is some set element that follows *PODCZAS* is satisfied. In the case of the second preposition, *PO*, this requirement is satisfied by *PRZED* that belongs to the same set and follows *PO*.

<sup>15</sup>Many thanks to Adam Przepiórkowski for noticing this problem and very helpful discussion.

By contrast, this limitation of (98) makes it impossible to produce the alternative embedding shown in (104). While the first preposition, *PODCZAS*, satisfies the constraints in the second disjunct of (98), because *PO* is another member of the same set and it follows *PODCZAS*, *PO* cannot satisfy these constraints as there is no other member belonging to the same set that follows *PO*. While *PRZED* linearly follows *PO* in (102), these two prepositions belong to different sets in (104).

In order to obtain the f-structure in (104), the constraints in the second disjunct of (98) must be modified so as to make it possible to reach members of other sets: this can be achieved by replacing  $\in$  with  $\in^+$  in the value of the local name %s, as shown in (107).

- (107) *form*            P    ( $\uparrow$  PRED)=‘LEMMA<( $\uparrow$  OBJ)>’  
                                   { ( $\uparrow$  OBJ CASE VALUE)= +  
                                   | %s = ( $\in^+$   $\uparrow$ )  
                                   (%s CONJ)  
                                    $\uparrow <_h$  (%s  $\in$ )  
                                   ( $\uparrow$  OBJ)= (%s OBJ) }

## 6 Known issues

This section briefly describes two known issues that could not be fully addressed in this paper.

### 6.1 Ambiguity resulting from the CCA-like analysis

Let us return to example (61), repeated below as (108) for the sake of convenience:

- (108) *po*            (*i podczas*) *meczu*  
           after.LOC    and during.GEN match.GEN/LOC  
           ‘after (and during) the match’

As explained in Section 3.4, while the two coordinated prepositions have different case requirements (*PO* takes a locative object, while *PODCZAS* takes a genitive object), their shared nominal object *meczu* can satisfy both these requirements at the same time, because it is a syncretic form (genitive/locative). As a result, the grammar produces the f-structure in (65), repeated below as (109):

- (109) 
$$\left[ \left[ \left[ \begin{array}{c} \text{PRED 'AFTER' } \langle \underline{1} \rangle \\ \text{OBJ } \underline{1} \\ \text{CASE } \begin{bmatrix} \text{ACC} & - \\ \text{DAT} & - \\ \text{INST} & - \\ \text{LOC} & + \\ \text{NOM} & - \end{bmatrix} \end{array} \right] \text{ , } \left[ \begin{array}{c} \text{PRED 'DURING' } \langle \underline{2} \rangle \\ \text{OBJ } \underline{2} \\ \text{CASE } \begin{bmatrix} \text{ACC} & - \\ \text{DAT} & - \\ \text{GEN} & + \\ \text{INST} & - \\ \text{NOM} & - \end{bmatrix} \end{array} \right] \right] \right] \text{ CONJ AND }$$

While there is no need to use the CCA-inspired analysis presented in Section 5 in order to produce a well-formed f-structure for (108), the constraint in (98) is necessary in order to account for examples such as (100), as explained in Section 5.1. It is important to realise that increasing the grammar coverage by making it possible to account for examples such as (100) comes at a cost when analysing examples such as (108). As a result of using the constraint in (98) in the lexical entries of semantic prepositions, the modified grammar will produce two parses for (108), instead of just one parse where both prepositions impose case constraints, as in (109) above. The second, additional parse is the one where the case requirements of the more distant preposition, *PO*, are ignored – this results in the f-structure representation in (110):

$$(110) \left[ \left[ \left[ \begin{array}{c} \text{PRED 'AFTER'(\underline{1})} \\ \text{OBJ } \underline{1} \end{array} \right], \left[ \begin{array}{c} \text{PRED 'DURING'(\underline{1})} \\ \text{OBJ } \underline{1} \end{array} \right] \right], \left[ \begin{array}{c} \text{PRED 'MATCH'} \\ \text{CASE } \left[ \begin{array}{c} \text{ACC } - \\ \text{DAT } - \\ \text{GEN } + \\ \text{INST } - \\ \text{NOM } - \end{array} \right] \end{array} \right] \right] \right]$$

CONJ AND

While the cost of adopting (98) to increase grammar coverage is ambiguity when parsing strings such as in (108), it is worth noting that it is not an instance of spurious ambiguity, because the two f-structures in (109)–(110) are not identical.

## 6.2 Case ambiguity and semantics

Section 6.1 discussed ambiguity resulting from the analysis in (98) that relies on a mechanism inspired by CCA. This section shows that the practical issue related to ambiguity is actually bigger and can quickly become quite serious, and explores how this issue could be addressed.

Let us again consider example (108) discussed in Section 6.1: according to the glosses in (108), the preposition *PO* requires locative case from its object, while *PODCZAS* requires a genitive object. However, while *PODCZAS* is truly unambiguous in that it can only take genitive case, *PO* is more complex, as explained in Section 2 at the beginning of this paper. While it is true that *PO* requires a locative object when it expresses a temporal meaning, as mentioned in Section 2, *PO* can also take a locative object when it expresses a locative/perlative meaning. Since the analysis presented in Section 5 does not take semantics into consideration and neither does the morphological analyser *Morfeusz2* used with the grammar (Krasnowska-Kieraś & Patejuk 2015) that analyses the preposition *PO* as taking accusative or locative case, there will be more ambiguity. Since the noun *meczu* is a syncretic genitive/locative form, the string *po i podczas meczu* in (108) will have 3 parses, rather than just the two discussed in Section 6.1. The third parse is the one where the preposition *PO* takes accusative case but its case requirements are ignored under the CCA-like analysis formalised in (98) in Section 5. Unless additional constraints are introduced in order to express the semantics of the preposition, the f-structure corresponding to this parse would be identical to (110) where *PO* would normally require locative case from its object, but its case requirement was ignored.

It is important to realise that this issue can cause a varying amount of ambiguity, depending on 3 factors: how many cases a given preposition can take, how many prepositions are coordinated, as well as the ordering of coordinated prepositions. To see how this works in practice, let us consider all possibilities that are available when coordinating (as flat coordination, without embedding: as in (15), repeated in (111) below) 3 prepositions discussed earlier: *PRZED* can take an instrumental or accusative object, *PODCZAS* can only take a genitive object and *PO* can take a locative or accusative object.

$$(111) \quad \text{przed,} \quad \text{podczas} \quad \text{i} \quad \text{po} \quad \text{wydarzeniu} \\ \text{before.INST/ACC} \quad \text{during.GEN} \quad \text{and} \quad \text{after.LOC} \quad \text{event.LOC/*GEN/*INST/*ACC}$$

(111) has 2 parses ( $2 \times 1$ ), because *PRZED* whose case requirements need to be ignored can take instrumental or accusative case, while *PODCZAS* whose case requirement is also ignored can only require one case (genitive). Similarly, (112) has 2 parses ( $1 \times 2$ ), because *PODCZAS* can only take genitive case, while *PO* can take locative or accusative case:

$$(112) \quad \text{podczas,} \quad \text{po} \quad \text{i} \quad \text{przed} \quad \text{wydarzeniem} \\ \text{during.GEN} \quad \text{after.LOC/ACC} \quad \text{and} \quad \text{before.INST} \quad \text{event.INST/*LOC/*ACC/*GEN}$$

However, (113) has 4 parses ( $2 \times 2$ ), because case requirements of both *PO* and *PRZED* are ignored and each of these prepositions has 2 alternative case requirements, as shown below:

- (113) po, przed i podczas wydarzenia  
after.LOC/ACC before.INST/ACC and during.GEN event.GEN/\*INST/\*ACC/\*LOC

For the same reason, (114) where the ordering of two first conjuncts is switched, has 4 parses ( $2 \times 2$ ):

- (114) przed, po i podczas wydarzenia  
before.INST/ACC after.LOC/ACC and during.GEN event.GEN/\*LOC/\*ACC/\*INST

Like (111), but with a reversed order of the first two conjuncts, (115) has 2 parses ( $1 \times 2$ ):

- (115) podczas, przed i po wydarzeniu  
during.GEN before.INST/ACC and after.LOC event.LOC/\*INST/\*ACC/\*GEN

Similarly, like (112) but with a reversed order of the first two conjuncts, (116) also has 2 parses ( $2 \times 1$ ):

- (116) po, podczas i przed wydarzeniem  
after.LOC/ACC during.GEN and before.INST event.INST/\*GEN/\*LOC/\*ACC

A potential solution to this issue could involve using an attribute such as PSEM to represent the semantics of the preposition when it requires a given case. While with some prepositions it would be a one-to-one mapping (for instance, PODCZAS can only take genitive case and it can only express a temporal meaning), some prepositions can express more than one meaning with the same case (for example, PO with locative case can express temporal as well as locative/perlative semantics; apart from this, PO can also take accusative case when it expresses purpose). The next step would be to add a constraint in order to ensure that ignoring case requirements of a preposition that is not closest to its object is only allowed when this preposition has the same semantics as other coordinated prepositions.

## 7 Conclusion

This paper offered an LFG analysis of a phenomenon occurring in Polish where prepositions that have different case requirements are coordinated and their shared object is marked for a case that is appropriate only for the closest preposition, while it is not appropriate for the more distant prepositions. Such examples cannot be explained by case syncretism, which is a challenge to existing analyses of case in LFG. The fact that such examples are acceptable is interesting, because normally – outside of coordination – violating case requirements of a preposition results in stark ungrammaticality. The proposed LFG analysis inspired by earlier analyses of CCA was implemented and tested in XLE. Some outstanding issues that are left for future research were discussed in Section 6.

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# Mixed agreement vs. case assignment patterns

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## 1 Introduction

Agreement and case assignment seem to be two very different phenomena. When two constituents agree, they usually agree in all appropriate morphosyntactic features. For example, in many languages adjectives and nouns agree in all the features they share, e.g., in various Slavic languages, in number, gender, and case. By contrast, case assignment – whether it is conditioned by configurational, functional, lexical, or semantic factors (see Butt & King 2003, 2004, as well as King 1995: §8.1, and Butt 2023: §7, for summaries) – results in the exponence of a specific grammatical case, but it does not depend on the presence of another constituent bearing the same case value. In some syntactic constructions, both phenomena may be observed, as in many nominative-accusative languages, where subject-verb agreement in  $\phi$  features (i.e., number, gender, and – where applicable – person) is accompanied by the nominative case assignment to the subject.

However, there are constructions that display a more complex interplay of agreement and case assignment. One such construction, studied in various frameworks (see section 5 for literature overview), but not in Lexical Functional Grammar (LFG; Bresnan 1982, Bresnan et al. 2016, Dalrymple et al. 2019, Dalrymple 2023), is the numeral-noun construction (NNC) in North Slavic languages.<sup>1</sup> This is illustrated in table 1, which shows forms of two numeral phrases, differing in the gender of the noun, in various case positions: *pjat’stul’ev* ‘five chairs.M’ and *pjat’krovatej* ‘five beds.F’.<sup>2</sup>

Table 1: Russian numeral-noun constructions

| position | ‘five chairs’         |                          | ‘five beds’           |                            |
|----------|-----------------------|--------------------------|-----------------------|----------------------------|
|          | ‘five’                | ‘chairs.M’               | ‘five’                | ‘beds.F’                   |
| NOM      | <i>pjat’.PL.NOM</i>   | <i>stul’ev.PL.M.GEN</i>  | <i>pjat’.PL.NOM</i>   | <i>krovatej.PL.F.GEN</i>   |
| ACC      | <i>pjat’.PL.ACC</i>   | <i>stul’ev.PL.M.GEN</i>  | <i>pjat’.PL.ACC</i>   | <i>krovatej.PL.F.GEN</i>   |
| GEN      | <i>pjati.PL.GEN</i>   | <i>stul’ev.PL.M.GEN</i>  | <i>pjati.PL.GEN</i>   | <i>krovatej.PL.F.GEN</i>   |
| DAT      | <i>pjati.PL.DAT</i>   | <i>stuljam.PL.M.DAT</i>  | <i>pjati.PL.DAT</i>   | <i>krovatjam.PL.F.DAT</i>  |
| LOC      | <i>pjati.PL.LOC</i>   | <i>stuljax.PL.M.LOC</i>  | <i>pjati.PL.LOC</i>   | <i>krovatjax.PL.F.LOC</i>  |
| INS      | <i>pjat’ju.PL.INS</i> | <i>stuljami.PL.M.INS</i> | <i>pjat’ju.PL.INS</i> | <i>krovatjami.PL.F.INS</i> |

In nominative and accusative positions, the noun occurs in the genitive case. While both the numeral and the noun are plural (as can be verified by the forms of agreeing adjectives, not shown here), it is not

<sup>1</sup>Slavic languages are traditionally subdivided into East Slavic (e.g., Russian, Ukrainian), West Slavic (e.g., Czech, Polish), and South Slavic (e.g., Bulgarian, Croatian), with the less established term ‘North Slavic’ sometimes used to refer jointly to East and West varieties.

<sup>2</sup>All abbreviations used in this paper follow the Leipzig Glossing Rules, with the addition of COLL to mark collective numerals.

clear whether this is true agreement, as in this construction neither form can be put in the singular to test whether the other would follow suit. Similarly, in line with the robust generalization that Russian gender is neutralized in the plural, the form of the numeral does not depend on the gender of the noun: the two columns of table 1 labelled ‘five’ are identical. In short, only case assignment is evident in NOM and ACC rows.

By contrast, in dative, locative, and instrumental positions, the noun and the numeral agree at least in case: both occur in the case appropriate for the syntactic position of the NNC. That is, only agreement is evidenced in DAT, LOC, and INS rows. (In the case of GEN, the data is interpretable as either assignment or agreement – or both.)

In terms of Babby (1987), Russian NNCs display a homogeneous pattern in the oblique cases (GEN, DAT, LOC, INS) and a heterogeneous pattern in the direct cases (NOM, ACC). In our terms, table 1 illustrates a mixed agreement vs. case assignment pattern – a MACA pattern in short. The problem with MACA constructions is that they cannot be simply described as always involving agreement or as always involving case assignment or as always involving both; which of these phenomena is observed depends on the case position of the whole construction.

Polish presents additional complications. One that is ignored in this paper is that, in nominative positions, the numeral bears the accusative – see, e.g., Przepiórkowski (1999, 2004), as well as Przepiórkowski & Patejuk (2012) for an LFG analysis. The other complication is that, unlike in Russian, some agreement is clear even in the direct case positions, as illustrated in table 2 with case paradigms for the masculine *pięciu chłopców* ‘five.M boys.M’ and the feminine *pięć dziewczyn* ‘five.F girls.F’.<sup>3</sup>

Table 2: Polish numeral-noun constructions

| position | ‘five boys’               |                            | ‘five girls’              |                               |
|----------|---------------------------|----------------------------|---------------------------|-------------------------------|
|          | ‘five.M’                  | ‘boys.M’                   | ‘five.F’                  | ‘girls.F’                     |
| NOM      | <i>pięciu</i> .PL.M.ACC   | <i>chłopców</i> .PL.M.GEN  | <i>pięć</i> .PL.F.ACC     | <i>dziewczyn</i> .PL.F.GEN    |
| ACC      | <i>pięciu</i> .PL.M.ACC   | <i>chłopców</i> .PL.M.GEN  | <i>pięć</i> .PL.F.ACC     | <i>dziewczyn</i> .PL.F.GEN    |
| GEN      | <i>pięciu</i> .PL.M.GEN   | <i>chłopców</i> .PL.M.GEN  | <i>pięciu</i> .PL.F.GEN   | <i>dziewczyn</i> .PL.F.GEN    |
| DAT      | <i>pięciu</i> .PL.M.DAT   | <i>chłopcom</i> .PL.M.DAT  | <i>pięciu</i> .PL.F.DAT   | <i>dziewczynom</i> .PL.F.DAT  |
| LOC      | <i>pięciu</i> .PL.M.LOC   | <i>chłopcach</i> .PL.M.LOC | <i>pięciu</i> .PL.F.LOC   | <i>dziewczynach</i> .PL.F.LOC |
| INS      | <i>pięcioma</i> .PL.M.INS | <i>chłopcami</i> .PL.M.INS | <i>pięcioma</i> .PL.F.INS | <i>dziewczynami</i> .PL.F.INS |

As mentioned above, a given construction may display both case assignment and agreement in all shared features (as, again, in subject-verb constructions in nominative-accusative languages). However, what is observed in Polish MACA patterns in NOM and ACC rows is case assignment of the genitive accompanied by agreement in only some of the morphosyntactic features shared by the noun and the numeral: certainly gender, but apparently not case (with the status of number less clear).

The aim of this paper is to propose and contrast two analyses of North Slavic NNCs: derivational in section 2 and LFG in section 3. That is, this paper is in the spirit of King (1995), which proposed derivational and LFG accounts of syntactic aspects of information structure. While most of the data discussed in sections 2 and 3 is well known (with the exception of the ‘something interesting’ idiosyncrasy), section 4 presents new data concerning collective numerals, uniformly ignored by previous analyses

<sup>3</sup>In Polish structuralist linguistics, 5 gender values are assumed (Mańczak 1956), including – apart from feminine and neuter – three masculine: human (M1), animate (M2), and inanimate (M3). (The names of these genders are a little misleading, as many M2 nouns are inanimate and some are human.) The difference in the numeral forms illustrated in table 2 is between M1 and the other four genders. For this reason, a human masculine noun, *chłopiec* ‘boy’, is used in the Polish table. However, in the Russian table, using such an animate noun would reveal – and necessitate explaining – additional complications of Russian to do with the fact that masculine animate direct objects are in the genitive instead of the expected accusative. Hence the difference in lexical items used in tables 1 and 2.

(with the exception of Przepiórkowski 1999: §5.3.2.2) and – perhaps not coincidentally – at first sight incompatible with those analyses. I will show that the usually expressed generalizations concerning Polish collective numerals are wrong and that the actual empirical facts are amenable to the Minimalist (Chomsky 1995b, 2000) analysis of section 2, as well as the LFG analysis of section 3. In section 5, the proposed analyses are briefly compared to previous work, and section 6 concludes.

## 2 Minimalist analysis

### 2.1 Main ideas

The Minimalist analysis of NNCs sketched here, presented in much more detail in Przepiórkowski (2025), is based on the following theoretical ideas, which are relatively framework-neutral in the sense that they may in principle be formalized in various frameworks, including LFG, as shown in section 3 below.

First, regardless of the syntactic position or the case assigned to that position, NNCs always involve both agreement, as if numerals were adjectives, and the assignment of the genitive case to the noun, as if numerals were themselves nouns. This is justified diachronically, given that Slavic numerals evolved from adjectives (low – i.e., paucal – numerals) and from nouns (high numerals), and that they share various properties of these two classes to various degrees (see, e.g., Corbett 1978 and much subsequent literature). This is also in line with the behaviour of Polish NNCs, where both overt gender agreement and genitive assignment are witnessed in the same (direct) positions.

However, I assume that relevant numerals and nouns agree fully, not only in gender, but also in number and, importantly, case. This means that nouns may bear two case values in NNCs: that resulting from agreement and the assigned genitive. For example, the overtly genitive noun *dziewczyn* ‘girls’ in the ACC row of table 2 actually bears both GEN and ACC, and the overtly instrumental form *dziewczynami* in the INS row actually bears both GEN and INS. In the Minimalist literature, this situation is sometimes referred to as *covert case stacking* (Richards 2013, Pesetsky 2013).

Second, which of the covertly stacked cases is overtly expounded is regulated by explicit exponence principles. I adopt here the rule assumed in Matushansky (2008) (cf. Ionin & Matushansky 2018: 185), namely: *expose the most marked case*.<sup>4</sup> Matushansky (2008) proposes this rule on the basis of case assigned to nominal predicates in Finnish and additionally justifies it with Russian NNCs, foreshadowing crucial aspects of the analysis proposed here. Additionally, Grishin (2024) applies it to Gothic free relatives.

Third, case markedness is not stipulated but it is derived on the basis of systematic syncretisms and morphological containments (e.g., Caha 2009, Smith et al. 2019; cf. Blake 2001). In particular, Caha (2009) argues at length, on the basis of phenomena independent of those discussed in the current paper, for the following case hierarchy for Slavic (and universally):<sup>5</sup>

- (1) NOM < ACC < GEN < LOC < DAT < INS (Caha 2009)

Note that the first idea (numerals having properties of both nouns and adjectives) directly reflects empirical observations and diachronic developments, while the other two ideas (the *expose the most marked* rule and the specific case markedness hierarchy in (1)) are motivated independently of the phenomena at hand. Together, they immediately account for MACA patterns observed in tables 1 and 2: given that GEN is more marked than NOM and ACC, it is expounded on the noun in nominative and accusative positions; by contrast, DAT, LOC, and INS are more marked than GEN, so they are expounded in oblique positions.<sup>6</sup>

<sup>4</sup>See Przepiórkowski (2025) for refinements necessitated by Russian paucals and Estonian pseudopartitives.

<sup>5</sup>As is usual, I ignore the vocative, as its case status is not clear (cf. Blake 2001: §1.2.3).

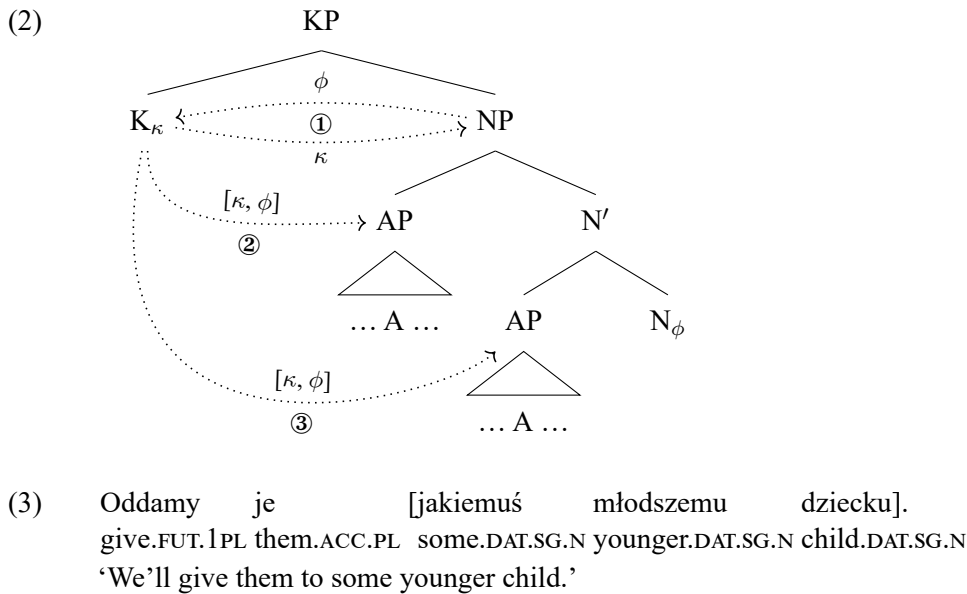
<sup>6</sup>One of the reviewers wonders how this analysis could be extended to Russian paucal numerals, which display a considerably more complex pattern; such an extension, but only in Minimalist terms, is proposed in Przepiórkowski (2025).

## 2.2 Technicalities

### 2.2.1 Concord

The account of NNCs proposed in Przepiórkowski (2025) is based on a novel approach to nominal concord. Current Minimalist theories of concord, such as Norris (2014, 2018) or Bayırılı (2017), postulate a number of feature percolation operations specific to concord – upward percolation of some features, e.g.,  $\phi$ , and downward percolation of others, e.g., case – which goes against the Minimalist aim to avoid such specialized operations. By contrast, the operation responsible for concord in Przepiórkowski (2025) is Agree, which is also responsible for other instances of agreement. A recent approach to Agree is assumed (Deal 2015, 2024, Clem & Deal 2024), on which a single probe may Agree with multiple accessible goals (so-called *insatiable Agree*). A possible side effect of Agree is flagging, i.e., marking goals with a specific case or with a specific feature bundle.

The schematic tree in (2), which corresponds to the bracketed nominal phrase in (3), illustrates this account of concord.<sup>7</sup>



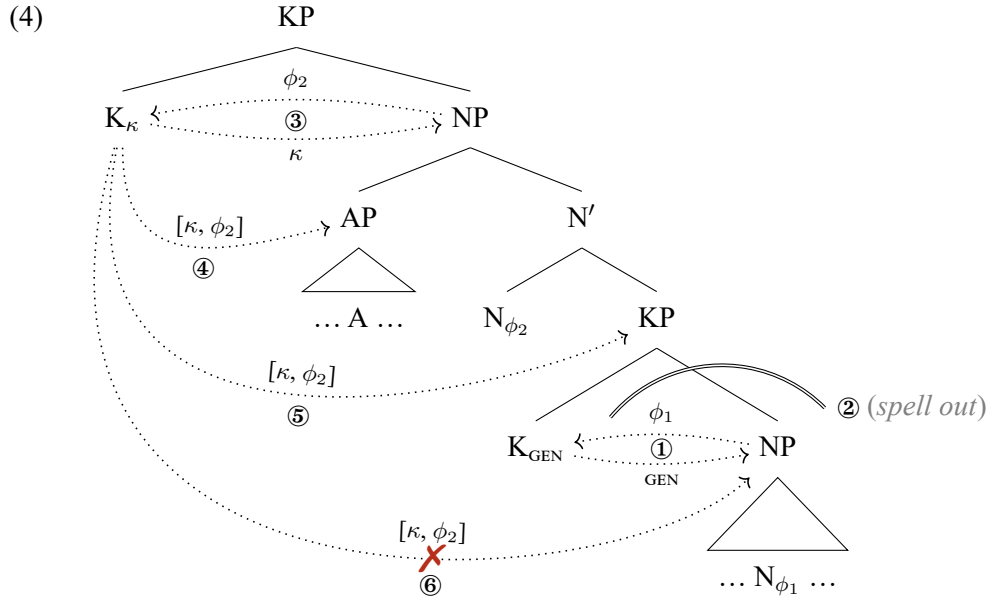
For simplicity, I assume that there are no DPs in Polish, only NPs, but nothing hinges on this assumption. Importantly, maximal nominal projections are assumed to be KPs, with the functional case head K phonologically empty in Polish, but possibly overt in some other languages (Bittner 1994, Bittner & Hale 1996a,b). Assuming a realizational approach to morphology (such as Distributed Morphology, Halle & Marantz 1993, or Nanosyntax, Caha 2009), some of the tree leaves are lexical roots which initially bear only some morphosyntactic features, those which are specific for the root (e.g., the grammatical gender of the noun) or which reflect the intended semantics (e.g., the singular number of the noun). Thus, the nominal leaf N in (2) is specified for number and gender ( $\phi$  in (2) = SG.N in (3)), but not for case, while the adjectival leaves A are initially not specified for any morphosyntactic features.

Assuming Bare Phrase Structure (Chomsky 1995a), N, N', and NP in (2) are actually the same feature bundle, i.e., they share all features, including  $\phi$ , in a way analogous to c-structure nodes along a spine sharing the same f-structure in LFG. In the first interesting step, ①, the insatiable probe on K Agrees with the NP, i.e., it copies over the  $\phi$  features of this nominal complement and, in the process, flags the NP with its case,  $\kappa$  (= DAT in (3)). Following Clem & Deal (2024), any subsequent probing amounts to flagging with the whole  $[\kappa, \phi]$  bundle; see steps ② and ③. This way not only the particular case  $\kappa$ , but also the noun's  $\phi$  features end up on all accessible constituents within the maximal nominal projection –

<sup>7</sup>Unless indicated otherwise, all examples come from the National Corpus of Polish (NCP; <https://nkjp.pl/>; Przepiórkowski et al. 2011, 2012).

in this case, on both adjectival phrases – creating the impression of direct agreement between these APs and the head noun.

The notion of accessible constituents refers to the standard Minimalist approach to locality, on which certain kinds of phrases are spelled out at certain points of derivation and, thus, become inaccessible for any further operations, including Agree (Chomsky 2000). In particular, maximal nominal projections – here, KPs – are assumed to be so-called phases, which means that NP complements of Ks are spelled out as soon as KPs are built. This prevents flagging of such NPs by higher insatiable probes, as illustrated with the tree in (4), which corresponds to example (5).



- (5) Pozwolił się uwieść [gładkiemu ciałku szefowej].  
 allowed.PST.3SG.M REFL seduce.INF smooth.DAT.SG.N body.DAT.SG.N boss.GEN.SG.F  
 ‘He allowed himself to be seduced by his boss’s smooth body.’

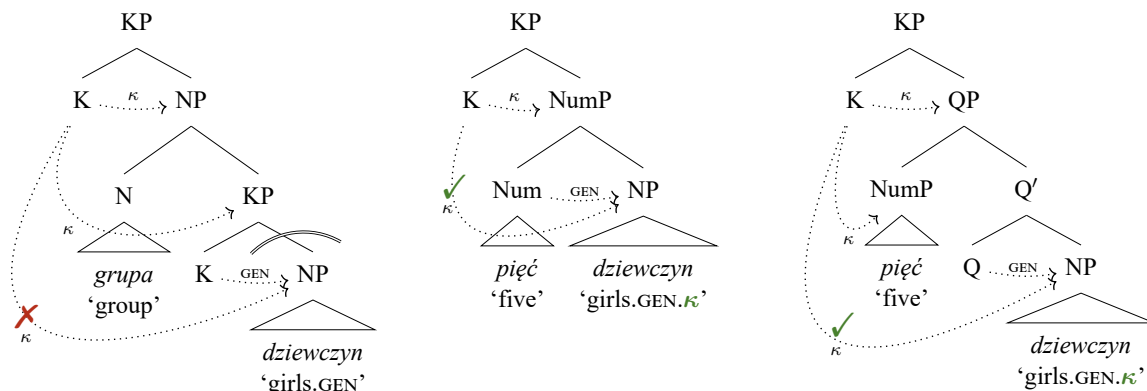
In the first interesting step ①, the lower GEN-assigning K combines with the lower NP, resulting in the genitive KP *szefowej* ‘boss.GEN.SG.F’. At this point, the lower NP is spelled out in step ②, so no further process can affect the form of this genitive constituent. Steps ③–④ in (4) are fully analogous to steps ①–③ in (2). In step ⑤, the lower KP is successfully flagged with  $[\kappa, \phi_2]$ , but features on K are not overtly expored in Polish, so this has no visible effect, in contrast to overt case stacking languages such as Kardil (see Przepiórkowski 2025 for details). Finally, an attempt at flagging in ⑥ fails, as the lower NP has already been spelled out at this stage.

### 2.2.2 Numeral-noun construction

There is no agreement in derivational literature on the structure of Slavic NNCs. On some approaches (e.g., Klockmann 2017), NNCs are headed by the numeral, as schematically illustrated in (7) for the NNC *pięć dziewczyn* ‘five girls’. On other approaches (e.g., Witkoś et al. 2018), numeral phrases are in the specifier position of an empty Q head, as in (8). However, in all approaches I am aware of, the noun belongs to the same extended projection (Grimshaw 2005) as the numeral. This is in contrast to nominal phrases containing embedded genitive nominal phrases, e.g., *grupa dziewczyn* ‘a group of girls’ in (6), where the embedded genitive nominal phrase is a separate KP, the crucial parts of which are spelled out before the higher K merges, as discussed above. Since no separate KP encompasses the noun in NNCs, it may be flagged by the K with the case  $\kappa$ , in addition to receiving the genitive from the numeral (as in (7)), from the empty Q (as in (8)), or by some other process specific to a given analysis of NNCs. Hence, whatever the exact source of the genitive, the noun ends up with two – covertly stacked – cases:

GEN and  $\kappa$ . Given the *exponere the most marked* principle and Caha's (2009) case hierarchy in (1) above, the NNC facts in tables 1 and 2 follow: when  $\kappa \in \{\text{NOM}, \text{ACC}\}$ , the markedness competition is won by GEN, when  $\kappa = \text{GEN}$ , the two competing cases are both GEN, so GEN is exponed, and finally when  $\kappa \in \{\text{DAT}, \text{LOC}, \text{INS}\}$ , the competition is won by  $\kappa$ , as it is more marked than GEN.

- (6) noun-noun construction: (7) NNC (Num is head): (8) NNC (NumP is in Spec,QP):



On this analysis, there is nothing special about numeral or Q heads that results in MACA patterns, apart from the universally assumed property that they belong to the same extended projection as the noun and that they are able to assign GEN, perhaps by virtue of being (partially) functional heads (see Klockmann 2017 on semi-lexicity). This means that similar patterns might occur outside the domain of numeral phrases. This prediction is borne out by Estonian pseudopartitives discussed in Norris (2014, 2018) and analysed in the current framework in Przepiórkowski (2025), but also by a certain rarely discussed quirk of Polish, to which we turn now.

### 2.3 Something interesting

There are a handful of Polish pronouns, all containing the root *c(o)*, which display the MACA pattern similar to that of numerals, including: *co* ‘what’, *coś* ‘something’, *cokolwiek* ‘whatever’, and *nic* ‘nothing’; see table 3. Note that, while in NNCs the numeral occurs in the expected case and the noun displays the mixed case pattern, here the pronoun occurs in the expected case and it is the adjective that displays the mixed pattern.

Table 3: Something (and somebody) interesting in Polish

|          | ‘something interesting’ |                               | ‘somebody interesting’ |                       |
|----------|-------------------------|-------------------------------|------------------------|-----------------------|
| position | ‘something.N’           | ‘interesting.N’               | ‘somebody.M’           | ‘interesting.M’       |
| NOM      | <i>coś</i> .NOM         | <i>ciekawego</i> . <u>GEN</u> | <i>ktoś</i> .NOM       | <i>ciekawcy</i> .NOM  |
| ACC      | <i>coś</i> .ACC         | <i>ciekawego</i> . <u>GEN</u> | <i>kogoś</i> .ACC      | <i>ciekawego</i> .ACC |
| GEN      | <i>czegoś</i> .GEN      | <i>ciekawego</i> .GEN         | <i>kogoś</i> .GEN      | <i>ciekawego</i> .GEN |
| DAT      | <i>czemuś</i> .DAT      | <i>ciekawemu</i> .DAT         | <i>komuś</i> .DAT      | <i>ciekawemu</i> .DAT |
| LOC      | <i>czymś</i> .LOC       | <i>ciekawym</i> .LOC          | <i>kimś</i> .LOC       | <i>ciekawym</i> .LOC  |
| INS      | <i>czymś</i> .INS       | <i>ciekawym</i> .INS          | <i>kimś</i> .INS       | <i>ciekawym</i> .INS  |

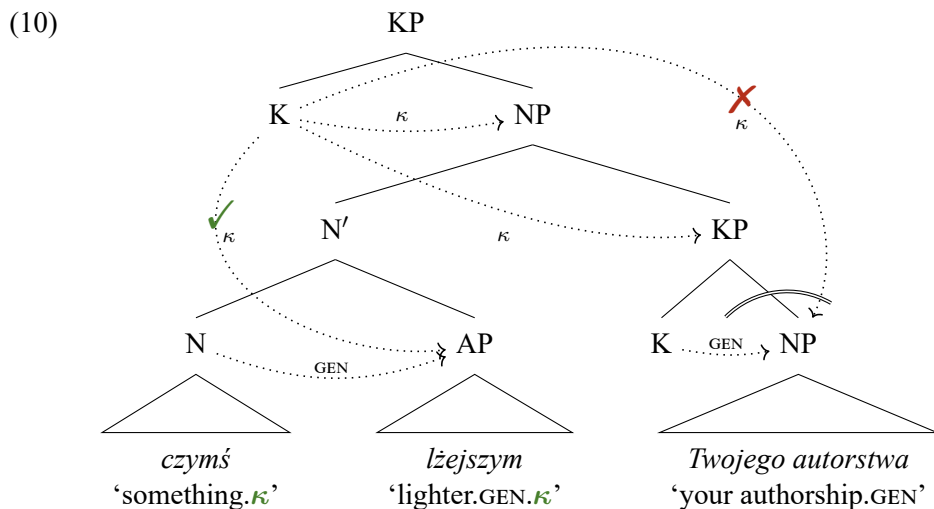
This behaviour should be contrasted with the usual situation, exemplified in the final columns of table 3, which illustrate that pronouns based on the root *kt(o)*, e.g., *ktoś* ‘somebody’, do not display the MACA pattern; here the adjective always agrees with the pronoun, as it does elsewhere in Polish.

It is not clear why exactly *coś* ‘something’, but not *ktoś* ‘somebody’, flags its adjectival modifier with GEN.<sup>8</sup> But, given that it does, the pattern shown in table 3 is fully expected on the approach to concord presented above: since AP is not (within) a separate phase, the higher K may flag this AP with case  $\kappa$ , on top of GEN received from *coś*, resulting in covert case stacking and the realization of the most marked case. On this account, the only idiosyncrasy of the Polish pronominal root *c(o)* is that it flags the adjective with GEN; the mixed pattern seen in table 3 follows from the lack of phase boundary between the higher K and the AP and from the *expose the most marked* principle.

This is confirmed by the fact that – in contrast to such AP dependents – genitive KP dependents of *coś* ‘something’ must stay in the genitive regardless of the external case, as illustrated with the constructed example (9) (based on a similar corpus example).

- (9) Porozmawiajmy o [czymś lżejszym Twojego autorstwa].  
 talk.IMP.1PL about something.LOC lighter.LOC your.GEN authorship.GEN  
 ‘Let’s talk about something lighter (written) by you.’  
 (lit.: ‘...something.LOC lighter.LOC [your authorship].GEN’)

The structure of such nominal phrases is schematically given in (10) (where  $\kappa = \text{LOC}$  in (9)), without commitment to any particular position of the AP and the inner KP; what is crucial is only that the inner KP is a phase, so the NP within it is not accessible to the probe on the higher K, while there is no similar phase boundary between the higher K and the AP.



In summary, the ‘something interesting’ idiosyncrasy is in line with the general approach to concord and the particular analysis of Slavic numeral-noun constructions offered above. There is nothing special about numeral constructions that gives rise to the famous MACA pattern. This conclusion is additionally confirmed by the observation in Rutkowski & Szczegot (2001) that some Lithuanian pronouns, including *kažkas* ‘something’, behave similarly to Polish *coś* ‘something’, even though Lithuanian NNCs do not display the Slavic MACA pattern.

Having presented a Minimalist formalization of the relatively framework-independent ideas sketched in section 2.1, let me now propose a corresponding LFG analysis.

<sup>8</sup>In terms of Klockmann (2017), the root *c(o)* – but perhaps not *kt(o)*, etc. – would be analysed as idiosyncratically semi-lexical, in the sense that it hosts certain functional features (here; a GEN-flagging probe); see also Rutkowski & Szczegot (2001) for a similar analysis.

### 3 LFG analysis

The following analysis is formulated in standard LFG terms, but it is inspired by some aspects of L<sub>R</sub>FG (Melchin et al. 2020, Asudeh & Siddiqi 2022, 2024, Asudeh et al. 2023, 2024) – a still evolving version of LFG which does not assume the Lexical Integrity Principle (Bresnan & Mchombo 1995, Asudeh et al. 2013), but instead relies on the “syntax all the way down” approach of Distributed Morphology (Halle & Marantz 1993).

#### 3.1 Main ideas

The main ideas of the LFG analysis are essentially the same as in the case of the Minimalist analysis presented in section 2 above.

First, NNCs involve both concord and the assignment of GEN to the noun.

Second, the realization of a specific case on the noun is regulated by explicit exponence rules, which rely on case markedness.

Third, the North Slavic case markedness hierarchy repeated below in (11) is not stipulated but reflects morphological syncretism and containment facts discussed in Caha (2009).

$$(11) \quad \text{NOM} < \text{ACC} < \text{GEN} < \text{LOC} < \text{DAT} < \text{INS} \quad (\text{Caha 2009})$$

#### 3.2 Technicalities

##### 3.2.1 Concord

In this subsection, I introduce some assumptions and an initial version of the proposed approach to concord, which will be slightly modified in the following section 3.2.2.

Technically, I follow Asudeh et al. (2024) and Belyaev et al. (2025) in representing cases as feature matrices, with features such as NOM, ACC, or DAT understood as privative: either present (with the + value) or absent.<sup>9</sup> Case hierarchies such as (11) – but also more complex, non-linear hierarchies – are encoded via macros (also called *templates*; Dalrymple et al. 2004, Asudeh et al. 2013) in such a way that macros corresponding to more marked cases in the hierarchy call macros corresponding to immediately less marked cases. The six macros defined in (12)–(17) are needed in the case of (11).<sup>10</sup>

$$\begin{aligned}
 (12) \quad @\text{NOM} &:= (\downarrow \text{CASE NOM}) = + & (18) \quad \begin{bmatrix} \text{PRED} & \text{'GIRL'} \\ \text{CASE} & \begin{bmatrix} \text{NOM} & + \\ \text{ACC} & + \\ \text{GEN} & + \end{bmatrix} \\ \text{PHI} & \begin{bmatrix} \text{NUMBER} & \text{PL} \\ \text{GENDER} & \text{F} \end{bmatrix} \end{bmatrix} \\
 (13) \quad @\text{ACC} &:= @\text{NOM} & (19) \quad \begin{bmatrix} \text{PRED} & \text{'AMBITIOUS'} \\ \text{CASE} & \begin{bmatrix} \text{NOM} & + \\ \text{ACC} & + \\ \text{GEN} & + \end{bmatrix} \\ \text{PHI} & \begin{bmatrix} \text{NUMBER} & \text{PL} \\ \text{GENDER} & \text{F} \end{bmatrix} \end{bmatrix} \\
 (14) \quad @\text{GEN} &:= @\text{ACC} \\
 (15) \quad @\text{LOC} &:= @\text{GEN} \\
 (16) \quad @\text{DAT} &:= @\text{LOC} \\
 (17) \quad @\text{INS} &:= @\text{DAT}
 \end{aligned}$$

While similar hierarchies are often assumed for particular  $\phi$  features (cf. the *feature geometry* of Harley & Ritter 2002), also in L<sub>R</sub>FG, I will not do that here, as a careful investigation of the Polish gender

<sup>9</sup>See Dalrymple et al. (2009) for a similar but distinct idea: there, such attributes are binary (valued + or –, or absent) and they are used to model syntactic effects of syncretism.

<sup>10</sup>These macros are defined in such a way that they can be used in syntactic rules, e.g., to mark nominal dependents of numerals as genitive, as in (26) in the main text below. More general – parameterized – macros are needed to be also useful in lexical entries, e.g., to specify a given argument of a verb as genitive; such parameterized macros are introduced in section 3.3.

system, with its 3 masculine genders (cf. footnote 3), deserves a separate treatment. However, I will group the  $\phi$  features into a separate feature matrix (cf. INDEX in HPSG), so that the basic f-structure of the form *dziewczyn* ‘girl.GEN.PL.F’ is as in (18) above.

I moreover follow Haug & Nikitina (2015) in adopting the “feature sharing” approach to agreement, with agreement features represented directly on all agreeing constituents (cf. Haug 2023).<sup>11</sup> For example, the syncretic adjective *ambitnych* ‘ambitious’, when interpreted as GEN.PL.F, is represented at f-structure as plural not just by virtue of this adjective modifying a plural noun, as in standard LFG, but by virtue of expressing this feature directly, as in (19).

Given these assumptions, fully symmetrical concord may be encoded via the macros in (20)–(22), used in rules as shown in (23), and leading to functional representations as in (24) (with variables [1] and [2] indicating structure sharing).

$$(20) \quad @CONCORD := @CASECONCORD \\ @PHIAGREEMENT$$

$$(21) \quad (\text{preliminary version, to be replaced with (25)}) \\ @CASECONCORD := (\uparrow CASE) = (\downarrow CASE)$$

$$(22) \quad @PHIAGREEMENT := (\uparrow PHI) = (\downarrow PHI)$$

$$(23) \quad (\text{preliminary version, to be replaced with (35)}) \\ NP \rightarrow AP^* \quad N \\ \downarrow \in (\uparrow ADJ) \quad \uparrow = \downarrow \\ @CONCORD$$

$$(24) \quad \textit{ambitnych dziewczyn} \\ \text{‘ambitious.GEN.PL.F girls.GEN.PL.F’}$$

$$\left[ \begin{array}{l} \text{PRED ‘GIRL’} \\ \text{CASE [1] } \left[ \begin{array}{l} \text{NOM +} \\ \text{ACC +} \\ \text{GEN +} \end{array} \right] \\ \text{PHI [2] } \left[ \begin{array}{l} \text{NUMBER PL} \\ \text{GENDER F} \end{array} \right] \\ \text{ADJ } \left\{ \left[ \begin{array}{l} \text{PRED ‘AMBITIOUS’} \\ \text{CASE [1]} \\ \text{PHI [2]} \end{array} \right] \right\} \end{array} \right]$$

### 3.2.2 Numeral-noun construction

The gist of the analysis of Slavic NNCs is that two constituents may agree in  $\phi$  features (number, gender, and – where applicable – person) and case, but one of them may be additionally assigned a specific case, which sometimes results in case inequality – lack of case concord – between the two constituents. I implement this paradoxical “ $\phi$  and case concord but perhaps no case concord in the end” approach by modelling case concord as subsumption rather than equality, i.e., by replacing (21) above with (25) below.

$$(25) \quad @CASECONCORD := (\uparrow CASE) \sqsubseteq (\downarrow CASE) \quad (\text{final version, replaces (21)})$$

Note that nothing substantial changes in the analysis of simple adjective-noun concord illustrated with (23)–(24) above: the values of the two PHI features are still identical, and also CASE features are the same, but without the constraint that they must remain identical, so that some other part of the grammar may in principle further specify the value of the adjective’s CASE. As this does not happen in adjective-noun concord, the two CASE values remain identical.

However, this symmetry is broken in NNCs, which are licensed by syntactic rules such as (26). (Num stands for Numeral.)

$$(26) \quad \text{NumP} \rightarrow \text{Num} \quad \text{NP} \\ \uparrow = \downarrow \quad \downarrow = (\uparrow \text{OBJ}) \\ @CONCORD \\ @GEN$$

Such rules are directly responsible for MACA patterns. Let me illustrate this effect with numeral phrases in accusative and locative positions.

<sup>11</sup> This approach is typical of HPSG (Pollard & Sag 1994, Wechsler & Zlatić 2003), but it is also assumed in the derivational approach of Ackema & Neeleman (2013).

Assume a numeral phrase in an accusative position, i.e., with CASE value equal to [NOM+, ACC+]. Given the @CONCORD annotation in (26), this CASE value subsumes the CASE value of the noun, in accordance with the definition of @CONCORD in (25). This means that N's CASE has at least these two features: NOM+, ACC+. However, the @GEN annotation defines three CASE features on N: NOM+, ACC+, GEN+. Note that these two macros, @CONCORD and @GEN are compatible and result in the noun being specified as genitive. However, crucially, since the numeral's CASE only *subsumes* the noun's CASE rather than being *equal* to it, the numeral stays in the accusative, as illustrated in (27).

Assume now a NumP in a locative position, where the value of CASE is [NOM+, ACC+, GEN+, LOC+]. This value subsumes N's CASE, so the noun must also be “at least locative”. This time the presence of @GEN does not add anything to this specification, as the noun already contains the three features defining the genitive: NOM+, ACC+, GEN+. The resulting f-structure is illustrated in (28).

(27) *pięć dziewczyn* ‘five.ACC girls.GEN’

|   |          |             |         |             |
|---|----------|-------------|---------|-------------|
| [ | PRED '5' |             | ]       |             |
|   | CASE     | [NOM +]     |         |             |
|   |          | [ACC +]     |         |             |
|   | PHI      | [1]         |         | [NUMBER PL] |
|   |          |             |         |             |
| ] | OBJ      | [           |         |             |
|   |          | PRED 'GIRL' |         |             |
|   |          | CASE        | [NOM +] |             |
|   |          |             | [ACC +] |             |
|   |          |             | [GEN +] |             |
|   |          | PHI         | [1]     |             |

(28) *pięciu dziewczynach* ‘five.LOC girls.LOC’

|          |                   |           |
|----------|-------------------|-----------|
| PRED '5' |                   |           |
| CASE     | [ NOM + ]         |           |
|          | ACC +             |           |
|          | GEN +             |           |
|          | LOC +             |           |
| PHI      | [1] [ NUMBER PL ] |           |
|          | [ GENDER F ]      |           |
| OBJ      | PRED 'GIRL'       |           |
|          | CASE              | [ NOM + ] |
|          |                   | ACC +     |
|          |                   | GEN +     |
|          |                   | LOC +     |
|          | PHI               | [1]       |

In summary, the presence of both macros, @CONCORD and @GEN, on a given constituent in a syntactic rule is responsible for the MACA pattern discussed in this paper. The constituent will invariably be in the genitive when it agrees with a nominative, accusative, or genitive constituent, and it will occur in the agreeing case in locative, dative, and instrumental. As shown in the following section, this behaviour is not specific to NNCs and may be equally easily accounted for in ‘something interesting’ constructions. But a couple of technical comments are needed before moving there.

First, on the encoding of case assumed above, lexical entries cannot *define* case, they can only *expose* case defined in the grammar. For example, imagine that the LOC.PL.F form of *pięciu* ‘five’ had the lexical entry in (29). Then such a lexical entry would be compatible with the grammatical specification of case as accusative, i.e., as [NOM+, ACC+], which would result in an f-structure in (28), where case is locative, for the accusative numeral phrase *pięć dziewczyn* ‘five.ACC girls.GEN’.

(29) (bad lexical entry)

|               |     |                     |
|---------------|-----|---------------------|
| <i>pięciu</i> | Num | (↑ PRED) = ‘5’      |
|               |     | (↑ PHI NUMBER) = PL |
|               |     | (↑ PHI GENDER) = F  |
|               |     | (↑ CASE NOM) = +    |
|               |     | (↑ CASE ACC) = +    |
|               |     | (↑ CASE GEN) = +    |
|               |     | (↑ CASE LOC) = +    |

(30) (good lexical entry)

|               |     |                     |
|---------------|-----|---------------------|
| <i>pięciu</i> | Num | (↑ PRED) = ‘5’      |
|               |     | (↑ PHI NUMBER) = PL |
|               |     | (↑ PHI GENDER) = F  |
|               |     | (↑ CASE GEN)        |
|               |     | ¬(↑ CASE INS)       |

Instead, lexical entries should specify case via constraining statements, as in (30). This lexical entry is also more general than (29) was meant to be, as it defines a feminine form that exposes genitive,

locative, and dative (see table 2 for a fuller paradigm). This is done by ensuring the presence of CASE GEN, which excludes nominative and accusative, and denying the presence of CASE INS, which excludes instrumental.<sup>12</sup>

The second remark is that, as things stand at the moment, the analysis may be further simplified by assuming that *all* agreement is defined via subsumption rather than via identity. A single attribute, e.g., AGR, could collect all agreement features (NUMBER, GENDER, and particular case features such as ACC and LOC), and @CONCORD could be defined simply as  $(\uparrow \text{AGR}) \sqsubseteq (\downarrow \text{AGR})$ . However, exploring this possibility and its compatibility with alternative approaches to the representation of number and gender (e.g., as sets of privative features, as is common in L<sub>R</sub>FG) would take us too far afield, so only the more conservative solution – where  $\phi$  agreement is encoded as symmetric feature sharing – is considered here.

### 3.3 Something interesting

The Minimalist analysis of the ‘something interesting’ idiosyncrasy offered in section 2.3 is noncommittal about the exact position of the adjective in the NP, although the tree in (10) suggested that it is a complement of N rather than an ordinary modifier. The LFG analysis offered in this subsection makes this aspect of the analysis more explicit.

The crucial observation is that in Polish – just as in English – the AP in this construction is necessarily postnominal, as illustrated in the following constructed examples:

- (31) { [Coś ciekawego] / ?\*[Ciekawego coś] } się wydarzyło.  
 something.NOM interesting.GEN interesting.GEN something.NOM REFL happen.PST.3SG  
 ‘{[Something interesting] / \*[Interesting something]} happened.’
- (32) Porozmawiajmy o { [czymś interesującym] / ?\*[interesującym czymś] }.  
 talk.IMP.1PL about something.LOC interesting.LOC interesting.LOC something.LOC  
 ‘Let’s talk about {[something interesting] / \*[interesting something]}.’

Such postnominal adjectives have a special status in Polish (see, e.g., Rutkowski & Progovac 2005 and Rutkowski 2007, as well as references therein): unlike prenominal adjectives, they tend to refer to essential, not contingent, properties, or to particular subclasses of entities denoted by the noun. This difference is best illustrated with an example from Rutkowski (2007: 329):

- (33) a. mały pancernik olbrzymi  
 small armadillo giant  
 ‘a small *giant armadillo* (i.e., a small representative of *Priodontes maximus*)’  
 b. olbrzymi pancernik mały  
 giant armadillo small  
 ‘a giant *dwarf armadillo* (i.e., a giant representative of *Zaedyus pichiy*)’

While the two NPs in (33a–b) contain the same words, their interpretation is different: (33a) may only refer to a giant armadillo which happens to be small (for this genus), while (33b) refers to a dwarf armadillo which happens to be particularly large (for this genus).

Another aspect of the special status of postnominal APs is that apparently only one such AP may appear in a nominal phrase, while there is no limit on the number of prenominal APs. For example, the attested (34a) with two prenominal APs cannot be transformed into (34b) with two postnominal APs, even though each of these APs alone may occur postnominally.<sup>13</sup>

<sup>12</sup>Such exponence rules are more naturally expressed in L<sub>R</sub>FG, with which the present analysis is meant to be compatible, but which has not been employed here for simplicity.

<sup>13</sup>The subjective judgements reported below assume neutral prosody. (34b) could be saved by a strong prosodic break after *podkładka* ‘placemat’ and the “open-ended list” prosody of the following two APs typical of asyndetic coordination (Büring & Hartmann 2015), with the resulting meaning ‘There was a placemat on the table; and it was plastic, transparent...’.

- (34) a. Na stole leżała plastikowa przezroczysta podkładka.  
           on table was plastic transparent placemat  
           ‘There was a transparent plastic placemat on the table.’  
       b. ?\*Na stole leżała podkładka plastikowa przezroczysta.  
           on table was placemat plastic transparent  
       c. Na stole leżała podkładka {plastikowa / ?przezroczysta}.  
           on table was placemat plastic transparent

Given the possibility of such a postnominal AP and its special classificatory status (argued for at greater length in Rutkowski & Progovac 2005), the NP rule in (23) should be replaced with (35).

- (35) NP → AP\* N (AP) (final version, replaces (23))  
           ↓ ∈ (↑ ADJ) ↑ = ↓ ↓ = (↑ CLASS)  
           @CONCORD @CONCORD

Note that the postnominal AP is not treated here as an ordinary adjunct, but rather as a kind of optional classificatory complement (CLASS). Given this treatment, what is special about pronouns such as *coś* ‘something’ is that they idiosyncratically mark their CLASS dependent as @GEN, e.g., in the case of the form *coś* syncretic between NOM and ACC:

- (36) *coś* N (↑ PRED) = ‘PRO’  
           (↑ PHI NUMBER) = SG  
           (↑ PHI GENDER) = N  
           ¬(↑ CASE GEN)  
           (↑ CLASS) → @GEN((↑ CLASS))

The first 4 lines of (36) should be clear; in particular, the possibility of *coś* to expone NOM or ACC but no other case is encoded as a negative constraint forbidding the presence of GEN (cf. (30) above). The last line is an implication saying that, if the CLASS dependent is present, it is marked as (at least) genitive.<sup>14</sup> This lexical entry uses more general parameterized case macros defined in (37)–(42). Given such macros, the non-parameterized macros employed above, such as @NOM or @GEN, may be understood as shorthand notations for corresponding macros with the parameter ↓, e.g., @NOM(↓) or @GEN(↓).

- (37) @NOM(X) := (X CASE NOM) = +  
       (38) @ACC(X) := @NOM(X)  
               (X CASE ACC) = +  
       (39) @GEN(X) := @ACC(X)  
               (X CASE GEN) = +  
       (40) @LOC(X) := @GEN(X)  
               (X CASE LOC) = +  
       (41) @DAT(X) := @LOC(X)  
               (X CASE DAT) = +  
       (42) @INS(X) := @DAT(X)  
               (X CASE INS) = +

The net effect of the presence of @CONCORD on the AP classifier in the syntactic rule (35) and the presence of @GEN((↑ CLASS)) in the lexical entry (36) is that both macros apply to the postnominal AP, resulting in the same MACA pattern as in North Slavic NNCs.

<sup>14</sup>Ideally, this constraint should be defined in the grammar just once, for the pronominal root *c(o)*, rather than separately for each pronoun based on this root, but it is not clear to me how to do this either in traditional LFG or in L<sub>R</sub>FG.

Note that the @GEN macro has to be stated in the lexicon, as postnominal APs display the MACA pattern only when they combine with the *c(o)* pronouns, not when they combine with other pronouns (recall table 3) or ordinary nouns. Moreover, while prenominal APs modifying pronouns are rare, when they occur, they always agree with the pronoun, even in NOM or ACC, as in the following examples from the National Corpus of Polish:

- (43) ...czuła to, co czuje teraz: niemożność złapania oddechu, [jakieś coś  
felt.3SG.F this what feels now impossibility catching breath some.ACC something.ACC  
niemiłego]...  
unpleasant.GEN  
'...she felt what she feels now: the inability to catch her breath, something unpleasant...'
- (44) ...a [podobne coś takiego] ma Dagger w Jacku Młocie.  
and similar.ACC something.ACC such.GEN has Dagger in Jacek Młot  
'...and Dagger in Jacek Młot has something similar.' (lit.: '...similar something of-this-kind')

In (43), *jakieś* 'some, some kind of' is an adjectival form agreeing with *coś* 'something' also in the accusative case; it is only the postnominal *niemiłego* 'unpleasant' that occurs in the genitive. Similarly, in (44) the prenominal adjective *podobne* 'similar' agrees with *coś* 'something' in the accusative case, while the adjective *takiego* 'such' occurs in the genitive. Such examples confirm the above analysis in terms of the difference between postnominal adjectival classifiers, which may occur in GEN when relevant pronouns are in NOM or ACC, and prenominal modifiers, which always fully agree with the (pro)noun.

This completes the LFG analysis of MACA patterns. In summary, while some positions are @CONCORD positions and some are @GEN positions, there are some positions in Polish – nominal dependents of numerals, postnominal adjectival dependents of some pronouns – which are specified as both @CONCORD and @GEN. In such cases, given the above encoding of case hierarchy, genitive wins when concord implies nominative or accusative (or genitive), and concord wins otherwise.

What would be unexpected on this analysis is GEN winning not only in NOM and ACC positions, but also in some oblique positions involving a case that is more marked than GEN, e.g., in INS positions. However, apparently exactly this happens in NNCs involving collective numerals.

## 4 Collective numerals

### 4.1 Empirical generalizations

Polish has special numeral lexemes – or, on a minority view, special forms of cardinal numeral lexemes (Saloni 2009) – which are used with certain classes of nouns. The usual generalization found in grammars is that they are used with certain *plurale tantum* nouns, with neuter nouns referring to young animals, and with masculine nouns referring to groups of mixed gender, as well as in various collocations, including with paired parts of the body, especially eyes (e.g., Swan 2002: 200–201). However, the exact distribution of such collective forms in spoken Polish is a matter of some debate, with the consensus that it is much more limited than the prescriptive norm would have it and that collective numerals are slowly disappearing from Polish, with cardinal numerals increasingly used in their place (e.g., Kucała 1976, Zieniukowa 1986, Dmowska & Karpowicz 1993, Karpowicz 1994, Andrzejczuk 2011, Badyda & Warda-Radys 2016, Siuciak 2018, Stefańczyk 2018, Markiewicz 2021).<sup>15</sup> Nevertheless, they are still irreplaceable in some contexts, for example there is no other way to say 'two children' using a numeral than employing a collective numeral, *dwoje dzieci* 'two.COLL.NOM/ACC children.GEN'.<sup>16</sup> Also, where there is optionality

<sup>15</sup>In the opinion of one diachronic linguist specializing in Polish numerals, collective numerals are still present in contemporary Polish only because of considerable prescriptive pressure (Siuciak 2018). Whether it is so or not (one of the reviewers expresses doubts here), they are apparently stronger in Polish than in other Slavic languages (Stefańczyk 2018: 122).

<sup>16</sup>However, the results of a survey among 13–15-year old students reported in Markiewicz (2021) suggest that even here some of the youngest Poles use cardinal numerals.

between cardinal and collective numerals, as in the case of a group of students of mixed gender, collective numerals are still perceived as relatively commonplace.<sup>17</sup> The two paradigms for ‘five students’ – cardinal and collective – are given in table 4. The paradigm for collective NNCs is presented here in a way that is normally presented in grammars, and its accuracy will be disputed below.

Table 4: Polish NNCs with cardinal and collective numerals (prescriptively)

| position | ‘five students’ (cardinal 5) |                       | ‘five students’ (collective 5) |                       |
|----------|------------------------------|-----------------------|--------------------------------|-----------------------|
|          | ‘five.M’                     | ‘students.M’          | ‘five.COLL’                    | ‘students.M’          |
| NOM      | <i>pięciu.ACC</i>            | <i>studentów.GEN</i>  | <i>pięcioro.ACC</i>            | <i>studentów.GEN</i>  |
| ACC      | <i>pięciu.ACC</i>            | <i>studentów.GEN</i>  | <i>pięcioro.ACC</i>            | <i>studentów.GEN</i>  |
| GEN      | <i>pięciu.GEN</i>            | <i>studentów.GEN</i>  | <i>pięciorga.GEN</i>           | <i>studentów.GEN</i>  |
| DAT      | <i>pięciu.DAT</i>            | <i>studentom.DAT</i>  | <i>pięciorgu.DAT</i>           | <i>studentom.DAT</i>  |
| LOC      | <i>pięciu.LOC</i>            | <i>studentach.LOC</i> | <i>pięciorgu.LOC</i>           | <i>studentach.LOC</i> |
| INS      | <i>pięcioma.INS</i>          | <i>studentami.INS</i> | <i>pięciorgiem.INS</i>         | <i>studentów.GEN</i>  |

Polish collective numerals seem to pose a problem for the analyses above, as well as for earlier analyses of NNCs. The reason can be seen in the last column of table 4: unlike in cardinal NNCs, in collective NNCs the noun is in the genitive not only in NOM and ACC (and GEN), but also in INS positions. In terms of previous analyses (mentioned in section 5), which often rely on the direct vs. oblique distinction or structural vs. lexical/inherent distinction, this is unexpected as Polish instrumental is oblique and lexical/inherent, not direct or structural, like nominative and accusative. In terms of the analyses above, this is unexpected because, unlike nominative and accusative, instrumental is *more* marked than genitive, so it should win the competition for exponence.

My reply to this challenge is that the collective paradigm given in grammars and in table 4 is incomplete. The complete descriptive paradigm, together with diacritics indicating their contemporary usage, is given in table 5.

Table 5: Polish NNCs with collective numerals (descriptively)

| position | ‘five students’ (collective 5) |                                                              |
|----------|--------------------------------|--------------------------------------------------------------|
|          | ‘five.COLL’                    | ‘students.M’                                                 |
| NOM      | <i>pięcioro.ACC</i>            | <i>studentów.GEN</i>                                         |
| ACC      | <i>pięcioro.ACC</i>            | <i>studentów.GEN</i>                                         |
| GEN      | <i>pięciorga.GEN</i>           | <i>studentów.GEN</i>                                         |
| DAT      | <i>pięciorgu.DAT</i>           | <i>studentów.GEN</i> <sup>??</sup> or <i>studentom.DAT</i>   |
| LOC      | <i>pięciorgu.LOC</i>           | <i>studentów.GEN</i> <sup>?</sup> or <i>studentach.LOC</i>   |
| INS      | <i>pięciorgiem.INS</i>         | <i>studentów.GEN</i> or <i>studentami.INS</i> <sup>?</sup> * |

The first descriptive observation is that, contrary to prescriptive rules, genitive nouns are possible in all positions, including DAT and, especially, LOC. This has been noted in the few works that attempted to investigate the matter experimentally: with a small survey among 26 adult Poles reported in Dmowska & Karpowicz (1993), accompanied by recommendations in Karpowicz (1994) about how to modify prescriptive rules, with a larger survey involving 200 students of Polish Philology reported in Stefańczyk (2018), and with another survey among 100 middle school (13–15-year old) students reported in Markiewicz

<sup>17</sup>And they are still prescribed as the only possibility by various prescriptive sources and language clinics, e.g., <https://sjp.pwn.pl/poradnia/haslo/Piecioro-studentow-czy-pieciu-studentow;19306.html> (in 2019).

(2021). In all cases the conclusion is the same: GEN nouns should also be considered grammatical in DAT and LOC positions (Karpowicz 1994: 119–120; Stefańczyk 2018: 130; Markiewicz 2021: 101).

While this conclusion has been mostly ignored in grammars and textbooks, one popular textbook on Polish inflection says that in DAT and LOC “genitive forms of nouns are less frequent, but not to the extent that they should be ignored or discredited” (Bańko 2002: 64; translation mine). As this frequency impression has never been supported by any hard statistics, I searched for all occurrences of forms such as *dwojgu* ‘two.COLL.DAT/LOC’ and *pięciorgu* ‘five.COLL.DAT/LOC’ in the 300-million token balanced subcorpus of the National Corpus of Polish (NCP; cf. footnote 7).<sup>18</sup> After removing 10 false positives and repetitions, the 738 remaining results of this query were manually annotated independently by me and by a linguistically-trained student of Cognitive Science at the University of Warsaw.<sup>19</sup> This annotation consisted of 1) marking examples with the noun elided and, in the case of NNCs in LOC positions, with the noun syncretic between GEN and LOC (e.g., the pronoun *nich* ‘they.ACC/GEN/LOC’) – such examples were excluded from further analysis, and 2) disambiguating the numeral forms for DAT or LOC, as the automatically assigned morphosyntactic tags could not be trusted here. Finally, I adjudicated the differences between the two annotators that occurred in 39 (out of 738) results. In effect, 482 occurrences of DAT and LOC NNCs were found with the noun either agreeing in case with the numeral or occurring in GEN; see table 6.

Table 6: Polish NNCs with DAT and LOC collective numerals in the 300M balanced sample of NCP

| position | noun frequencies |     | noun proportions |       |
|----------|------------------|-----|------------------|-------|
|          | agreeing         | GEN | agreeing         | GEN   |
| DAT      | 377              | 24  | 94.0%            | 6.0%  |
| LOC      | 60               | 21  | 74.1%            | 25.9% |

In the case of DAT positions, the noun occurred in GEN – i.e., shunning prescriptive rules – in 6% of the examples, while in the case of LOC positions, it occurred in GEN in as many as 26%. As over 80% of NCP consists of texts written to be published in print (newspapers, books; see Górski & Łaziński 2012: 33), i.e., texts which should follow prescriptive rules, both these numbers are relatively high.

In partial summary, it is clear both from the results of earlier surveys and from the above corpus investigation that the system of Polish allows for genitive nouns in collective NNCs in all case positions, including – contrary to prescriptive rules – DAT and LOC. It is also clear that it allows for agreeing nominal forms in DAT and LOC positions, in line with prescriptive rules. However, the prescriptive position that it does not allow for agreeing INS forms of nouns in INS positions has not been disputed so far. In the remainder of this subsection, I will attempt to cast some doubts also on this claim.

It is true that most Polish native speakers, including the author, usually do not accept and would probably never produce phrases such as *z pięciorgiem studentami* ‘with five.COLL.INS students.INS’. However, there are a few such phrases in the complete NCP, mostly in Usenet posts, involving collective numerals *dwoje* ‘two.COLL’ and *oboje* ‘both.COLL’, e.g.:<sup>20</sup>

- (45) IMHO coś            nie tak jest z    mamusią    / obojgiem    rodzicami.  
 IMHO something NEG so is    with mummy.INS    both.COLL.INS parents.INS  
 ‘IMHO, there is something wrong with the mummy or with both parents.’

Also, Markiewicz (2021: 106–107) reports that, while most middle school students used cardinal numerals instead of the prescribed collective numerals, some (but very few) of those that did use collective numerals “wrongly” put the noun in the instrumental.

<sup>18</sup>The specific query used: [pos="num.\*" & orth=".\*o[rj]gu"].

<sup>19</sup>I am grateful to Aleksandra Wolska for her help at this stage of the process.

<sup>20</sup>There are 7 such examples, plus additional 4 cited in Usenet discussions about grammaticality of such constructions.

It is easy to interpret this scarcity of INS nouns in collective NNCs as editing or production errors, but diachronic developments suggest an alternative explanation. We will first look at the development of *cardinal* numerals, and then we will return to *collective* numerals.<sup>21</sup>

Proto-Indo-European numerals 5 and above were recategorized as mostly feminine nouns in Proto-Slavic, and remained such until the late stages of Old Polish, i.e., until around the 15th century. Similarly to other nouns, they combined with nominal phrases in the genitive, so only case assignment was observed. Around the early 16th century, such semantically numeral nouns started developing the MACA pattern illustrated in table 2, i.e., they started “grammaticalizing” as *cardinal* numerals. Interestingly, this was a long process: numeral-noun case agreement was first observed in DAT positions (becoming the only option around the early 17th century), then in LOC positions (becoming obligatory in the mid-18th century), and only subsequently in INS positions (obligatory since the mid-19th century). See table 7.

Table 7: Development of agreeing forms of NNCs in Polish across centuries; when two dates are given, D1 / D2, agreement started being as frequent as GEN in D1 and took over more or less completely in D2

| numerals   | DAT               | LOC              | INS                                                    |
|------------|-------------------|------------------|--------------------------------------------------------|
| cardinal   | 16th / early 17th | 16th / mid-18th  | early 18th / mid-19th                                  |
| collective | (no data) / 17th  | 17th / (no data) | (infrequently and briefly in late 18th and early 19th) |

Now, *collective* numerals seem to have set out on the same path, but they had a longer way to go, as they started their life in Proto-Slavic as adjectives modifying singular nouns, with meanings such as ‘twofold’, and only such uses existed until the 15th century (Stefańczyk 2018: 121). Such uses were still reported by Michał Abraham Trotz in his 1764 dictionary, e.g., *troie zwycięstwo* ‘threefold victory’ (Trotz 1764: 2336), although they seem to have vanished from actual use by around that time (Stapor 2007: 570; Siuciak 2018: 109). In the meantime, around the 16th century, apparently nominal uses of collective numerals started spreading, which always combined with GEN nouns, as in the relevant column in table 5 (Siuciak 2008: 170–171). Recall that at this stage *cardinal* numerals were already on their way to develop the MACA pattern.

Crucially, the newly formed *collective* numerals followed suit, but with a delay (Siuciak 2008: 171–173). As the frequency of collective numerals is relatively low, it is difficult to give specific times of when a given change occurred; however, only case agreement in collective NNCs is observed in DAT positions already in the 17th century. As for LOC positions, both agreeing and GEN forms of nouns are witnessed with *collective* numerals at that time (even within one publication), even though only agreeing forms are attested with *cardinal* numerals in this period. Finally, in the case of INS positions, there are attested examples of agreeing forms occurring in the 2nd half of the 18th century, and at least one mid-19th century grammar admits such constructions (Łazowski 1848: 140), in line with table 5.<sup>22</sup> However, subsequent and more influential grammars only allow for GEN nouns in instrumental collective NNCs (Małecki 1863: 126).

A convincing interpretation of these developments in Siuciak (2008: 173) is that collective numerals were well under way to follow the development of cardinal numerals and to exhibit exactly the same MACA pattern, but this development was artificially arrested by the intensive codification trends in the 19th century and in the early 20th century (Walczak 2011: 106; Siuciak 2020). This resulted in the freezing of the unstable state where agreement was already dominant in DAT and LOC positions, but where

<sup>21</sup>The following paragraphs draw heavily on Siuciak (2008).

<sup>22</sup>The specific example given there is:

- (i) *pieciorgiem ludzi* (albo *ludźmi*) *nie wiele zrobisz*  
 five.COLL.INS people.GEN or people.INS NEG much do.2SG.FUT  
 ‘you won’t do much with (i.e., having) five people’

GEN assignment was still almost obligatory in INS positions; this way the nascent agreement pattern in INS was eradicated by prescriptivists.

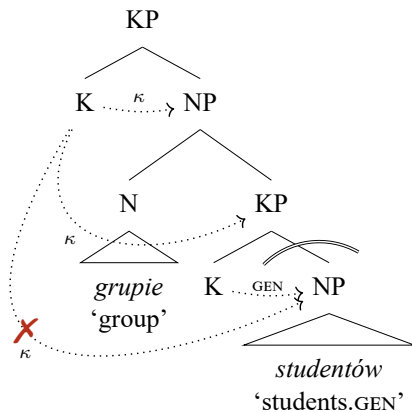
The following subsection demonstrates that this diachrony-driven interpretation of synchronic data is compatible with the analyses proposed above.

## 4.2 Analytical considerations

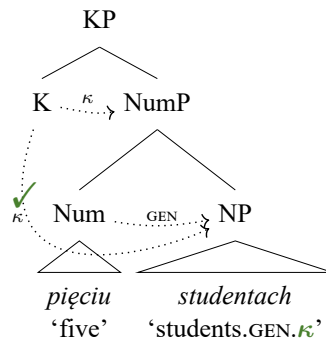
### 4.2.1 Minimalism

As discussed immediately above, cardinal numerals stem from nouns, so – assuming an analysis of numeral phrases as headed by numerals (i.e., as (7) rather than (8)) – a change occurred from a structure like (46) below to a structure like (47). Note that this process involved changing the category from N to Num and changing the complement from KP (i.e., a phase) to NP (not a phase). In the case of collective numerals, this development was arrested at the stage where fully transitioned – but defective due to the prescriptive intervention – collective numerals (as in (49)) co-exist with items that have not undergone the full transition (as in (48)).<sup>23</sup>

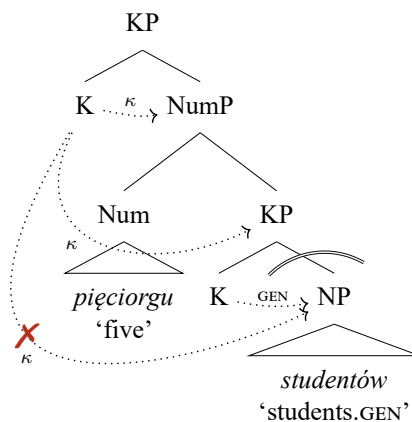
(46) noun-noun ( $\approx$  (6)):



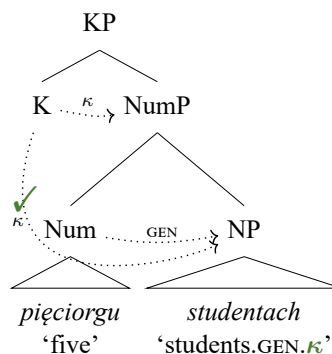
(47) cardinal-noun ( $\approx$  (7)):



(48) nounish collective-noun ( $\sim$  (46)):



(49) cardinalish collective-noun ( $\approx$  (47)):



The partially transitioned collective numerals, illustrated in (48), have changed their category from N to Num, as is clear from the fact that – like prototypical cardinal numerals – they are inherently plural and trigger the default 3SG.N agreement on the verb, as illustrated with the attested (50):

<sup>23</sup> The terminals in the above trees correspond to  $\kappa = \text{LOC}$ , i.e., the forms *grupie* 'group', *pięciu* 'five.CARD', *pięciorgu* 'five.COLL', and *studentach* 'students' may be interpreted as locative. ("May" because – with the exception of *studentach* 'student.PL.M.LOC – they are all syncretic with some other cases.)

- (50) *Te czworo czy pięcioro dzieci mogłoby się przysłużyć państwu.*  
 these.PL four.COLL or five.COLL children.GEN could.3SG.N REFL serve.INF state.DAT  
 ‘These four or five children could be of service to the state.’

The adjectival demonstrative *te* ‘these.NOM/ACC’ agrees with the numeral, and not with the genitive noun; this is clear as *te* is not in the genitive. (Agreement with the noun would also be possible here, but then the form would be the genitive *tych*.) Given that *te* is plural, the numeral must be analysed as plural – this is a standard and generally accepted argument for the inherent plural number of Polish numerals; no singular form would be possible here. However, despite this plurality of the subject, the verb occurs in 3rd person *singular*, which is the default form reflecting the lack of agreement (Dziwirek 1990, Preminger 2014). This is again typical of Polish numerals and it is often explained as reflecting the accusative case of the numeral (Przepiórkowski 1999, 2004, Witkoś et al. 2018, Citko et al. 2018) – an aspect of Polish numerals ignored here.<sup>24</sup>

The above considerations show that collective numerals have successfully changed their category to Num. However, they have not traversed the whole path regarding their complement: they are indeterminate as to whether they still, like nouns, combine with genitive KPs (as in (48)), or whether they are integrated into the noun’s extended projection, like cardinal numerals (as in (49)). In the first case, the complement is realized as GEN, given that KPs are phases, and in the second the nominal complement is marked with the same case  $\kappa$  as the numeral, creating the impression of agreement when  $\kappa$  is at least as marked as GEN. Additionally, given the prescriptivist intervention discussed above, this last option is artificially blocked when  $\kappa = \text{INS}$ .<sup>25</sup>

#### 4.2.2 LFG

While not much hinges on this, I assume that both cardinal and collective numerals have the syntactic category Num but differ in the value of the NUMTYPE feature specified in lexical entries of numerals: CARD or COLL. As discussed immediately above, there are various similarities between cardinal and collective numeral phrases that warrant this treatment, including the fact that they are accusative in subject positions and, consequently, trigger the default third person singular neuter agreement on the verb.

For those speakers who allow for all the possibilities shown in table 5, including agreement in INS, the rule for collective numeral phrases, given in (52), is almost identical to that for cardinal numeral phrases, repeated (with NUMTYPE added) in (51). The only difference is that, in the case of collective numerals, @CONCORD is optional, so the noun may occur in GEN in all positions, even when the numeral bears a case that is more marked than GEN.

- (51) cardinal numerals (modified from (26))

$$\begin{array}{ccc}
 \text{NumP} & \rightarrow & \begin{array}{c} \text{Num} \\ \uparrow = \downarrow \\ (\downarrow \text{NUMTYPE}) =_c \text{CARD} \end{array} & \begin{array}{c} \text{NP} \\ \downarrow = (\uparrow \text{OBJ}) \\ @\text{CONCORD} \\ @\text{GEN} \end{array}
 \end{array}$$

- (52) collective numerals (permissive)

$$\begin{array}{ccc}
 \text{NumP} & \rightarrow & \begin{array}{c} \text{Num} \\ \uparrow = \downarrow \\ (\downarrow \text{NUMTYPE}) =_c \text{COLL} \end{array} & \begin{array}{c} \text{NP} \\ \downarrow = (\uparrow \text{OBJ}) \\ (@\text{CONCORD}) \\ @\text{GEN} \end{array}
 \end{array}$$

<sup>24</sup>Given these considerations, a fuller gloss of *czworo* in (50) would be ‘four.COLL.ACC.PL’, and similarly for *pięcioro* ‘five.COLL.ACC.PL’, with *te* glossed as ‘these.ACC.PL’. (We ignore gender here.)

<sup>25</sup>Technically, this can be accounted for by the assumption that the feature bundle corresponding to an instrumental collective numeral categorially selecting for an NP – i.e., the bundle [Num, COLL+, INS, C:NP] – has no corresponding exponence rule.

## (53) collective numerals (restrictive)

$$\begin{array}{ccc} \text{NumP} & \rightarrow & \begin{array}{c} \text{Num} \\ \uparrow=\downarrow \\ (\downarrow \text{NUMTYPE}) =_c \text{COLL} \end{array} & \begin{array}{c} \text{NP} \\ \downarrow = (\uparrow \text{OBJ}) \\ (@\text{CONCORD} \wedge \neg(\uparrow \text{CASE INS})) \\ @\text{GEN} \end{array} \end{array}$$

However, grammars of most speakers seem to follow the prescriptive rule that forbids concord in *INS*, which leads to the more complex rule in (53), where the optional *@CONCORD* is conditioned on the non-instrumental case of the numeral phrase.

In terms of diachronic change, the specification of dependent NPs evolved from (54a), which is how genitive dependents of nouns may be encoded,<sup>26</sup> to (54c), which shows the encoding of NP dependents of cardinal numerals (cf. (51)), via (54b), which encodes the most permissive specification of NP dependents of collective numerals (cf. (52)).<sup>27</sup>

## (54) nominal dependents of nouns and numerals:

|                                                                                                |                                                                                                                    |                                                                                                                  |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| a. of nouns:                                                                                   | b. of collective numerals:                                                                                         | c. of cardinal numerals:                                                                                         |
| $\begin{array}{c} \text{NP} \\ \downarrow = (\uparrow \text{POSS}) \\ @\text{GEN} \end{array}$ | $\begin{array}{c} \text{NP} \\ \downarrow = (\uparrow \text{OBJ}) \\ @\text{GEN} \\ (@\text{CONCORD}) \end{array}$ | $\begin{array}{c} \text{NP} \\ \downarrow = (\uparrow \text{OBJ}) \\ @\text{GEN} \\ @\text{CONCORD} \end{array}$ |

In summary, collective numerals do not pose a challenge for the analysis of North Slavic NNCs offered in previous sections. On the contrary, once correct empirical generalizations are discovered, it is easy to extend the analysis of cardinal numeral phrases to collective numeral phrases.

## 5 Previous work

### 5.1 LFG

To the best of my knowledge, there is no previous LFG work convincingly explaining MACA patterns in general or NNCs in particular. Neidle (1988), an LFG monograph on Russian case, briefly considers (in §4.1.2) the typical paradigm of Russian numerals (illustrated in table 1 above) and proposes that each apparent numeral lexeme is a conflation of two defective lexemes: nominal (hence the assignment of *GEN* in these positions; only *NOM* and *ACC*) and adjectival (hence the case concord in these positions; *GEN*, *DAT*, *LOC*, *INS*), as shown in table 8.

However, this explanation is very unlikely to be correct, as defective paradigms are usually a matter of some idiosyncrasy, while here all cardinal numerals would actually be pairs of identically complementarily defective lexemes – and not only in Russian, but also in other North Slavic languages.<sup>28</sup>

Another LFG work that attempts to codify the MACA pattern is Przepiórkowski & Patejuk (2012), where the rule (55) (much simplified here) is stated explicitly, and a rule like (56) is assumed.

$$(55) \quad \text{NumP} \rightarrow \begin{array}{c} \text{Num} \\ (\downarrow \text{ACM}) =_c \text{REC} \\ \uparrow=\downarrow \end{array} \quad \begin{array}{c} \text{NP} \\ (\downarrow \text{CASE GEN}) =_c + \end{array}$$

$$(56) \quad \text{NumP} \rightarrow \begin{array}{c} \text{Num} \\ (\downarrow \text{ACM}) \neq \text{REC} \\ \uparrow=\downarrow \end{array} \quad \begin{array}{c} \text{NP} \\ (\downarrow \text{CASE}) = (\uparrow \text{CASE}) \end{array}$$

<sup>26</sup>Such a dependent could be specified in an extended version of rule (35) above.

<sup>27</sup>Note that the differences would be even smaller if grammatical functions were drastically reduced in LFG, as advocated by Alsina (1996), Patejuk & Przepiórkowski (2016), Przepiórkowski (2016), and Lowe (2025), as then the equations defining grammatical functions – now *POSS* vs. *OBJ* – might be the same.

<sup>28</sup>Apparently, Neidle (1988) is the sole work in the whole vast literature on Slavic NNCs that assumes such a systematic and complementary defectiveness.

Table 8: Russian numeral-noun constructions according to Neidle (1988)

| position | ‘ f i v e   c h a i r s ’ |                     |                     |                        |
|----------|---------------------------|---------------------|---------------------|------------------------|
|          | 5 is a noun               |                     | 5 is an adjective   |                        |
|          | ‘five’                    | ‘chairs’            | ‘five’              | ‘chairs’               |
| NOM      | <i>pjat’</i> .NOM         | <i>stul’ev</i> .GEN | *                   |                        |
| ACC      | <i>pjat’</i> .ACC         | <i>stul’ev</i> .GEN | *                   |                        |
| GEN      | *                         |                     | <i>pjati</i> .GEN   | <i>stul’ev</i> .GEN    |
| DAT      | *                         |                     | <i>pjati</i> .DAT   | <i>stuljam</i> .DAT    |
| LOC      | *                         |                     | <i>pjati</i> .LOC   | <i>stuljax</i> .LOC    |
| INS      | *                         |                     | <i>pjat’ju</i> .INS | <i>stuljami</i> .M.INS |

These rules assume the “complex case” approach of Dalrymple et al. (2009), according to which [GEN+] on a word means that this word may be interpreted as genitive, while [GEN−] means that it cannot be a genitive form.<sup>29</sup> Additionally, these rules employ the grammatical feature called *accommodability*, abbreviated here to ACM, introduced in Polish structuralist linguistics (Bień & Saloni 1982) to distinguish between numeral forms agreeing with their dependent nouns ([ACM CONGR]) and those requiring the genitive case ([ACM REC]). Hence, the effect of these rules is that [ACM REC] numerals combine with genitive nouns and other numerals combine with nouns agreeing in case.

However, this account does not say anything about the distribution of [ACM REC] on numeral forms. On the assumption that the functional description ( $\uparrow$  ACM) = REC is present on all and only lexical entries for (NOM and) ACC numeral forms, this account ‘works’ in a technical sense, but it is as stipulative as the proposal in Neidle (1988), which relies on highly regular and complementary defectiveness.

By contrast, the LFG account proposed above is free from such lexical stipulations. Instead, it relies on the independently motivated case hierarchy, its LFG encoding based on work within L<sub>R</sub>FG, and a general approach to nominal concord.

## 5.2 Outside LFG

While there is hardly any work on Slavic NNCs in LFG, the derivational literature on this topic is vast – too large to do any justice here, so below I only mention some of the most relevant derivational (and HPSG) works.<sup>30</sup> Most of the work in 1980s and 1990s, of which Babby (1987) and Franks (1994, 1995) are prominent exemplars, crucially relied on the distinction between Deep Structure and Surface Structure assumed within the Government and Binding Theory (GB; Chomsky 1981), but given up in Minimalism. Additionally, that work assumed ad hoc case percolation mechanisms, which the approach to concord proposed in Przepiórkowski (2025) and summarized in section 2 attempts to avoid, as well as a variety of other mechanisms motivated only by the phenomenon of NNCs. One example of such a mechanism is the resolution of conflicts in case assignment on the basis of markedness, with oblique cases (e.g., DAT, INS, etc.) defined as more marked than the genitive of quantification, which in turn is defined as more marked than direct cases (NOM, ACC). While this hierarchy – and this particular aspect of Babby’s (1987) analysis – is broadly compatible with the one assumed here, it was not motivated in Babby (1987) outside of its usefulness to account for Russian NNCs.

Foreshadowing one of the ideas on which the analyses offered in this paper are based, Matushansky (2008: §5.2) proposes that, when essive and translative compete for the exponence of Finnish predicates, translative wins, as it is more marked than essive. In this case, unlike in Babby (1987), markedness

<sup>29</sup>So, for example, [NOM−, ACC+, GEN+, DAT−, LOC−, INS−] indicates that a given form is syncretic (only) between ACC and GEN.

<sup>30</sup>Apart from the broadly generative tradition, there is important dependency work on Russian NNCs by Igor A. Mel’čuk (1985, 1988, 2009), but I do not discuss it here for lack of space.

is defined as in Distributed Morphology, i.e., in terms of featural richness: *essive* expones the feature [PREDICATIVE], while *translative* expones the more marked feature combination [PREDICATIVE, AFFECTED]. Matushansky (2008: §6) also briefly suggests that this approach to case exponence may explain the MACA pattern of Russian NNCs, but she does not provide a worked out analysis.<sup>31</sup>

Another derivational analysis which bears certain resemblance to the analyses proposed here is that of Witkoś et al. (2018). Not only does it assume Caha's (2009) case hierarchy, but it also adopts specific Nanosyntax mechanisms and representations. However, the part of the analysis aiming to explain the difference between agreement and case assignment patterns is rather complex, it is based on a number of unusual assumptions (see, e.g., Witkoś et al. 2018: 64, fn. 35), and it leaves many questions open, so a more detailed discussion of this approach would require considerable space, which I lack here.

Finally, an HPSG analysis of Polish NNCs inspired by some GB ideas, especially, the distinction between structural and lexical case assignment, is offered in Przepiórkowski (1999) (and related publications). On this analysis, numerals in structural positions require genitive dependents and those in lexical positions require agreeing dependents. Given the power of HPSG, this statement can be made once in the grammar, rather than – missing generalizations – in a large number of lexical entries, as in the LFG analyses discussed in section 5.1. Nevertheless, apart from being more stipulative than the analyses offered above (why should there be such a difference between structural and lexical positions?), it faces a problem related to arguments of prepositions.

Morphological realization of cases assigned structurally depends on particular syntactic configurations. For example, in Polish, structurally-cased nominal subjects of verbs are exponed as nominative and structurally-cased objects as accusative (in the absence of negation). It has been similarly proposed (e.g., in Franks 1995) that, unless a preposition assigns a specific lexical case (e.g., LOC or INS) to its argument, this argument bears a structural case, realized as accusative. However, there are also some (very few) prepositions in Polish that combine with nominative NPs, e.g., *via* 'via, through'. If accusative is the structural case of arguments of prepositions, then such nominative NPs must bear the *lexical* nominative. But numeral phrases behave in such nominative positions as in "structural" positions, not as in "lexical" positions: the noun is in the genitive, and not in the nominative expected on the analysis in Przepiórkowski (1999) if nominative assigned by prepositions were lexical.<sup>32</sup> This is illustrated by the following attested example, ungrammatical when the GEN form *balkonów* is changed to the NOM/ACC form *balkony*:<sup>33</sup>

- (57) *nocna eskapada Julii [via siedem {balkonów / \*balkony}] do pokoju żonatego*  
 nightly escapade Julia.GEN via seven balconies.GEN/\*{NOM/ACC} to room married.GEN  
*mężczyzny*  
 man.GEN  
 'Julia's nighttime escapade via seven balconies to a married man's room'

The analyses proposed in this paper, which rely on the markedness of morphological cases rather than on the structural/lexical distinction, are free from this problem.

## 6 Conclusion

I believe that the above account of MACA patterns is considerably less stipulative than previous analyses. In the case of NNCs, it does not rely on any lexical stipulations, but it does rely on a lexical stipulation where it seems unavoidable: in the case of the 'something interesting' idiosyncrasy. It also relies on an independently motivated case hierarchy, rather than on a stipulated hierarchy or on the structural/lexical

<sup>31</sup>I became aware of this proceedings paper on predication only after developing the account presented in Przepiórkowski (2025). Note that also Ionin & Matushansky (2018: 185) seem to assume such an *expones the most marked case* principle in their account of Russian paucals.

<sup>32</sup>Conversely, if ad-prepositional nominative were taken to be structural and ad-prepositional accusative lexical, then ad-numeral nouns in such ad-prepositional accusative positions would be wrongly expected to occur in the accusative rather than in the genitive.

<sup>33</sup><https://ruj.uj.edu.pl/bitstreams/b17150a7-e61b-4cc2-b343-dac0868322f6/download>

dichotomy and the timing of case assignment, as in the case of the best known derivational analyses. Finally, each of the two implementations of the account relies on general mechanisms independently employed in the respective framework: Agree in Minimalism and a particular encoding of case proposed in  $L_{\text{R}}\text{FG}$ .

On the empirical side, I adduced new data showing that collective numerals – usually avoided in discussions of Slavic numerals, probably due to the problems they seem to pose for most analyses – are not a problem for the proposed account, once the correct empirical generalizations are found. Hopefully, these empirical considerations will make it possible to include collective numerals in future analyses – before this class of numerals disappears from Slavic altogether.

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# Case-marking in Pitjantjatjara: Edge inflection and noun phrase structure

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## 1 Introduction

One of the strengths of the Lexical-Functional Grammar (LFG) framework is its ability to describe in precise terms the work done by different parts of the grammar (such as morphology and syntax) in any given language, and how those levels interface. This descriptive flexibility then allows for a broad range of complex and unusual empirical phenomena to be accounted for, and for more precise comparison between the structures of different languages. Work on case and case marking in this vein is particularly rich, and has been enhanced substantially by work by Miriam Butt and Tracy King over many years, e.g. Butt & King (1991, 2003, 2004). In this paper, we discuss the case system of Pitjantjatjara, a Pama-Nyungan language of Central Australia, and show how its complex system can be provided a unified analysis in LFG, drawing on a number of different and independently motivated aspects of the framework, including constructive case (Nordlinger 1998), non-projecting words (Toivonen 2003), lexical sharing (Wescoat 2002, Broadwell 2008, Lowe 2015, 2016), and aspects of the analysis of Urdu case clitics presented by Butt & King (2004). Pitjantjatjara appears initially to present a number of puzzles for the morphology-syntax interface, yet we show how they can be given an explanatory and intuitive account within LFG. We also discuss how Pitjantjatjara adds to our understanding of the typology of case realisation.

Goddard (1985: 24) describes the case system of Yankunytjatjara (a very closely related variety to Pitjantjatjara) as “[presenting] a complex picture, not so much in the sheer number of markers ...but in the way that morphological, phonological and semantic factors interact to determine their distribution”. Pitjantjatjara is also cited by Haspelmath (2017: 53) as “idiosyncratic” in the way that case markers appear to be simultaneously morphological (i.e. exhibit morphophonological alternations and lexically arbitrary forms) and syntactic (i.e. appearing always at the right edge of the left-headed NP). These facts are shown in (1).<sup>1</sup> Here we see that the head is invariably at the left edge, while the case marker appears on the rightmost word of the phrase, with its form differing based on that final word.

- (1) a. *tjitji pulka-**ngku***  
child big-ERG  
‘big child’ (Bowe 1990: 30)
- b. *tjitji ninti puku**l-tu***  
child clever happy-ERG  
‘happy, clever child’ (Bowe 1990: 30)
- c. *tjitji tjukutjuku palu-**ru***  
child small 3SG-ERG  
‘the little child’ (Bowe 1990: 50)

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<sup>1</sup>The Pitjantjatjara orthography includes the underlined letters <l, n, r, t> to represent the post-alveolar consonants /l, n, r, t/. Digraphs <ng, ny, tj> represent /ŋ, ɲ, tʃ/. Non-Leipzig abbreviations used in glosses in this paper: PERL ‘perlative’, PROP ‘propriative’, DS ‘different subject’, SS ‘same subject’, MV ‘medial verb’, ANAPH ‘anaphoric demonstrative’, EMPH ‘emphatic’, SEMBL ‘semblative’.

- d. wati Adama-**lu**  
man Adam-ERG  
'that man Adam'

(*Tjukurpa Palya*, Romans 5:19)

On the other hand, the spatial markers =*kutu* 'ALL', =*nguru* 'ABL', and =*wanu* 'PERL' have been described as case in some previous descriptions of the language (see Wilmoth & Nordlinger to appear), but do not show any morphophonological sensitivity to the stem to which they attach, and select locative case when attached to pronouns and proper names, as shown in (2a,b):

- (2) a. palu-la=**kutu**  
3SG-LOC=ALL  
'towards him/her/it'  
b. Mary-la=**kutu**  
Mary-LOC=ALL  
'towards Mary'

In Wilmoth & Nordlinger (to appear), we argue that case markers such as the ergative in (1) are edge-inflected case suffixes. That is, case is marked inflectionally by suffixation, but only on the rightmost word of the NP, regardless of whether this is the head or not. The spatial markers, however, can be shown to be postpositional clitics, syntactically positioned as the head of a right-headed PP. We show how this distinction accounts for the otherwise puzzling differences in behaviour between the two types of nominal markers (see Section 5.1 below for further discussion). There is also an additional puzzling fact that these spatial postpositions, when attached to common nouns, apparently attach to the bare stem (3), rather than a locative-marked noun as with pronouns and proper names (2).

- (3) a. karu=**kutu**  
creekbed=ALL  
'towards the creekbed'  
b. \*karu-**ngka**=**kutu**  
creekbed-LOC=ALL

In this paper, we build on our previous analysis to show how these case markers and postpositions can be accounted for within LFG. We begin in Section 2 with an overview of the Pitjantjatjara case system and the empirical phenomena that we will focus on in this paper. In Section 3, we present our analysis of case affixes and NP structure in Pitjantjatjara to account for their hybrid morphosyntactic behaviour as right-edge affixes. We then expand this analysis to include adnominal possession in Section 4. Then in Section 5, we discuss postpositions and postpositional phrases. We motivate the distinction between case suffixes and postpositional clitics on the basis of a number of properties, including differences in scopal behaviour in coordination (Section 5.1). In Section 5.2, we turn our attention to the interaction of postpositional clitics with the case affixes illustrated in (2). Then in Section 5.3, we show how our analysis also accounts for a range of other complex phenomena, including sequences of postpositions (4) and the fact that postpositions can not only follow case markers but can also themselves inflect for case (5).

- (4) puṇu tjilka=**tjara**=**nguru**  
plant prickly=PROP=ABL  
'from the thorny bush'  
(5) tjukurpa nyanga palu-la=**wanu**-**ngku**  
story this 3SG-LOC=PERL-ERG  
'through this story'

(*Tjukurpa Palya*, Luke 6:44)

(*Tjukurpa Palya*, Acts 7:8)

We end in Section 6 with a summary of our analysis, and a discussion of how Pitjantjatjara compares to other case marking systems in the world’s languages. Our analysis combines several independently motivated aspects of LFG, namely non-projecting words (Toivonen 2003), constructive case (Nordlinger 1998), and (partitioned) lexical sharing (Wescoat 2002, Lowe 2015). The combination of these elements, reflecting the idiosyncrasies of Pitjantjatjara, is not described in detail elsewhere to our knowledge.

## 1.1 Pitjantjatjara

Pitjantjatjara is a Western Desert, Pama-Nyungan language spoken as a first language by over 3,000 people in Central Australia (Department of Infrastructure, Transport, Regional Development and Communications et al. 2020). Like many other Pama-Nyungan languages, it is a predominantly suffixing, dependent-marking language with highly flexible constituent order within the clause (Wilmoth et al. 2025). It is well documented compared to many other Australian languages, and is still being acquired as a first language by children and used as the primary language across a number of communities in the region. Our data in this paper comes largely from the fieldwork corpus of the first author, recorded in Pukatja (Ernabella) in South Australia. Several examples are taken from the Pitjantjatjara translation of the Bible (*Tjukurpa Palya*, 2019); the English translation of these is generally ours. We also refer to Bowe (1990), Wilmoth (2022) and Goddard (1985). The latter is a grammar of the very closely related dialect Yankunytjatjara; there are no differences between Pitjantjatjara and Yankunytjatjara which are relevant for our discussion here.

## 2 Case marking in basic NPs

In this section, we introduce the cases and case allomorphy in Pitjantjatjara, before showing how these are distributed across some basic NP constructions. There are five grammatical cases in Pitjantjatjara: ergative, nominative, accusative, dative, and locative. These are shown in Table 1 with allomorphy matching descriptions of traditional Pitjantjatjara; there have been some changes to case allomorphy in recent generations which we do not discuss here (see Wilmoth 2022, Langlois 2004).

Table 1: Case marking paradigm with traditional allomorphy

|               |         | ERG   | NOM  | ACC  | DAT   | LOC   |
|---------------|---------|-------|------|------|-------|-------|
| Nouns         | V-final | -ngku | -Ø   | -Ø   | -ku   | -ngka |
|               | C-final | -Tu   | -Ø   | -Ø   | -ku   | -Ta   |
| Proper names  | V-final | -lu   | -nya | -nya | -ku   | -la   |
|               | C-final | -Tu   | -nga | -nga | -ku   | -Ta   |
| Free pronouns | 1SG     | -lu   | -lu  | -nya | -ku   | -la   |
|               | 3SG     | -ru   | -ru  | -nya | -mpa  | -la   |
|               | other   | -Ø    | -Ø   | -nya | -mpa* | -la   |

Phonologically conditioned allomorphy can be seen in parts of this paradigm, depending on whether the stem is vowel- or consonant-final. The capital T indicates a coronal stop homorganic with the preceding coronal segment, or /t/; that is ERG/LOC -tju/tja following a palatal, -tu/ta following a retroflex, or -tu/ta following other consonants. The forms of case markers also differ depending on the type of nominal they attach to: nouns, proper names and free pronouns are distinguished, with free pronouns having slightly more idiosyncratic forms.<sup>2</sup> What we refer to as the ‘noun’ category in Pitjantjatjara includes common nouns such as *papa* ‘dog’, but also demonstratives such as *nyanga* ‘this’, property-denoting words such as *pulka* ‘big’, as well as numerals and quantifiers (such as *kutju* ‘one’ or *tjuta* ‘PL’). A large class of nominals subsuming these types is common in Australian languages (Dixon 1980); we use ‘nominal’ and

<sup>2</sup>There is an additional irregularity in the cell highlighted with a \*. The 1PL pronoun base is *nganana*, and this otherwise follows the pattern in the ‘other’ row. However, the 1PL.DAT pronoun is *nganampa*, not *nganampa*.

N to refer to the superclass in Pitjantjatjara, and ‘noun’ to refer to the subtype of nominals that take the *-ngku* (etc.) case allomorphy, in contrast to pronouns and proper names.

Finally, note that the three core cases (ERG/NOM/ACC) exhibit some syncretism in parts of the paradigm. For nouns, the nominative and accusative cases are zero-marked, unlike the ergative. For proper names, the nominative and accusative are *-nya/-nga*, also distinct from the ergative. Free pronouns, on the other hand, have the same form for ergative and nominative, and *-nya* for accusative only. We analyse this apparent ‘split ergative’ system as having three underlying case categories with differing patterns of syncretism present in the morphology, following Goddard (1982). We briefly illustrate this in (6), which shows a noun *papa* ‘dog’ and a 3SG pronoun *palu-* in A, S and P roles (corresponding to ergative, nominative and accusative case here). We see the ergative suffix *-ngku* on *papa* when this is the subject of the transitive verbal predicate ‘chase’ (6a), whereas *papa* is unmarked when it is an accusative object (6b) or nominative subject (6c). On the other hand, the 3SG pronoun appears as *palu-ru* when subject of intransitive (6a) and transitive (6b) clauses, and *palu-nya* when it is an accusative object (6a).

- (6) a. **Palu-ru** wirtjapaka-nu, ka **papa-ngku** **palu-nya** piruku ngulu-ra watapara-nu.  
 3SG-NOM run-PST and.DS dog-ERG 3SG-ACC again scare-MV follow-PST  
 ‘He ran, and the dog chased him again.’ (SW20190531-04-LeafStory)
- b. **Papa** **palu-ru** tju-nu.  
 dog(ACC) 3SG-ERG put-PST  
 ‘He put the dog (in the yard).’ (SW20190331-01-VariousStories)
- c. **Papa** ngara-nyi.  
 dog(NOM) stand-PRS  
 ‘The dog is standing.’ (SW20190331-02-MonsterStory)

As mentioned above, case is marked only once in the noun phrase, always at the right edge. This is despite the fact that the head is invariably phrase initial (see Bowe 1990 for a description of ordering of modifiers within the NP). This is true of NPs ending with nouns, pronouns, and proper names, as seen in the following examples. Example (7) shows an NP headed by *wati* ‘man’ followed by a series of nouns (in the language-specific sense defined above). Thus the plural marker *tjuta* receives the V-final noun ergative case marker *-ngku*. Example (8) shows the 3SG pronoun *palu-* at the right edge of the NP; this pronoun frequently appears in this position and marks definiteness (see Louagie & Verstraete 2015 for a typological discussion of this phenomenon in Australian languages). Here it appears in its idiosyncratic ergative form *paluru*. Finally, example (9) shows two NPs ending in proper names. These are marked with the C-final proper name allomorphs, ergative *-tu* and accusative *-nga* respectively.

- (7) Ka=ya **wati panya nintipuka tjuta-ngku** mayatja-ngka wangka-ngu...  
 and.DS=3PL.ERG man ANAPH wise PL-ERG leader-LOC speak-PST  
 ‘And those wise men said to the king...’ (Tjukurpa Palya, Daniel 2:10)
- (8) **Mamu panya palu-ru** papa yaata-ngka tju-nu.  
 monster ANAPH 3SG-ERG dog yard-LOC put-PST  
 ‘That monster put the dog in the yard.’ (SW20190328-02-MonsterStory)
- (9) Ka **wati panya Simon-tu** nya-ngu **Kurunpa Miilmiil-nga**  
 and.DS man ANAPH Simon-ERG see-PST spirit sacred-ACC  
 ‘And that man Simon saw the Holy Spirit.’ (Tjukurpa Palya, Acts 8:18)

The proper name allomorphs can also be found attached to nominalised verbs in relative clauses. In this construction, the relative clause follows the relativised noun in the same position as other modifiers. Again, case marking appears on the right edge of the whole NP, attached to the final word and not on the head noun. In (10), we find the proper name, V-final ergative allomorph *-lu* attached to the nominalised verb.

- (10) **Minyma panya maku tjuta tjawa-ntja-lu ngayu-nya u-ngu.**  
 woman ANAPH witchetty.grub PL dig.out-NMLZ-ERG 1SG-ACC give-PST  
 ‘The woman who dug out lots of witchetty grubs gave (them) to me.’

If there is another nominal within the NP but following the relative clause, however, this rightmost word receives case marking with the appropriate allomorph. For example, we see the V-final noun ergative case marker *-ngku* on *tjuta* in (11), rather than any case marking on the nominalised verb or the head noun.

- (11) **Palu anangu panya ngayu-lu alti-nytja tjuta-ngku kuli-ra alatji=tu**  
 but person ANAPH 1SG-ERG summon-NMLZ PL-ERG hear-MV like.SO=EMPH  
 wanti-ngi.  
 leave.alone-PST.IPFV  
 ‘But the people whom I invited refused to come.’ (Tjukurpa Palya, Matthew 22:8)

While marking at the edge of a phrase in this way is often taken as evidence of clitic-hood (e.g. Butt & King 2004 for Urdu case markers), the Pitjantjatjara case markers exhibit a high degree of selection with respect to their stems, behaviour that has been standardly accepted as evidence for affixhood since Zwicky & Pullum (1983). Not only is there morphophonological interaction between the form of the case affix and whether the stem is V-final or C-final, as shown in Table 1, in some cases this is idiosyncratic and lexically arbitrary, as with the distinction between nouns and proper names, and the idiosyncratic forms for some pronouns, all of which is strong evidence for an analysis which treats these as affixes (Lowe 2016). This is further supported by the fact that the case affixes cannot have wide scope over coordination (12), which should be possible if they were clitics (Butt & King 2004).

- (12) a. [katja]-ngku munu [untal]-tu  
 son-ERG and daughter-ERG  
 ‘son and daughter’  
 b. \*[katja munu untal]-tu  
 son and daughter-ERG

Therefore, in Wilmoth & Nordlinger (to appear) we argue that case is marked by the rightmost word of the NP appearing in its appropriate inflected form, with an idiosyncratic system of case suffixes in the morphology. This is thus truly edge inflection, similar to the distantly related Australian language Kuuk Thaayorre (Anderson et al. 2006).

### 3 Analysis of case marking

Having now described the basics of case and case marking in Pitjantjatjara, we begin to sketch an LFG analysis of this, following some brief background. The account outlined in this section captures the following key facts:

- the head is at the left edge of the NP;
- case is marked via inflection of the rightmost word of the NP;
- case markers cannot have wide scope over coordination.

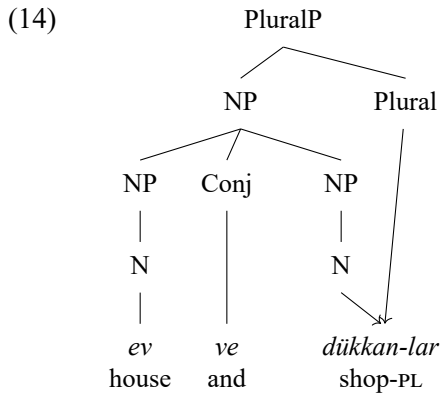
Syntactically positioned affixes such as these have been captured in LFG by using lexical sharing, e.g. by Broadwell (2008) and Şenşekerçi (2022) for Turkish, and by Lowe (2015, 2016) for some instances of the possessive construction in English. Lexical sharing was first proposed by Wescoat (2002) to account for phenomena that seemed to violate the principle of lexical integrity, whereby a single morphological word apparently maps onto more than one syntactic head. In LFG terms, a single word may be instantiated by two or more distinct nodes in the c-structure. There are some constraints on this: importantly, these nodes

must be linearly adjacent (Wescoat 2002), and there must be some independent evidence for a separate syntactic head (Broadwell 2008, Lowe 2016).

We can illustrate the basic idea with an example from Turkish. Broadwell (2008) uses lexical sharing to account for suspended affixation, where many affixes are able to appear at the end of a complex NP and have scope over coordination, as in (13).

- (13) [ev ve dükkan]-lar.  
house and shop-PL  
'houses and shops' (Kabak 2007, p. 335, cited in Broadwell 2008: 202)

The corresponding simplified c-structure for (13) is given in (14).



The fact that the single lexical item *dükkan-lar* instantiates both the N head of the second NP as well as the Plural head of the PluralP in (14) captures the fact that this plural suffix can have scope over both conjuncts in the conjoined NP.

If a single word maps onto more than one terminal node in the c-structure, the question arises of how the f-descriptions in the lexical entry are distributed across the corresponding f-structures. An additional amendment to the lexical sharing approach was therefore a proposal by Lowe (2015) that distinguishes unified and partitioned lexical sharing.<sup>3</sup> This distinction accounts for differences in possessive constructions in historical vs Present Day Englishes. In the Present Day English example (15), *species* has an affixal 'zero' possessive, and instantiates both N and D nodes by Lowe's analysis (2015: 215). Its lexical entry specifies separate (i.e. partitioned) f-descriptions for these two nodes, accounting for the fact that it is not *the species* that is the possessor; rather, the grammatical function POSS should be associated with the DP *the female of the species* as a whole.

- (15) a. *The female of the species' deadliness*  
b. *species* N D  
(↑ PRED) = 'species' (POSS ↑)

This differs from Early Middle English, as illustrated in (16) (Lowe 2015: 223). In Early Middle English, possessive affixes were strongly constrained to appear on the head of the possessor phrase, and immediately before the possessum. This meant that any post-modifiers appeared after the possessum, such as *of Gloucester* which is associated with the possessor in (16). As with Present Day English, Lowe (2015) analyses possessive-marked words such as *eorles* as co-instantiating both a N and D node in the c-structure (there were still some morphological irregularities in possessive marking at this stage). Unlike Present Day English, however, in Early Middle English the POSS feature can be reliably associated with the N node as it is the head of the possessive phrase, and therefore no f-structure needs to be associated with the D node. This is unified as opposed to partitioned lexical sharing.

<sup>3</sup>In Lowe (2016), unified and partitioned lexical sharing are referred to as 'Head-marked Lexical Sharing' and 'Phrase-marked Lexical Sharing' respectively.

- (16) a. þe eorles douȝter of Gloucetre  
the earl.GEN daughter of Gloucester  
'The Earl of Gloucester's daughter.'  
b. *eorles* N D  
(↑ PRED) = 'earl'  
(POSS (∈) ↑)  
((POSS ↑) DEF) = +

We can take Turkish examples like (13) as a starting point for our analysis of case-marking in Pitjantjatjara, before we revisit the issue of partitioned lexical sharing. As we saw above in (12), Pitjantjatjara case affixes don't allow such wide scope and thus exhibit lexical sharing in a different way to Broadwell's (2008) analysis of Turkish suspended affixation, where the Plural projects a PluralP. Instead, we analyse case-inflected Pitjantjatjara nominals as coinstantiating an N and a non-projecting  $\widehat{K}$  which is syntactically positioned at the end of the NP.<sup>4</sup> Since the  $\widehat{K}$  is contained within the NP and doesn't project its own KP, the case affix cannot have scope over coordinated NPs. We can state the following preliminary phrase structure rule for Pitjantjatjara NPs (17).<sup>5</sup> This ensures that a case-inflected nominal must appear on the right edge of the NP and that other Ns in the structure cannot be inflected for case. Note that  $\widehat{K}$  is a co-head with the initial N, consistent with standard LFG principles of structure-function association by which functional categories take lexical categories as co-heads (Bresnan et al. 2016); we return to this issue below.

- $$(17) \quad \text{NP} \longrightarrow \text{N} \quad \text{N}^* \quad \hat{\text{K}} \\ \uparrow=\downarrow \quad \downarrow \in (\uparrow_{\text{ADJ}}) \quad \uparrow=\downarrow$$

Nominals are inflected with case in the morphological component, which takes an N stem as input and produces a lexical output which carries case and grammatical function information and coinstantiates N and  $\hat{K}$ . Recall example (1b), repeated here as (18).

- (18)   tjitji ninti pukul-**tu**  
 child clever happy-ERG  
 ‘happy, clever child’ (Bowe 1990: 30)

The analysis outlined here implies lexical entries for *pukul(pa)* as follows.<sup>6</sup> The lexical entry (19a) would be used for any uninflected, non-final use of this word, while (19b) and (19c) are used for NP-final instances of this word which are inflected for case; the latter also constructs a SUBJ in a transitive clause.<sup>7</sup> We use partitioned lexical sharing (Lowe 2015) whereby all f-descriptions in the lexical entry are assigned to particular c-structure nodes, ensuring that case and any grammatical function are associated with the  $\hat{K}$  and subsequently with the NP as a whole, while the PRED is associated with the N node only. As the lexical head of the NP is always initial, this final N may or may not be the head. In (18), *pukultu* is the last of two post-head adjuncts. If the f-structures were not partitioned in this way, and all information

<sup>4</sup>This analysis draws on the notion of non-projecting words (Toivonen 2003), although here we are dealing with a single morphological word which maps onto two syntactic heads. A similar analysis is discussed by Lowe (2016) for some instances of the English genitive affix. There are also some similarities to Spencer's (2005) analysis of case in Hindi, whereby the ergative clitic is analysed as a non-projecting  $\widehat{P}$ .

<sup>5</sup>For presentational simplicity, we assume here a flat structure for Pitjantjatjara NPs. A more comprehensive analysis may require a more articulated structure in order to account for multi-word nominal dependents, but nothing in our discussion here hinges on this issue and so we leave it aside for future work. In this paper, we follow standard assumptions in LFG that all phrase structure nodes in the C-structure are optional, so we do not indicate this explicitly in the phrase structure rules (Börjars et al. 2019).

<sup>6</sup>These lexical entries include the epenthetic *-pa*, which attaches to consonant-final stems in order to meet a phonological constraint that all words are vowel-final.

<sup>7</sup>We follow Nordlinger (1998) here in treating the ergative case as constructing a SUBJ grammatical function in a transitive clause (i.e. one that also contains an OBJ). (19b) is used in both nominative and accusative contexts; we therefore assume that it doesn't construct a grammatical function, but is appropriately integrated into the f-structure by the principles of Completeness and Coherence.

associated with the final case-inflected nominal was assigned to the f-structure of the  $\widehat{K}$ , the PRED of *pukul<sub>tu</sub>* would clash with the PRED of the head noun.

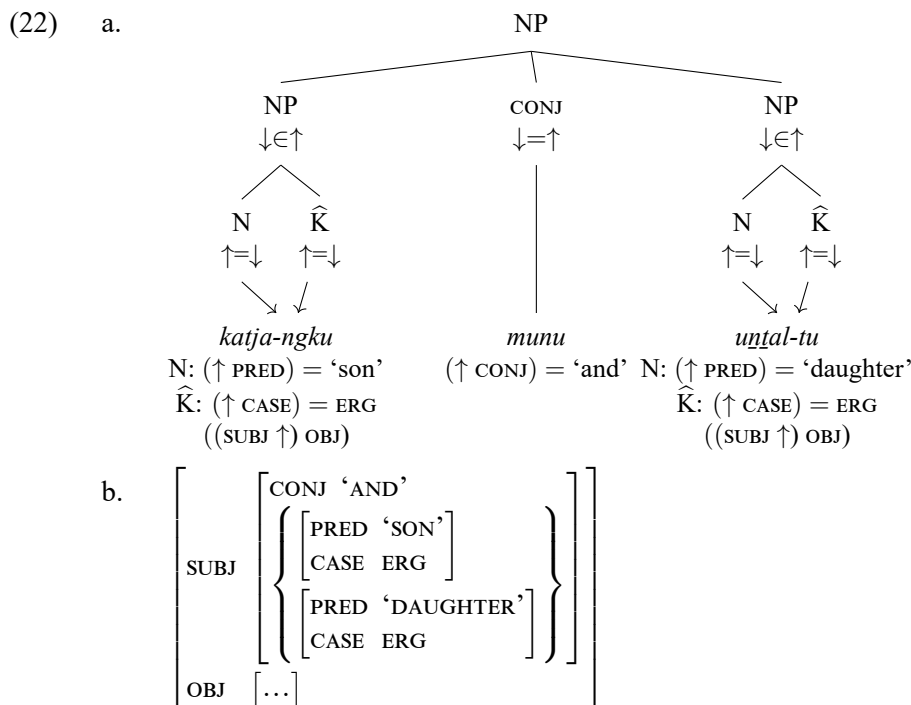
- (19) a. *pukul<sub>pa</sub>* N  
 $(\uparrow \text{PRED}) = \text{'happy'}$
- b. *pukul<sub>pa</sub>* N  $\widehat{K}$   
 $(\uparrow \text{PRED}) = \text{'happy'}$   $(\uparrow \text{CASE}) = \{\text{NOM}|\text{ACC}\}$
- c. *pukul<sub>tu</sub>* N  $\widehat{K}$   
 $(\uparrow \text{PRED}) = \text{'happy'}$   $(\uparrow \text{CASE}) = \text{ERG}$   
 $((\text{SUBJ } \uparrow) \text{ OBJ})$

Example (18) therefore has the following c- and f-structures (20). The fact that  $\widehat{K}$  is a co-head ensures that the case and grammatical function information associated with the final N is ‘lifted up’ to the higher NP even when the final N to which it is attached is not the head.

- (20) a.
- 
- b.
- $$\left[ \begin{array}{c} \text{SUBJ} \\ \text{OBJ} \end{array} \left[ \begin{array}{c} \text{PRED 'CHILD'} \\ \text{CASE ERG} \\ \text{ADJ } \left\{ \begin{array}{c} \text{[PRED 'CLEVER']} \\ \text{[PRED 'HAPPY']} \end{array} \right\} \\ \dots \end{array} \right] \right]$$

Since the case affix is contained within the NP, this approach accounts straightforwardly for the fact that case affixes do not scope over coordinated NPs as in (12a). Assuming a standard coordination rule as in (21) (Dalrymple & Kaplan 2000, Sadler & Nordlinger 2010), each NP conjunct will require its own  $\widehat{K}$  at the right edge, and thus the c- and f- structures of (12a) will be as shown in (22) below. Case is a distributive feature (Dalrymple & Kaplan 2000), hence both conjuncts below are ergative.

- (21)  $XP \rightarrow XP^+ \text{ CONJ } XP$   
 $\downarrow \in \uparrow \quad \uparrow = \downarrow \quad \downarrow \in \uparrow$



#### 4 Possession

In the previous section, we have shown how to account for case marking in basic and coordinate NP structures in Pitjantjatjara using a combination of partitioned lexical sharing (Lowe 2015), non-projecting words (Toivonen 2003) and constructive case (Nordlinger 1998). In this section, we expand our analysis to accommodate adnominal possession. There are two possession constructions in Pitjantjatjara (23).

- (23) a. tjulpu pulka-ngka tjaa-ngka  
bird big-LOC mouth-LOC  
'in the big bird's mouth' (SW20190412-05-T&JDuckling)
- b. walawuru-ku manngu-ngka  
eagle-DAT nest-LOC  
'in the eagle's nest' (SW20190529-01-TjukurpaIrititjaPt1)

Example (23a) shows the inalienable possession construction, where possessor and possessum NPs agree in case. Syntactic evidence such as clitic placement shows that these NPs do not form a single constituent; we do not discuss this construction here as our focus is on possession that is expressed within the NP (although see Wilmoth 2022 for more discussion). Example (23b) shows the alienable possession construction, where the possessor appears adnominally and is marked with the dative case marker. Example (24a) shows that this is recursive. The possessors in these examples must appear before the head noun; the opposite order is not grammatical (24b–24c).

- (24) a. palu-mpa nguny-tju-ku ngura-ngka  
3SG-DAT mother-DAT home-LOC  
'in his mother's home.' (Tjukurpa Palya, Matthew 1:18)
- b. \*manngu walawuru-ku-ngka  
nest eagle-DAT-LOC  
'in the eagle's nest.'

- c. \*ngura palu-**mpa** nguny<sup>tju</sup>-**ku**-ngka  
 home 3SG-DAT mother-DAT-LOC  
 ‘in his mother’s home.’

This can be handled straightforwardly with the addition of an initial dative NP with a POSS function; this, like all c-structure nodes in our phrase structure rules, is optional.

$$(25) \quad NP \longrightarrow \begin{array}{cccc} NP & N & N^* & \hat{K} \\ (\downarrow \text{CASE}) =_c \text{DAT} & \uparrow = \downarrow & \downarrow \in (\uparrow \text{ADJ}) & \uparrow = \downarrow \\ (\uparrow \text{POSS}) = \downarrow & & & \end{array}$$

There is an additional complication, however. While the possessors in (23) must appear before the head noun, pronominal possessors may appear either before or after the head noun (26a–26b); if after, there is some variation in order with respect to other elements (26b–26c). Pronominal possessors also have case markers attached to them if they are NP-final (26d), in what appears to be a classic case of *Suffixaufnahme* (Plank 1995). Interestingly, in these contexts, the pronominal possessor takes the noun case allomorph, not the usual pronominal allomorphs (i.e. we see *-ngka* instead of *-la* for the locative in 26d).

- (26) a. ngana-**mpa** mai  
 1PL-DAT food  
 ‘our food’ (SW20190412-04-PinguCamping)
- b. puṭipulawa wiṛu ngana-**mpa**  
 flower lovely 1PL-DAT  
 ‘our beautiful flowers’ (SW20190531-02-TjukurpaPt2)
- c. mai ngana-**mpa** tjuṭa  
 food 1PL-DAT PL  
 ‘many of our foods’ (SW20190529-01-TjukurpaIrititjaPt1)
- d. ngura ngana-**mpa-ngka**  
 home 1PL-DAT-LOC  
 ‘at our home’ (SW20190531-01-TjukurpaPt1)

This data may appear to pose a challenge to our analysis so far, as our NP rule does not allow any case-marked embedded NPs after the lexical head, and we also need to rule out ungrammatical examples like (24b)–(24c) above. Example (27) summarises the distinction between lexical vs pronominal possessors, namely that lexical possessors can only appear before the possessum (27a–27d) while pronominal possessors can appear before or after the possessum (27e–27f).

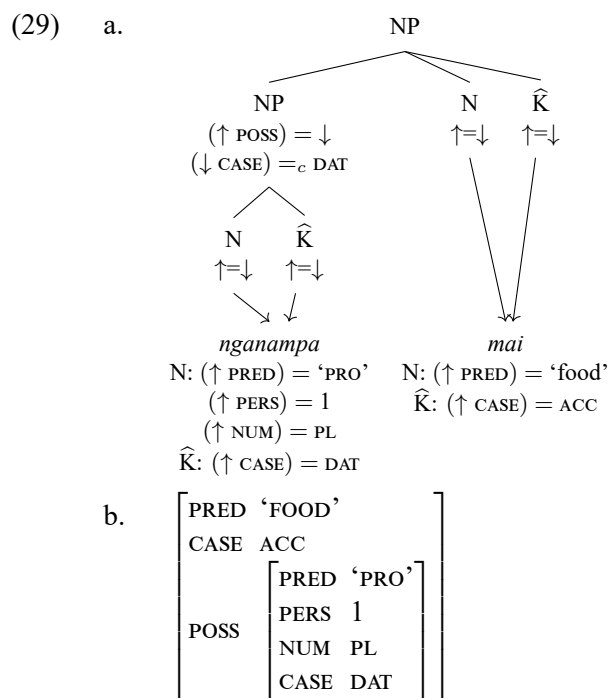
- (27) a. miny<sup>ma</sup> palu-**mpa** katja  
 woman 3SG-DAT son  
 ‘the woman’s son.’
- b. \*katja miny<sup>ma</sup> palu-**mpa**  
 son woman 3SG-DAT  
 ‘the woman’s son’
- c. miny<sup>ma</sup>-**ku** katja  
 woman-DAT son  
 ‘the woman’s son.’
- d. \*katja miny<sup>ma</sup>-**ku**  
 son woman-DAT  
 ‘the woman’s son.’
- e. palu-**mpa** katja  
 3SG-DAT son  
 ‘his/her son.’

- f. katja **palu-mpa**  
 son 3SG-DAT  
 ‘his/her son.’

The fact that (27f) is grammatical while (27b) and (27d) are ungrammatical suggests that this is a difference of syntactic representation, not purely length or part of speech. We therefore analyse these post-head pronominal possessors not as case-marked NPs (which would co-instantiate N and  $\hat{K}$  nodes) but as simply Ns with a lexically specified POSS function. We thus allow adjuncts or possessor Ns to follow the head, adjusting the NP rule as in (28). A defining equation (i.e. with  $\{\text{ADJ}|\text{POSS}\}$ ) would allow any N to be either adjunct or possessor, therefore a disjunct constraining equation ensures that only a pronominal possessor is admitted as a possessor. Uniqueness ensures that there is no more than one possessor in the f-structure of the NP, thus we cannot have both the pre-head and post-head possessor slots filled at once, and we cannot have more than one post-head possessor, even though there may be more than one post-head adjunct.

$$(28) \quad \text{NP} \longrightarrow \begin{array}{ccccc} \text{NP} & \text{N} & \text{N}^* & & \hat{K} \\ (\downarrow \text{CASE}) =_c \text{DAT} & \uparrow = \downarrow & \{\downarrow \in (\uparrow \text{ADJ}) \\ & & | (\downarrow \text{GF}) =_c \text{POSS}\} & & \uparrow = \downarrow \\ (\uparrow \text{POSS}) = \downarrow & & & & \end{array}$$

There is no reason to argue that the post-head pronominal possessors bear any case feature (contrary to our glossing above), and thus no need for a  $\hat{K}$  node. The morphology provides two homophonous pronouns. One is simply an N and can be used for post-head possessors. The other instantiates N and dative  $\hat{K}$  and can be used for pre-head possession (as well as other uses of the dative discussed below). This contrast is illustrated in (29) and (30) for (26a) and (26c) respectively. While they are shown as isolated NPs above, in context they are both objects, so we include the (unmarked) accusative case below. The pre-head possessor in (29) is an NP and thus has a dative case feature associated with a  $\hat{K}$  node; the POSS function is provided by the c-structure annotation. On the other hand, the post-head possessor in (30) is simply an N, rather than an NP, and therefore lacks any case feature associated with a  $\hat{K}$  node; the POSS function is constructed by the morphology, thus allowing it to satisfy the constraining equation and appear in this position.



- (30) a.
- 
- b.
- |      |                                                                                                                                             |      |       |      |   |     |    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------|------|-------|------|---|-----|----|
| PRED | 'FOOD'                                                                                                                                      |      |       |      |   |     |    |
| CASE | ACC                                                                                                                                         |      |       |      |   |     |    |
| POSS | <table border="1"> <tr> <td>PRED</td> <td>'PRO'</td> </tr> <tr> <td>PERS</td> <td>1</td> </tr> <tr> <td>NUM</td> <td>PL</td> </tr> </table> | PRED | 'PRO' | PERS | 1 | NUM | PL |
| PRED | 'PRO'                                                                                                                                       |      |       |      |   |     |    |
| PERS | 1                                                                                                                                           |      |       |      |   |     |    |
| NUM  | PL                                                                                                                                          |      |       |      |   |     |    |
| ADJ  | { [PRED 'MANY'] }                                                                                                                           |      |       |      |   |     |    |

Pre-head possessors that consist of a single pronoun, such as (27e), are simply dative case-marked NPs headed by pronouns, and are thus captured in our phrase structure rule. Dative NPs have various other functions in Pitjantjatjara, such as in (31) and (32) where the non-subject arguments selected by the predicates appear in the dative case. These are all accounted for in a unified way by our NP rule regardless of whether they are lexical or pronominal, or whether they are possessors or have other functions.

- (31) Palu-mpa maḷany-pa paṭa-ṇingi palu-mpa.  
 3SG-DAT younger.sibling-EP wait-PST.IPFV 3SG-DAT  
 'His younger brother was waiting for him.' (SW20190602-02-WalypalaWakantja)
- (32) Kungka puluka-ku nguḷu-ri-nga-nyi.  
 girl bullock-DAT afraid-INCH-AUG-PRS  
 'The girl is afraid of the bullock.' (20180927-PJ05)

Examples such as (26d) where a locative case marker is attached to the possessive pronoun are also easily handled; the lexicon produces *nganampangka* with the PRED and features of the possessor associated with an N node, and the locative case feature associated with a  $\hat{K}$  node.<sup>8</sup>

- (33) a.
- 

<sup>8</sup>Note this also constructs an ADJ function; the reasons for this are discussed further in Section 5.2.

$$b. \left[ \text{ADJ} \left\{ \begin{array}{l} \left[ \begin{array}{l} \text{PRED 'HOME'} \\ \text{CASE LOC} \end{array} \right] \\ \left[ \begin{array}{l} \text{POSS} \left[ \begin{array}{l} \text{PRED 'PRO'} \\ \text{PERS 1} \\ \text{NUM PL} \end{array} \right] \end{array} \right\} \right]$$

Examples such as (26b), which is an object in its original context, can be handled in the same manner, with a morphologically unmarked accusative case feature associated with the NP-final  $\hat{K}$  node.<sup>9</sup>

## 5 Postpositions and PPs

The sections above have described and provided an LFG analysis of case marking of Pitjantjatjara NPs with the five grammatical cases found in the language, including coordination and possessive constructions. We now turn to the second class of markers introduced in Section 1, and the phrases they project. Many previous descriptions of Pitjantjatjara and Yankunytjatjara have described ALLative =*kutu*, ABLative =*nguru*, and PERlative =*wanu* as ‘local’ case suffixes (e.g. Goddard 1985, Bowe 1990, Wilmoth 2022), and markers with similar functions are often described as semantic case in other Australian languages (Simpson 2023). Like the case suffixes, these spatial markers always come at the right edge of the NP in Pitjantjatjara, as seen in (2). However, they differ from case suffixes in a number of morphological and syntactic respects, and in Wilmoth & Nordlinger (to appear) we argue that they are more accurately analysed as postpositional clitics. These are members of a larger class of postpositions shown in Table 2 combined with the place name *Pukatja*; most are likewise clitics with the exception of *wiya* which is an independent word.<sup>10</sup>

Table 2: Postpositions in Pitjantjatjara

| Function           | Example                       | Translation                           | Case selected |
|--------------------|-------------------------------|---------------------------------------|---------------|
| Allative           | <i>Pukatja-la=kutu</i>        | ‘towards Pukatja’                     | LOC           |
| Ablative           | <i>Pukatja-la=nguru</i>       | ‘from Pukatja’                        | LOC           |
| Perlative          | <i>Pukatja-la=wanu</i>        | ‘through Pukatja’                     | LOC           |
| Intensive          | <i>Pukatja-nya=kitja</i>      | ‘with some intention relating to P’   | ACC           |
| Deprivative        | <i>Pukatja-nya=tjiratja</i>   | ‘due to lack of/out of concern for P’ | ACC           |
| Sequential         | <i>Pukatja-nya=tjanu</i>      | ‘after Pukatja’                       | ACC           |
| Proprietary        | <i>Pukatja-nya=tjara</i>      | ‘with/having/about Pukatja’           | ACC           |
| Privative/Negative | <i>Pukatja-nya wiya</i>       | ‘without Pukatja/not Pukatja’         | ACC           |
| Semblative         | <i>Pukatja-nya=puruny(pa)</i> | ‘like Pukatja’                        | variable      |

In the following we discuss a number of issues relating to postpositions and show how they can be accounted for within our LFG analysis. Firstly, in Section 5.1 we discuss and exemplify the morphosyntactic differences between postpositions and case markers which motivate their different analyses, including the fact that postpositions can have wide scope over coordinated NPs, can function as adnominal adjuncts, and do not participate in case agreement. We then discuss the case of NP objects selected by postpositions, and the fact that nouns do not have the locative *-ngka* in PPs headed by the spatial postpositions, unlike pronouns and proper names (Section 5.2). Finally, in Section 5.3 we discuss sequences of case affixes and postpositions, including noun-like inflection of Ps, and sequences of multiple Ps.

<sup>9</sup>As pointed out by reviewers, this analysis of possession involves some additional complexity, with homophonous dative and possessive versions of each pronoun, and different representations of constructions that appear to be the same apart from their order. This complexity appears to be an oddity of the language itself, however, given the facts outlined in this section.

<sup>10</sup>Some previous descriptions (Bowe 1990, Langlois 2004, Wilmoth 2022) also group the aversive *tawara* together with these markers. For reasons we do not discuss here due to space, we analyse this as a locational term, not as a postposition. See Wilmoth & Nordlinger (to appear) for further discussion.

### 5.1 Postpositions vs case affixes

The postpositions shown in Table 2 differ from the case markers in a number of respects. Firstly, as mentioned above, they show no morphophonological alternations depending on the phonology or lexical category of their host in the way that the case affixes do, which supports their analysis as clitics and not suffixes (Zwicky & Pullum 1983). For example, in (12), we saw *katja-ngku* ‘son-ERG’ and *untal-tu* ‘daughter-ERG’, with a different form of the ergative suffix depending on the final segment of the stem in traditional Pitjantjatjara. The postpositional clitics behave quite differently; we find *untalpa=tjara/katja=tjara* ‘daughter/son=PROP’, *untalpa=nguru/katja=nguru* ‘daughter/son=ABL’, and so on. Here the consonant-final stem *untal* requires the epenthetic *-pa*, ensuring that this word is vowel-final. This process applies in the absence of a case suffix, before the attachment of any postpositional clitics, adding further support to our analysis that the former are morphological while the latter are not.

Two distributional facts also point to these clitics having a structural position distinct from that of the case affixes discussed above. Firstly, words or phrases followed by these postpositional clitics can appear as adnominal adjuncts, as in (34), where *=tjara* attaches to the (unmarked) accusative form of *raipula* ‘rifle’. On the other hand, words or phrases with only case affixes cannot appear as adnominal adjuncts within the NP (35).

- (34) *Anangu raipula=tjara kutju-ngku anangu pau-nu*  
 person rifle=PROP one-ERG person shoot-PST  
 ‘A person with a rifle shot a person.’ (20181002-PJ18; describing a stimulus image)
- (35) \**Kungka mutuka-ngka kutju-ngku ngayu-nya nya-ngu*  
 girl car-LOC one-ERG 1SG-ACC see-PST  
 Intended meaning: ‘A girl in a car saw me.’

Secondly, we discussed above in Section 2 and showed in example (12) that case affixes cannot have wide scope over coordinated NPs. In coordination contexts, the postpositional clitics may appear either on both conjuncts (36a) or with wide scope (36b).

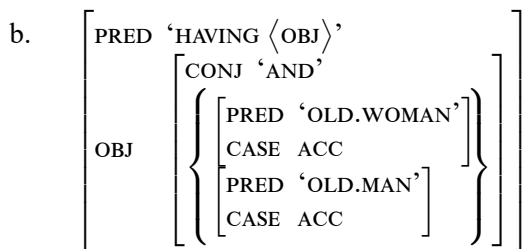
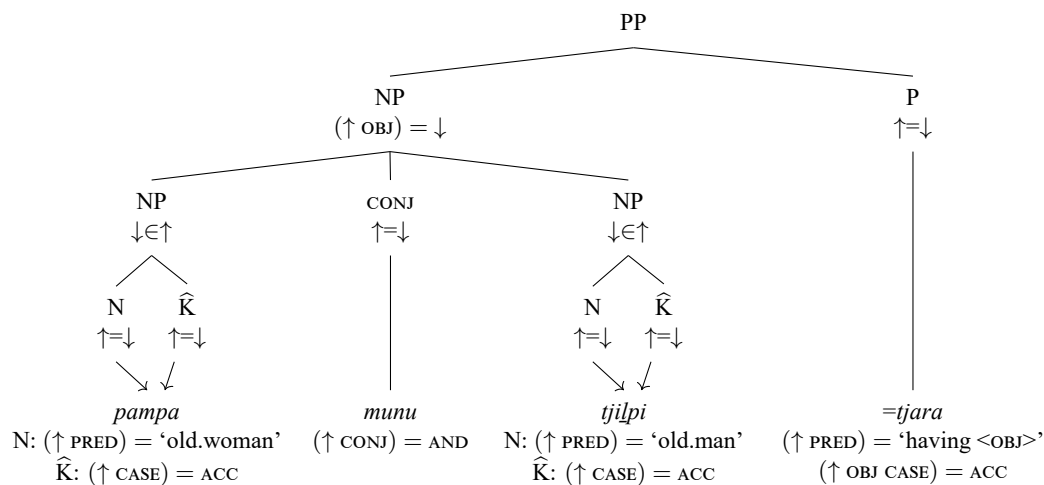
- (36) a. *pampa=tjara munu tjilpi=tjara*  
 old.woman=PROP and old.man=PROP  
 ‘with the old man and old woman’
- b. *pampa munu tjilpi=tjara*  
 old.woman and old.man=PROP  
 ‘with the old man and old woman’

These distributional differences can be accounted for by analysing the clitics as postpositions projecting a PP, which takes an NP as its object (37b). We then amend our NP rule as stated in (28) to include PP adjuncts as in (37a), to account for examples such as (34). Since the NP rule does not allow internal NP modifiers, we rule out (35) since case-marked nominals are necessarily NPs.

- (37) a. NP  $\rightarrow$  NP N {N|PP}\*  $\hat{K}$   
 $(\downarrow \text{CASE}) =_c \text{DAT}$   $\uparrow = \downarrow$   $\downarrow \in (\uparrow \text{ADJ})$   $\uparrow = \downarrow$   
 $(\uparrow \text{POSS}) = \downarrow$
- b. PP  $\rightarrow$  NP P  
 $(\uparrow \text{OBJ}) = \downarrow$   $\uparrow = \downarrow$

We therefore treat examples like (36a) as coordinated PPs, using the coordination rule introduced in (21), and examples like (36b) as a PP having scope over a coordinated NP complement. The latter is illustrated in (38). Note there is a defining equation associated with the postposition *=tjara* regarding the case of the object it selects; this is discussed further in Section 5.2.

(38) a.



This accounts straightforwardly for the fact that the postposition can be either on both conjuncts, or at the right edge only, whereas the case affixes must appear on each conjunct (since they belong inside an NP). This follows from the fact that case is a distributive feature (Dalrymple & Kaplan 2000).

While we have established in this section that these markers are postpositional clitics and not case affixes internal to the NP, this does not necessarily establish that they are not also case markers themselves. In other languages, case markers may be clitics (e.g. Urdu; Butt & King 2004) or postpositions (e.g. Warlpiri; Simpson 2020). However, we argue that the postpositions in Pitjantjatjara are not case, unlike markers with similar functions in many other Australian languages (Simpson 2023), since they are never selected as arguments of verbal predicates, and they don't participate in grammatical phenomena such as agreement, unlike in Warlpiri. These issues are discussed further in Wilmoth & Nordlinger (to appear) and Wilmoth (2022), but we can briefly illustrate the difference in agreement behaviour with the following examples. Example (39) (repeated from (23)) shows the inalienable possession construction, where body part and possessor must agree in case. In contrast, postpositions cannot exhibit this agreement, and therefore do not appear in this construction at all (40). We therefore do not analyse these postpositions as expressing any case feature (see e.g. Spencer 2005 for similar argumentation regarding Hindi).

- (39) tjulpu pulka-ngka tjaa-ngka  
 bird big-LOC mouth-LOC  
 'in the big bird's mouth' (SW20190412-05-T&JDuckling)

- (40) \*Ilanypa pulka kungka palu-la=nguru kuru=nguru paka-nu.  
 teardrop big girl 3SG-LOC=ABL eye=ABL emerge-PST  
 Intended meaning: 'A large teardrop came from the girl's eye.'

## 5.2 Postpositions and their objects

In the above sections, we foreshadowed the issue of postpositions selecting particular cases. For example, (38) above showed =tjara selecting an accusative object, and the coordinated NPs are in the accusative case. Of course, these accusative nouns are zero-marked, and not distinguishable from uninflected nouns. The issue becomes clearer where an overt case suffix is required, as with pronouns and proper names.

Example (41) shows this same postposition =*tjara* where its object ends in a pronoun, and therefore with an overt -*nya* suffix.<sup>11</sup>

- (41) Ngayu-lu **tjukurpa palu-nya=tjara** a-nu London, iruplaina-ngka  
 1SG-NOM story 3SG-ACC=PROP go-PST London aeroplane-LOC  
 ‘I went to London with that story, on the plane.’ (SW20190430-01-Tjukurpa)

The last column of Table 2 above shows which cases are selected by the postpositions for their NP complements. This is locative for the three spatial postpositions and accusative for the remainder, with the partial exception of the semblative which varies.<sup>12</sup> Table 2 exemplifies each postposition with the place name *Pukatja*, which, being a proper name, is marked with either the locative -*la* or accusative -*nya*. However, nouns behave differently with respect to this locative marking compared to pronouns and proper names (and nominalised verbs in relative clauses). In examples (2)–(3), repeated and expanded here as (42), we see that while the locative -*la* is obligatory on the pronoun and name (42a–42d), the locative marker -*ngka* which usually attaches to nouns is ungrammatical (42e–42f); spatial postpositions like =*kutu* must attach to an apparently bare stem when combining with a noun.

- (42) a. palu-la=kutu  
 3SG-LOC=ALL  
 ‘towards him/her/it’  
 b. \*palu=kutu  
 3SG=ALL  
 c. Mary-la=kutu  
 Mary-LOC=ALL  
 ‘towards Mary’  
 d. \*Mary=kutu  
 Mary=ALL  
 e. karu=kutu  
 creekbed=ALL  
 ‘towards the creekbed’  
 f. \*karu-ngka=kutu  
 creekbed-LOC=ALL

Thus, while it is clear that these spatial markers require their NP complement to have locative case, this is unmarked on nouns when combined with a postpositional clitic. This raises the question for our analysis: how do we generate (42a), (42c) and (42e), while not overgenerating (42b), (42d) and (42f)? That is, given a phrase structure rule such as (37b), and a lexical entry for =*kutu* which selects a locative object, such as (43), how do we prevent *karu-ngka=kutu* from being generated?

- (43) =*kutu* P  
 (↑ PRED) = ‘towards <OBJ>’  
 (↑ OBJ CASE) = LOC

We propose that the morphology produces two distinct locative case forms for nouns, as seen for *karu* in (44). The lexical entry in (44a) carries the locative case feature, but does not construct an ADJ grammatical function and so can satisfy the defining equation in the lexical entry for =*kutu*; the lexical entry in (44b), on the other hand, constructs an ADJ which ensures that it cannot appear in the OBJ grammatical function and so cannot be the complement of the postposition. The partitioned lexical sharing approach outlined in Section 2, combined with  $\bar{K}$  being a co-head of the NP, ensures that the

<sup>11</sup>Note that this speaker expresses the goal in this example with the uninflected place name *London*, instead of with the allative =*kutu*. This variation is not well understood in Pitjantjatjara.

<sup>12</sup>The semblative usually but not always selects an accusative object; for reasons of space we do not discuss this here.

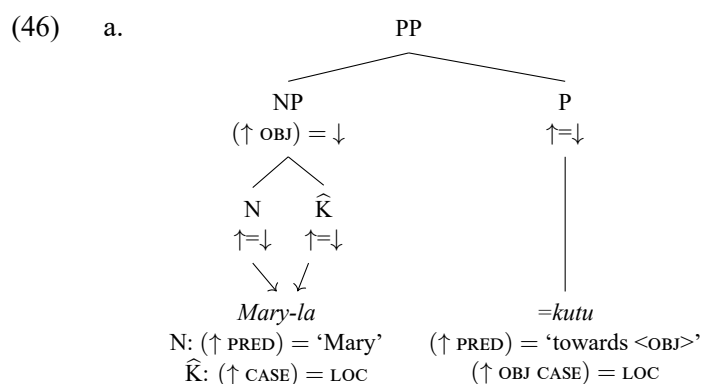
grammatical function of ADJ is associated with the f-structure of the NP as a whole. Thus we combine our lexical sharing analysis outlined above, with a constructive case approach (Nordlinger 1998) to ensure that the correct nominal form is constrained to appear in the appropriate syntactic contexts.<sup>13</sup> Though not shown here, under our analysis there would be the full range of lexical items, such that *karu* can also appear without a  $\hat{K}$  node, as seen in (19).

- (44) a. *karu* N  $\widehat{K}$   
 (↑ PRED) = ‘creekbed’ (↑ CASE) = LOC
- b. *karungka* N  $\widehat{K}$   
 (↑ PRED) = ‘creekbed’ (↑ CASE) = LOC  
 (ADJ ∈ ↑)

Proper names and pronouns likewise have two locative entries in the lexicon: one which constructs an adjunct grammatical function, and the other which does not.<sup>14</sup> However, both have additional phonological material in the form of a locative suffix, as in (45). Formally, this is the same as treating the ADJ annotation as optional; we show these separately here to illustrate that the analysis is exactly parallel with *karu(ngka)* in (44).

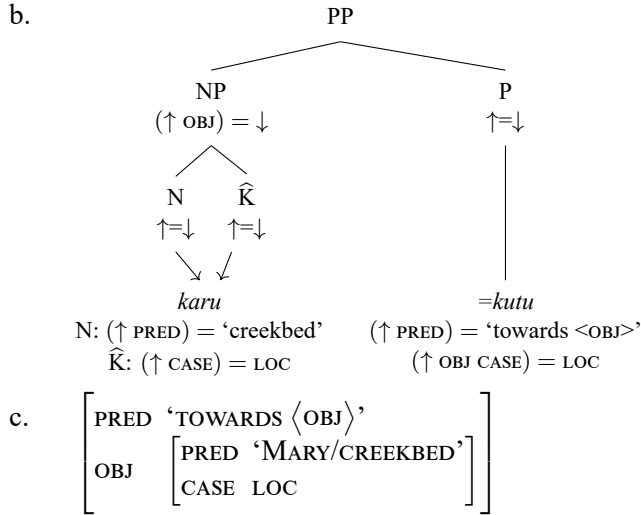
- (45) a. *Mary-la* N  $\widehat{K}$   
 ( $\uparrow$  PRED) = 'Mary' ( $\uparrow$  CASE) = LOC
- b. *Mary-la* N  $\widehat{K}$   
 ( $\uparrow$  PRED) = 'Mary' ( $\uparrow$  CASE) = LOC  
 (ADJ  $\in \uparrow$ )

This means that the structure of a PP headed by one of these spatial postpositions is the same regardless of whether the final word of the object NP is a name, pronoun or noun. The c-structure of this is shown in (46) for a name (46a) and a noun (46b). The f-structure is shown in (46c); this is identical for both c-structures apart from the value of OBJ PRED, so presented only once.



<sup>13</sup>Note that this alone doesn't prevent the bare nominal in (44a) appearing as a clausal locative adjunct, although this is ungrammatical in standard Pitjantjatjara. We assume that the fully-fledged locative nominal in (44b) carries locational semantics that is not present in the (44a) form, thereby accounting for this difference in function.

<sup>14</sup>These 'defective' locative forms are reminiscent of the 'derivational' case forms discussed by Austin (1995) for some other Pama-Nyungan languages of Australia, which satisfy morphological requirements rather than functioning to code syntactic relations in the usual way. In Pitjantjatjara they satisfy the subcategorisation properties of the postposition, rather than holding their usual function of creating a locational NP.



As discussed in Section 5.1, postpositions can have wide scope over coordinate noun phrases, while case affixes cannot. These coordinated noun phrases must each appear in the case selected by the postposition. We saw this already in (38) with unmarked accusative nouns, however this contrast between postposition and case affix is clearer where overt case suffixes are required, as in (47). Here we see coordinated PPs (47a) and a PP with a coordinated NP complement, with the locative case suffix on both NP conjuncts (47b). We also see that it is ungrammatical for that locative case suffix to have wide scope (47c), as already established. These facts can be readily accounted for by the analysis presented so far.

- (47) a. [Mary-**la**]=**kutu** munu [Johnny-**la**]=**kutu**  
M-LOC=ALL and J-LOC=ALL  
'Towards Mary and Johnny'
- b. [Mary-**la** munu Johnny-**la**]=**kutu**  
M-LOC and J-LOC=ALL  
'Towards Mary and Johnny'
- c. \*[Mary munu Johnny]-**la**=**kutu**  
M and J-LOC=ALL  
'Towards Mary and Johnny'

### 5.3 Inflecting Ps

In the previous section, we saw linear sequences of case affix followed by postposition, or  $\widehat{K}$  followed by P. A consequence of our analysis of these as distinct categories is that Pitjantjatjara does not allow case-stacking, unlike many other Australian languages (Dench & Evans 1988, Nordlinger 1998), although there is a clear functional similarity between  $\widehat{K}$ -P sequences and case-stacking. Somewhat more unusually, in some circumstances Pitjantjatjara also allows case markers to attach to postpositions, and postpositions to follow one another. We will address three different variations of this in turn, showing how they can be accounted for within our analysis.

In example (34), repeated as (48), we saw that PPs can occur as adnominal adjuncts.

- (48) Anangu raipula=**tjara** kutju-ngku anangu pau-**nu**  
person rifle=PROP one-ERG person shoot-PST  
'A person with a rifle shot a person.' (20181002-PJ18; describing a stimulus image)

Example (49) shows a similar example, although the PP appears immediately at the right edge of the NP. The ergative case marking appears in its usual position at the right edge, resulting in a case-inflected postposition. Example (50) also shows that the same case allomorphy described for nouns in Section 2

also applies when postpositions are inflected for case. Here we see the *-tju* ergative allomorph following the palatal nasal in *puruny*, instead of *-ngku*, which appears on vowel-final nouns (and postpositions).

- (49) Ka tjinguru wati kuri=**tjara-ngku** kuri kutjupa alti-ku.  
 and.DS maybe man spouse=PROP-ERG spouse other summon-FUT  
 ‘And perhaps a man who has a wife will take another wife.’ (*Tjukurpa Palya*, Exodus 21:10)
- (50) Palu manta unngu=nguru aruma=**puruny-tju** paka-ra pupa-ra manta tulyku-ningi.  
 but earth inside=ABL mist=SEMBL-ERG rise-MV crouch-MV earth mud(CAUS)-PST.IPFV  
 ‘But something like a mist came up from the earth and was watering the land.’  
 (*Tjukurpa Palya*, Genesis 2:6)

Case marking of postpositions can be accounted for with the phrase structure rules presented above in Section 5.1, simply by extending our partitioned lexical sharing analysis to postpositions. That is, a postposition like *=tjara* will have lexical entries with a similar structure to those of nouns. In (51a), *=tjara* has no case-marking/does not instantiate any  $\hat{K}$  node. This is what appears in examples like (48) where the PP does not appear at the right edge of an NP. On the other hand, (51b) is the lexical entry for *=tjara-ngku* in (49), where it co-instantiates a P as well as a  $\hat{K}$  node. The c- and f-structures for the NP *wati kuri=tjara-ngku* ‘a man with a wife’ are shown in (52). As before, the partitioned lexical sharing ensures the case and SUBJ function is associated with the higher NP.

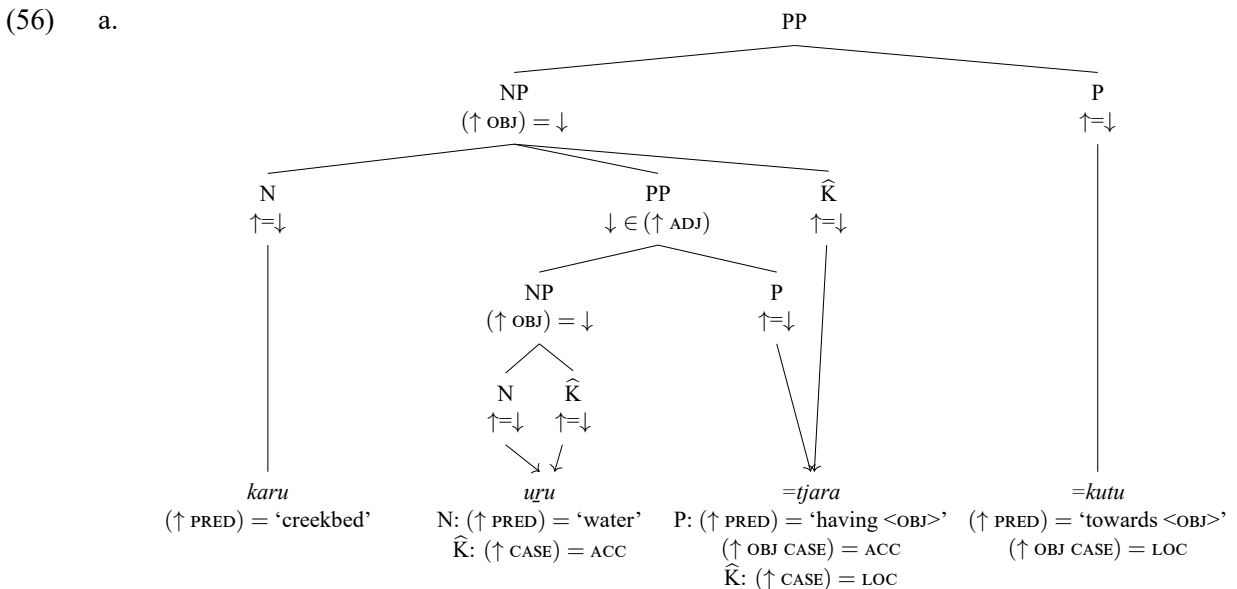
- (51) a. *=tjara* P  
 (↑ PRED) = ‘having <OBJ>’  
 (↑ OBJ CASE) = ACC
- b. *=tjarangku* P  $\hat{K}$   
 (↑ PRED) = ‘having <OBJ>’ (↑ CASE) = ERG  
 (↑ OBJ CASE) = ACC ((SUBJ ↑) OBJ)
- (52) a.
- 
- $\begin{array}{c} \text{NP} \\ \swarrow \quad \downarrow \quad \searrow \\ \text{N} \quad \text{PP} \quad \hat{K} \\ \uparrow=\downarrow \quad \downarrow \in (\uparrow \text{ADJ}) \quad \uparrow=\downarrow \\ \downarrow \quad \swarrow \quad \searrow \quad \downarrow \quad \downarrow \quad \downarrow \\ \text{wati} \quad \text{NP} \quad \text{P} \\ (\uparrow \text{PRED}) = \text{'man'} \quad (\uparrow \text{OBJ}) = \downarrow \quad \uparrow=\downarrow \\ \downarrow \quad \swarrow \quad \searrow \quad \downarrow \quad \downarrow \quad \downarrow \\ \text{kuri} \quad \text{N} \quad \hat{K} \quad \text{'=tjara-ngku'} \\ (\uparrow \text{PRED}) = \text{'spouse'} \quad (\uparrow \text{CASE}) = \text{ACC} \quad \begin{array}{l} \text{P: } (\uparrow \text{PRED}) = \text{'having <OBJ>'} \\ (\uparrow \text{OBJ CASE}) = \text{ACC} \\ \hat{K}: (\uparrow \text{CASE}) = \text{ERG} \\ ((\text{SUBJ } \uparrow) \text{ OBJ}) \end{array} \end{array}$
- b.
- 
- $$\left[ \begin{array}{c} \text{SUBJ} \\ \text{OBJ} \end{array} \left[ \begin{array}{c} \left[ \begin{array}{c} \text{PRED 'MAN'} \\ \text{CASE ERG} \end{array} \right] \\ \left[ \begin{array}{c} \text{ADJ} \\ \dots \end{array} \right] \end{array} \left\{ \left[ \begin{array}{c} \text{PRED 'HAVING <OBJ>'} \\ \text{OBJ} \left[ \begin{array}{c} \text{PRED 'SPOUSE'} \\ \text{CASE ACC} \end{array} \right] \end{array} \right\} \right] \right]$$

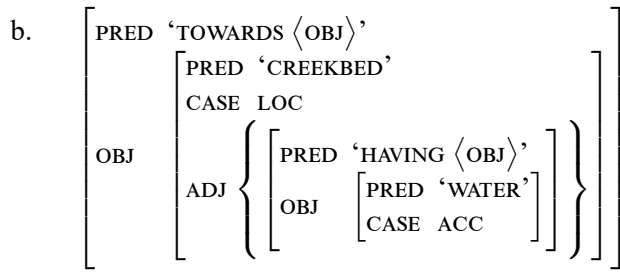
In this example, the PP headed by *=tjara* ‘PROP’ is clearly an adnominal adjunct, with the higher NP headed by *wati* ‘man’, as well as the functional co-head  $\hat{K}$ . Example (50) also contains a PP (*aruma=puruny-tju* ‘mist=SEMBL-ERG’), with ergative marking indicating that this is the subject. This is not a PP functioning as the subject of the clause, however. Rather, the PP is an adjunct within an NP, but the higher NP has no head noun, hence our translation ‘something like a mist’. This headlessness can be accounted for within standard LFG thanks to the Principle of the Economy of Expression (Bresnan et al. 2016). The postposition *=puruny-tju* then co-instantiates the head P as well as the  $\hat{K}$ , in the same fashion as *=tjara-ngku* in (52).

The final detail we discuss in this section is that there can be linear sequences of postpositions. Some examples of this are shown in (53)-(55).

- (53) *karu uru=tjara=kutu*  
creekbed water=PROP=ALL  
‘To the creek with water in it.’ (Tjukurpa Palya, Acts 16:13)
- (54) *nyara=kutu=nguru ngalya-pitja-ngu*  
over.there=ALL=ABL hither-come-PST  
‘(They) came from somewhere over that way.’ (SW20190427-08-Earthquake)
- (55) *parka panya tili=tjara=nguru palu-la wangka-ngu...*  
thin.leaf ANAPH flame=PROP=ABL 3SG-LOC speak-PST  
‘(God) spoke to him from the burning bush.’ (Tjukurpa Palya, Exodus 3:4)

Again, this is straightforwardly accounted for by our analysis. Above, we analysed examples of postpositions with case suffixes as NP-final adjuncts which therefore receive right-edge case marking. We can use this same analysis to account for sequences of Ps without amending our PP rule: the postpositions in these examples also take NP complements without overtly marked case. That is, our NP and PP rules can recursively generate these layered structures with no additional specification, as illustrated for example (53) in (56). We see an initial head noun *karu* ‘creekbed’, which is modified by a PP adjunct *uru=tjara* ‘water=PROP’. This PP is headed by *=tjara*, which selects an accusative NP object; here this is the zero-marked accusative noun *uru* which co-instantiates N and  $\hat{K}$ . The larger NP *karu uru=tjara* is the complement of the allative postposition *=kutu*, which selects a locative object. Therefore, the morphology outputs *=tjara* with a locative case feature that is associated with the linearly subsequent  $\hat{K}$  node, thus satisfying the requirements of *=kutu*. Partitioned lexical sharing ensures this is associated with the higher NP and not the PP itself.





Complex examples such as (57) can also be accounted for in the analysis we have outlined in this section, combined with our analysis of possession (Section 4). Here *ngana-mpa* ‘1PL-POSS’ co-instantiates N and  $\hat{K}$ , with a locative case feature associated with the  $\hat{K}$  node despite no overt locative suffix, as required by =*wanu*.<sup>15</sup>

- (57) Nganaṇa kunpu-ngku palya-ṇi, **wangka ngana-mpa=wanu-ngku**  
 1PL.ERG strong-ERG do-PRS language 1PL-POSS=PERL-ERG  
 ‘We do this strongly through our language.’ (SW20190531-01-TjukurpaPt1)

Adpositions inflect for case in some other languages, often with a genitive case relating to its complement (e.g. some Finnish postpositions select a genitive complement, and may themselves inflect for the genitive case if that complement is a pronoun; Karlsson 2017, p. 405). Adpositions may also inflect for case based on the external syntax, including some postpositions in Finnish which inflect for local cases and some postpositions in Urdu/Hindi, such as the nominative form of *pic<sup>h</sup>e* ‘behind’ in (58). This generally has a straightforward diachronic explanation, and the same may be the case in Pitjantjatjara, although further research is needed to establish this.

- (58) mē=ne billi=ka **pic<sup>h</sup>a** ki-ya  
 I=ERG cat.F.SG=GEN.M.SG behind.M.SG.NOM do-PRF.M.SG  
 ‘I went after the cat.’ (Butt & King 2004: 177)

## 6 Conclusion

In this paper, we have provided a unified analysis of case marking and NP structure in Pitjantjatjara, including modelling a distinction between case suffixes and postpositional clitics, and their interaction. Our analysis captures a number of facts about Pitjantjatjara, several of which are quite unusual. These include edge inflection (that is, an inflectional feature being morphologically marked on a word whose position is syntactically determined), the fact that these syntactically positioned case markers cannot have wide scope over coordination, constrained variation in possessor order, and complex interactions between case markers and postpositions, including the cases selected by postpositions, and the fact that the postpositions can also inflect for case. These facts are all captured with the following three phrase structure rules.

- (59) a. NP  $\rightarrow$   $\begin{array}{c} \text{NP} \\ (\downarrow \text{CASE}) =_c \text{DAT} \\ (\uparrow \text{POSS}) = \downarrow \end{array}$   $\begin{array}{c} \text{N} \\ \uparrow = \downarrow \end{array}$   $\begin{array}{c} \{ \text{N} | \text{PP} \}^* \\ \{ \downarrow \in (\uparrow \text{ADJ}) \\ | (\downarrow \text{GF}) =_c \text{POSS} \} \end{array}$

<sup>15</sup>The ergative markers in *ngana-mpa=wanu-ngku* ‘1PL-POSS=PERL-ERG’ and *kunpu-ngku* ‘strong-ERG’ are in agreement with the ergative subject *nganaṇa*. This use of case-marking is common in Australian languages, and was called referential by Dench & Evans (1988) as the ergative case marking on the adjuncts ‘references’ an ergative subject via agreement, indicating something about the subject or the way they are doing some activity, but the ergative-marked adjuncts are not themselves the subject. Although this means there are multiple ergative-marked phrases in this clause, a Coherence violation (i.e. ending up with three subjects) is avoided naturally as a result of the fact that the adjunct NPs are treated as headless, and are therefore embedded within an ADJ grammatical function by the Pitjantjatjara NP rule.

- b.  $XP \longrightarrow XP^+ \quad CONJ \quad XP$   
 $\downarrow \in \uparrow \quad \uparrow = \downarrow \quad \downarrow \in \uparrow$
- c.  $PP \longrightarrow \quad NP \quad P$   
 $(\uparrow OBJ) = \downarrow \quad \uparrow = \downarrow$

A non-projecting NP-final  $\hat{K}$  node ensures that case does not have scope over coordinated NPs. We use partitioned lexical sharing (Lowe 2015) to account for edge inflection where the case-marked word is often not the head. In our analysis, the morphology outputs an inflected nominal that instantiates both N and  $\hat{K}$  nodes. The PRED is associated only with the N node while case and grammatical function f-descriptions are associated with the  $\hat{K}$  node and thus with the NP as a whole.

This type of detailed analysis allows us to compare Pitjantjatjara with analyses of comparable systems in other languages. Butt & King (2004) analyse a range of markers in Urdu/Hindi as case-marking clitics. Spencer (2005), on the other hand, analyses these markers as non-projecting post-positions, rather than case markers (these are separate to a category of projecting postpositions, which are also analysed as such by Butt & King 2004). Unlike Pitjantjatjara, these Hindi/Urdu markers do not exhibit allomorphy conditioned by their host, other clitics may appear between the nominal and the markers in question, and they can have scope over coordination. Another comparable example comes from Turkish, which exhibits suspended affixation across its grammar, including the copula, case marking, and plural marking. Evidence from vowel harmony and voicing assimilation shows that these markers are phonologically part of the same word as the stems to which they attach. They are therefore best analysed as affixes, rather than clitics. Broadwell (2008) posits a lexical sharing analysis of this phenomenon. This is similar to Pitjantjatjara, where the case markers exhibit phonologically conditioned and lexically specific allomorphy depending on the stem. However, like Hindi, and unlike Pitjantjatjara, suspended affixes in Turkish can have wide scope over coordination. We are not aware of a detailed description of a system such as Pitjantjatjara which is clearly affixal edge inflection, and where the relevant affix cannot have wide scope over coordination. Broadwell (2008: 209) provides a typology of possible realisations of case, which helps to illustrate these differences. We reproduce this in a modified form in Table 3. This is presented as a spectrum from left to right of increasingly close attachment between case marker and host. Turkish case is morphologically affixal, however the case marker projects a KP; this is thus treated as coinstantiation within Broadwell’s lexical sharing analysis. To the right are Latin and Russian, two prototypical examples of case being marked by affixation on each word within the NP. Pitjantjatjara adds to this typology by being an intermediate example of coinstantiation but within an NP.

Table 3: Possible realisations of case, following Broadwell (2008: 209)

| KP                   |               |                       | NP                    |                |
|----------------------|---------------|-----------------------|-----------------------|----------------|
| <i>separate word</i> | <i>clitic</i> | <i>coinstantiated</i> | <i>coinstantiated</i> | <i>affix</i>   |
| Triqui, Hebrew       | Japanese      | Turkish               | Pitjantjatjara        | Latin, Russian |

In the spirit of Butt & King (2004) and much other work besides, this paper therefore adds empirically to our understanding of the morphosyntax of case systems and their treatment in LFG. We have also shown that independently motivated parts of the theoretical framework (namely partitioned lexical sharing (Lowe 2015), non-projecting words (Toivonen 2003), and constructive case (Nordlinger 1998)) work together to provide an explanatory account of this typologically unusual Pitjantjatjara system.

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## **Part II**

# **Syntax and its interfaces**



# Reconfiguring topic and focus in Russian

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## 1 Introduction

The proper analysis of word order in Russian (> Slavic > Indo-European) has been a source of contention for at least half a century. Russian is well-known for having a largely free word order, and the national linguistic tradition has correspondingly avoided using the immediate constituents model in favour of dependency grammar – as seen, for example, in the framework of Meaning-text theory (Mel'čuk 1988), whose design was strongly influenced by its creators' work on Russian and other 'free word order' languages. Transformational approaches to Russian clause structure (cf. e.g. Slioussar 2007) typically follow the standard GB/Minimalist assumptions, explaining word order 'freedom' through movement to various left-peripheral functional projections.

In the body of formal work on Russian syntax, King (1995) stands out as the only attempt at a purely positional approach to Russian word order and information structure. The LFG analysis in this book provides an alternative to both dependency-based approaches – which often struggle with capturing word order constraints – and transformational models, which impose additional levels of complexity for which there seems to be no language-internal evidence.

In spite of its simplicity and the descriptive advantages it provides, the approach of King (1995) was not developed any further during the last three decades. At the same time, much new research has appeared, which has provided not only new analyses, but additional data that was not available at the time the original research was published. Perhaps most importantly, LFG in 1995 lacked a coherent theory of the syntax-prosody interface; it was thus not possible to associate the c-structures proposed for Russian with the intonational patterns of this language. In this paper, we attempt to bridge this gap by proposing an 'update' of the analysis of King (1995) to bring it into line both with recent empirical advances in Russian linguistics and with the current state of the parallel architecture of LFG.

The paper is structured as follows. In Section 2, we describe the main configurational patterns which served as the basis for the analysis proposed by King (1995), as well as the analysis itself. We illustrate the main points not only by examples from King (1995), but also with sentences from the Russian National Corpus (RNC).<sup>1</sup> In Section 3, we 'translate' the original model into the modern formal machinery available in LFG. This includes the i-structure as a separate projection in the Parallel Architecture proposed in Dalrymple & Nikolaeva (2011), for which, of course, King's own proposal (King 1997) and previous work by Butt & King (1996) were of great influence. We also integrate the approach to the syntax-prosody mapping of Bögel (2015). In the last section, we outline possible directions for future research.

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<sup>1</sup><https://ruscorpora.ru>

## 2 The analysis of King (1995)

King (1995) is structured along the following lines: first, the author introduces key empirical facts that point to Russian being a configurational language, in spite of its word order freedom. Second, she asserts that the configurationality found in Russian is not the same as is standardly assumed for English, with dedicated subject and object positions, but is built more around discourse functions such as topic and focus. In other words, she describes Russian as a discourse configurational language. Finally, the analysis is formalized in two different frameworks: GB and LFG. The GB version of the analysis, while maintaining a version of UTAH (Speas 1990) and being within the limits of what was acceptable in GB analyses of the time, deviates considerably from current GB/Minimalist assumptions, in particular by having a flat V' containing all non-subject arguments of the clause. The LFG analysis, in contrast, follows the standard practices of this framework for establishing a configurational structure that are still valid today. In what follows, we describe the main insights of the LFG analysis of the syntax of Russian in King (1995).

The key empirical generalizations on the configurational syntax of Russian outlined in King (1995) essentially allow us to dissect the Russian clause into four 'fields', anchored around the finite verb:

- (1) (External Topics) – (Left-peripheral material) – (Internal Topics – Internal Foci) – V – (Right-Edge Foci)

External topics are left-peripheral, limited to one per clause, and can be considered a main clause phenomenon. They are often resumed by a personal pronoun, as in (2). To capture the main clause status of external topics, King (1995: 104) uses a special projection called E immediately dominating the external topic (if any) and CP. This projection, first proposed by Aissen (1992), only appears in main clauses, explaining why external topics are not found in subordinate clauses.

- (2) **Gleb**, ja ego ne ljublju.  
G. I.NOM he.ACC NEG love.PRS.1SG  
'Gleb, I don't like him.' (King 1995: 202)

Since external topics are peripheral to the core structure of the sentence and do not have any bearing on the syntactic patterns found inside CP, we ignore them in the rest of this discussion.

The next linear field, which we have labeled "Left-peripheral material", includes elements which obligatorily appear at the left edge of the clause: complementizers, question words and fronted finite verbs. King assumes that this domain is essentially the left periphery of CP: C<sup>0</sup> is the position for complementizers and fronted verbs, while interrogatives are found in SpecCP.

Internal topics, the next class of elements, follow the left periphery of CP and precede the finite verb (3). Note that King analyzes Russian as underlyingly a VSO language; thus all positions to the left of the verb are associated with information-structure functions. In particular, the subject in (3) is not in its canonical position; the unmarked word order would be VS: *Kogda rodilsja Lermontov?*

- (3) Kogda **Lermontov** rodilsja?  
when L.(M).SG.NOM be\_born.PST.M  
'When was LERMONTOV born?' (King 1995: 203)

This point can be further illustrated by the following corpus example (4). Its surrounding context, provided in the translation, supports the interpretation of the subject *Boborykin* as the internal topic.

- (4) Kak raz v tom godu, kogda **Boborykin** rodilsja.  
exactly in that.M.LOC year(M).SG.LOC when B.(M).SG.NOM be\_born.PST.M  
'{The Russian intelligentsia was invented not by Boborykin, but by Zhukovsky.} Exactly the year Boborykin was born.' (RNC)

Internal foci, which follow internal topics, bear 'sentence stress' and, according to King (1995: 207), are contrastive in nature, cf. Paducheva (2016). Thus, preverbal material in Russian, in King's analysis, is

always associated with specific information-structure functions: the clause-initial NP is normally the topic (which is why subjects are commonly clause-initial), while any material between the topic and the verb is focal, as seen in (5).

- (5) Ja k Anne prišel.  
I.NOM to Anna(F).SG.DAT come(PFV).PST.M  
'I visited *Anna*.'  
(King 1995: 207)

Finally, the verb and all postverbal material can be interpreted as a sequence of right-edge foci (King 1995: 208–211). Right-edge foci introduce new information, with the last word of the clause being the locus of intonational focus marking (King 1995: 208–209), as seen in (6).

- (6) Kolhoz zaveršil uborku urožaja.  
kolkhoz(M).SG.NOM finish(PFV).PST.M harvest(F).SG.ACC crop(M).SG.GEN  
'The kolkhoz *finished the crop harvest*.'  
(King 1995: 209)

Crucially, while the last constituent in the postverbal area is invariably marked as being focal, any continuous string of constituents to its left, up to and including the verb, can be focalized. Thus, in (6) it is either just *uborku urožaja* 'the crop harvest' or *zaveršil uborku urožaja* 'finished the crop harvest' that can be marked as focal material.

In LFG terms, King (1995) assumes the standard sequence of verbal projections: CP–IP–VP. As mentioned above, CP is the locus of complementizers, wh-words and fronted verbs. The lexical verb only appears in  $V^0$  in periphrastic forms (the future and the passive) and in non-finite clauses; otherwise, the unmarked position for the finite verb in Russian is in  $I^0$ . Thus all clausal arguments that are not placed in the left periphery are located within IP. The generalizations in (1)–(6) are captured by the following c-structure rules:

- (7) a.  $IP \rightarrow XP^* \quad XP^* \quad \bar{I}$   
 $(\uparrow GF) = \downarrow \quad (\uparrow GF) = \downarrow \quad \uparrow = \downarrow$   
 $\downarrow \in (\uparrow TOPIC) \quad \downarrow \in (\uparrow C-FOC)$   
 b.  $\bar{I} \rightarrow I^0 \quad VP$   
 $\uparrow = \downarrow \quad \uparrow = \downarrow$   
 c.  $VP \rightarrow XP, \bar{V}$   
 $(\uparrow SUBJ) = \downarrow \quad \uparrow = \downarrow$   
 d.  $\bar{V} \rightarrow V, XP$   
 $\uparrow = \downarrow \quad (\uparrow GF) = \downarrow$

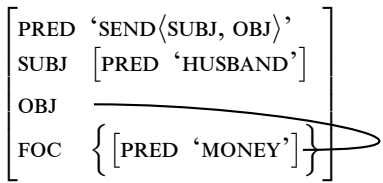
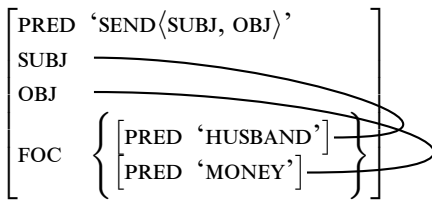
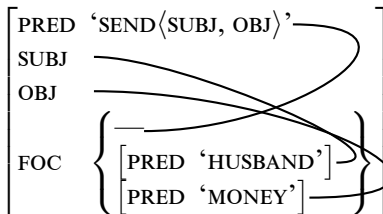
Note that for (7a) we use a more explicit form of the rule than the one proposed in King (1995). She achieves the same results by combining the rule in (8a) with the additional ordering principle in (8b). It is possible to formalize this principle using f-precedence (Kaplan & Zaenen 1989), but since both XPs appear in the same c-structure domain, the rule in (7a) is the simpler solution.

- (8) a.  $IP \rightarrow XP^* \quad \bar{I}$ , where DF is TOPIC or C-FOC  
 $(\uparrow GF) = \downarrow \quad \uparrow = \downarrow$   
 $\downarrow \in (\uparrow DF)$   
 b.  $TOP > C-FOC$

As can be seen from (7), right-edge foci are annotated as GFs and are not explicitly marked as foci in the rules. Yet all postverbal material can be focal, as seen most readily in sentences with VSO word order, which have athetic interpretation according to King (1995) and Yokoyama (1986). An example of such a sentence can be seen in (9), which may begin a new narrative (hence all information is new).

- (9) Prislal muž den'gi.  
 sent husband money  
 'My husband sent (me) the money.'  
 (King 1995: 212)

While in the discourse-initial context, such sentences are indeed *thetic*, they in fact have at least three interpretations because only the final constituent *den'gi* 'money' is obligatorily focal. According to King (1995: 210–211), this range of interpretations is produced by an interaction of syntax and prosody: “[l]eaf nodes in the c-structure can be marked  $\downarrow \in (\uparrow \text{FOC})$  from right to left, starting at the right-edge constituent with the falling intonation characteristic of this type of focus” (King 1995: 211). If so, for (9) we receive the following range of readings according to King (1995: 212):

- (10) a. 
- b. 
- c. 

The reading in (10c) is supposedly achieved by annotating the finite verb in I as  $\downarrow \in (\uparrow \text{FOC})$ , consistent with the generalization in the preceding paragraph. However, King (1995: 212, fn. 13) notes that there is “a technical difficulty” here because according to the annotations it is not the PRED that should become focused, but the whole f-structure that contains the FOC set. But this is not necessarily a problem, because such cyclic structures are not disallowed in LFG and have been used in some analyses, e.g. Haug & Nikitina (2012). What *is* problematic is how such f-structures should be interpreted from the information-structure point of view. But this problem is not unique to King’s analysis and is related to the early LFG idea of treating information structures via discourse overlay functions at f-structure. This idea has been criticized since at least Butt & King (1996), which introduced a separate projection for information structure. Furthermore, the prosodic component of the analysis is not formalized, which is understandable, given that there was no LFG implementation of the prosody-syntax interface at the time the work was published. In what follows, we provide an updated analysis of topic and focus marking in Russian that strives to keep all the core insights of the original analysis in King (1995) intact while bringing it into line with more up-to-date notions of information structure and its interfaces with syntax and prosody in LFG.

### 3 Updating the analysis

In this section, we attempt to remedy some of the problems outlined above, while also introducing a more explicit mapping of syntax to prosody than the one used in King (1995, 1997). In our translation of

the original model, we employ the i-structure framework of Dalrymple & Nikolaeva (2011) and use the mapping to prosody suggested in Bögel (2015).

### 3.1 Clause structure

Before turning to our reinterpretation of the analysis of King (1995), we have to discuss two important data points that have a bearing on the analysis. First, the readings of (9) given in (10a–c) require additional commentary. The interpretation in (10b), according to our own judgments, can only be attained as a result of verb topicalization and as an answer to a multiple constituent question like ‘Who planted what?’. (10c) isthetic, with the whole sentence presumably receiving a single pitch accent anchored on *repku* ‘turnip’. The reading in (10a) is related, but here only *repku* ‘turnip’ is focalized, while *posadil* ‘planted’ and *ded* ‘grandfather’ are in the background.

However, ‘plant’ and ‘turnip’ can also be focalized to the exclusion of ‘grandfather’, as argued by Kovtunova (1976), Yanko (2001), and Zimmerling (2014).<sup>2</sup> This reading is not present among those given in (10a–c), but its possibility is even more apparent in examples such as (11b), where the topic is instantiated by a first-person pronoun and a temporal adverb.

- (11) a. [T Ja zavtra] [F poedu na daču].  
 I.NOM tomorrow go(PFV).PRS.1SG on dacha(F).SG.ACC  
 ‘I will go to my dacha tomorrow.’ (Yanko 2001: 203)  
 b. [F Poedu] [T ja zavtra] [F na daču].

Relatedly, the thetic interpretation found in (9) is only available for VSO sentences. In VOS sentences, only the subject can be focalized: (12) has no thetic interpretation.

- (12) Kupila plat’e Inna.  
 buy.PST.F dress(N).SG.ACC I.(F).SG.NOM  
 ‘Inna<sub>F</sub> bought the dress.’

Thus the generalization found in King (1995) that allows all postverbal material to be focalized seems to be too broad. Instead, it is the *final* constituent that is focal. We have to assume that the other postverbal constituents are located in a configurational VP core, which can be achieved by the following rules:

- (13) a. IP → XP\* XP\*  $\bar{I}$   
 (↑ GF) = ↓ (↑ GF) = ↓ ↑=↓  
 (↓<sub>σL</sub> DF) = TOPIC (↓<sub>σL</sub> DF) = C-FOC  
 b.  $\bar{I}$  → I<sup>0</sup> VP  
 ↑=↓ ↑=↓  
 c. VP → XP  $\bar{V}$   
 (↑ SUBJ) = ↓ ↑=↓  
 d.  $\bar{V}$  → V XP\* XP\*  
 ↑=↓ (↑ GF) = ↓ (↑ GF) = ↓  
 (↓<sub>σL</sub> DF) = FOCUS

### 3.2 Syntax–prosody interface

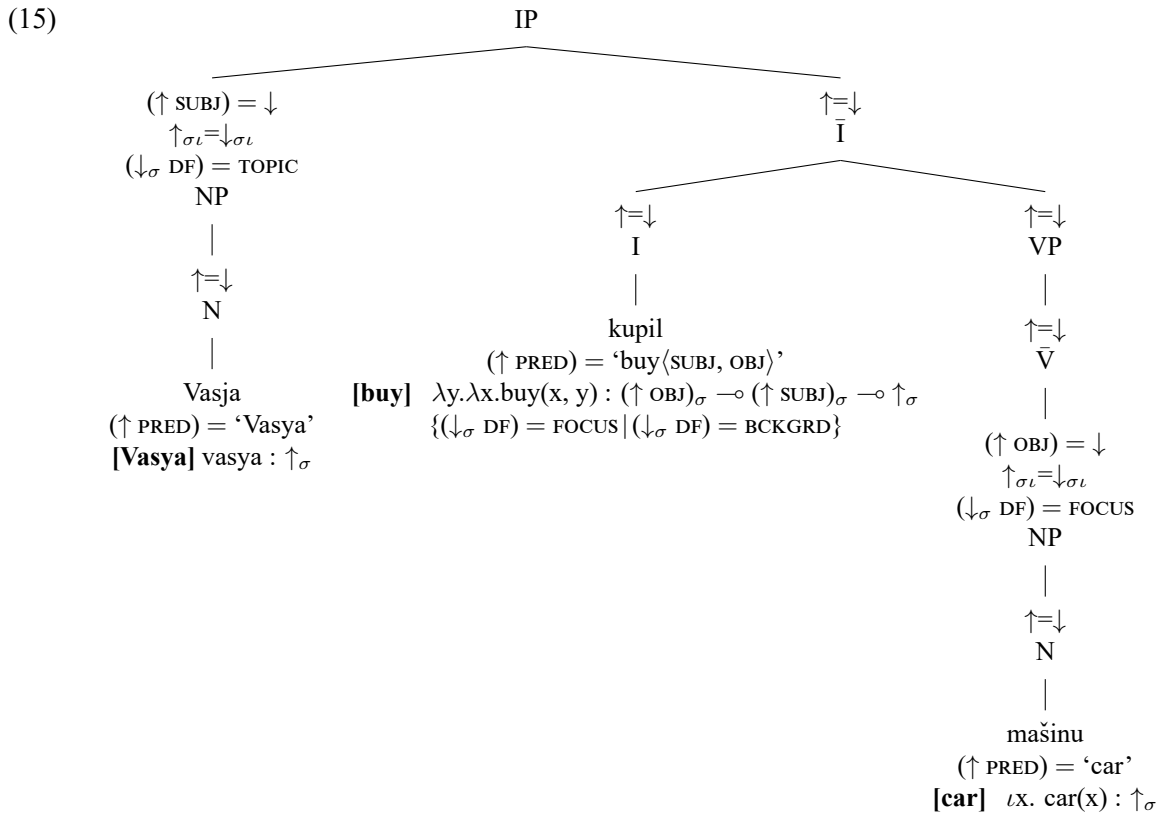
We begin with a simple SVO sentence like (14a). This utterance has at least two readings: one with VP focus (14b) and one with narrow object focus (14c), cf. King (1997).

<sup>2</sup>See Yanko (2001: 204–206) for discussion of an alternative whereby such sentences do not contain a topic. This analysis would correspond more closely to the f-structure in (10a).

- (14) a. Vasja kupil mašinu.  
 V.(M).SG.NOM buy.PST.M car(F).SG.ACC  
 ‘Vasya bought a car.’
- b. {<sub>T</sub> Vasja} {<sub>F</sub> kupil mašinu}.  
 ‘{— What did Vasya do?} — Vasya bought a car.’
- c. {<sub>T</sub> Vasja} kupil {<sub>F</sub> mašinu}.  
 ‘{— What did Vasya buy?} — Vasya bought a car.’

In both cases, the VP carries a single pitch accent, and it is only the IS status of the predicate’s meaning constructor that is different: in (14b) it is a member of the FOCUS set in i-structure, and in (14c) it is instead a member of the BACKGROUND set (which we abbreviate as BCKGRD below for brevity).

The c-structure in (15) is licensed by largely the same rules as originally suggested in King (1995). We amend it by annotations unifying the i-structures for the subject, the object, and the predicate. Individual positions identified above include annotations that specify the DF of arguments and the predicate.



The two readings have an identical basic f-structure, provided below:

- (16)  $f: \begin{bmatrix} \text{PRED} & \text{‘BUY(SUBJ OBJ)’} \\ \text{SUBJ} & s: [\text{PRED ‘VASYA’}] \\ \text{OBJ} & o: [\text{PRED ‘CAR’}] \end{bmatrix}$

The s-structures projected by the three f-structures in (16), labeled as  $f$ ,  $s$ , and  $o$ , are the same except for the DF associated with the predicate.<sup>3</sup>

- (17) a.  $(s_\sigma \text{ DF}) = \text{TOPIC}$      $s_\sigma: [\text{DF TOPIC}]$     b.  $(s_\sigma \text{ DF}) = \text{TOPIC}$      $s_\sigma: [\text{DF TOPIC}]$   
            $(o_\sigma \text{ DF}) = \text{FOCUS}$      $o_\sigma: [\text{DF FOCUS}]$      $(o_\sigma \text{ DF}) = \text{FOCUS}$      $o_\sigma: [\text{DF FOCUS}]$   
            $(f_\sigma \text{ DF}) = \text{FOCUS}$      $f_\sigma: [\text{DF FOCUS}]$      $(f_\sigma \text{ DF}) = \text{BCKGRD}$      $f_\sigma: [\text{DF BCKGRD}]$

Correspondingly, the i-structure for the entire utterance is also different:

- (18) a.  $f_{\sigma\iota} \left[ \begin{array}{l} \text{TOPIC } \{\text{Vasya}\} \\ \text{FOCUS } \{\text{buy} \\ \text{car}\} \end{array} \right]$     b.  $f_{\sigma\iota} \left[ \begin{array}{l} \text{TOPIC } \{\text{Vasya}\} \\ \text{FOCUS } \{\text{car}\} \\ \text{BCKGRD } \{\text{buy}\} \end{array} \right]$

Moving on to the mapping to prosody, we must propose a few additions to the model of Bögel (2015). Most works within this framework have focused on the application of pitch interpretation to the disambiguation in c-structure in much detail: see i.a. Bögel (2022) and Bögel & Zhao (2025) on a case study of German case ambiguities. The formal development of the contribution of syntactic structure to pitch assignment has only recently begun, see Langer & Bögel (2025) and Butt et al. (2024) on the prosody of the Hungarian noun phrase.

Since pitch accents are anchored to stressed syllables, the interface should be able to access such syllables. Note that c- to p-structure mapping already varies over the first and last syllables, labeled  $S_{\min}$  and  $S_{\max}$ , respectively.

However, pitch accent is not assigned to prosodic words ( $\omega$ s) directly. Rather, it is the larger phonological phrase ( $\phi$ ) that acts as the domain of pitch accent assignment. Syntactic constituents map onto  $\phi$ s, and the last  $\omega$  in a given  $\phi$  receives the pitch accent (but see Section 4 below for some complications). This is clearly seen in the VP realization in the next example (19). The VP features three prosodic words, where the second is a particularly long compound participial adjective. While there is certain supplementary pitch movement within the first two  $\omega$ s, the main VP accent,  $L^*$ , is realized on *sredstva* ‘agents’.<sup>4</sup> This is illustrated in Figure 1 using Praat (Boersma & Weenink 2025).

- (19) portit’      krovo-ostanavlivajuščie sredstva  
       damage.INF blood-stopping.PL.ACC agent(N).PL.ACC  
       ‘{There was only the problem of choosing an antibiotic drug which would not} damage hemostatic  
       agents.’ (RNC Multimedia Subcorpus)

A note is also required on Russian accentuation terminology. Many researchers working within the Russian tradition use the ‘intonational contour’ system developed by Bryzgunova (1963, 1982). Bryzgunova proposed seven intonational contours (rus. *intonacionnye kontury*, or IKs for short) most of which have clearly identifiable discourse functions. For instance, primary topics receive the IK-3 accent characterized by a rising tone movement on the stressed syllable which is then followed by a post-tonic fall. Thus, in the Auto-Metrical and ToBI based approaches of Odé (1989, 2008) and Yokoyama (1990), IK-3 corresponds to  $H^*L$ , while foci receive the IK-1 accent, or  $L^*$ .

The templates in (20a) and (20b) formalize IK-1 and IK-3 assignment, respectively. The templates are spelled out as follows:  $*$  is the current syntactic node, while  $T(*)$  is the set of terminal nodes corresponding to that node.  $T_{\max}$  is a variable analogous to  $S_{\max}$  that accesses the last syntactic terminal from a given set.

<sup>3</sup>The s-structure for the clause does not include the s-structures of its arguments, following Dalrymple & Nikolaeva (2011), but a single s-structure for  $f_\sigma$  with  $s_\sigma$  and  $o_\sigma$  occupying the functions ARG1 and ARG2 in the spirit of Asudeh & Giorgolo (2012) would not have any effect on the mapping to i-structure. An anonymous reviewer also points out a potential problem with verbal meaning constructors and their association to i-structure features identified by Lowe (2014). We keep to the original approach by Dalrymple & Nikolaeva (2011) for expository purposes.

<sup>4</sup>A reviewer points out that a pitch rise is also seen on the first syllable of this word. However, this is likely to be compensatory due to the large number of preceding unaccented syllables.

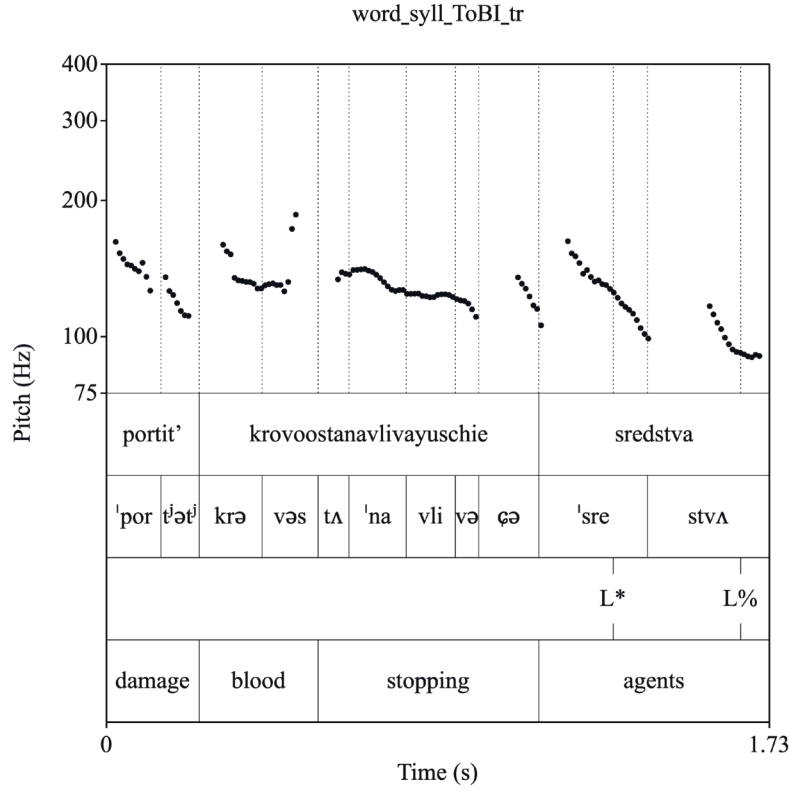


Figure 1: Praat picture illustrating the contextual realization of *portit' krovo-ostanavlivajuščie sredstva* 'damage hemostatic agents'

$\natural$  is an abbreviation for  $\pi^{-1} \circ \rho$  defined in Bögel (2015: 78):  $\pi$  is the relation from the string to c-structure nodes (accordingly,  $\pi^{-1}$  maps c-structure nodes to the string), and  $\rho$  relates the string to p-structure, whose visual representation is the p-diagram, see below. Specifically,  $\rho$  returns a vector for each syllable containing lexical phonological information. These vectors are indexed, and we can access a following syllable by adding 1 directly to a given vector. Lastly,  $S_{\text{prim}}$  is a variable that corresponds to the last syllable bearing primary stress. We define it formally as the syllable  $S$  for which the following relation holds within a given set of terminals  $X$ : **prim**( $S, X$ )  $\Leftrightarrow (S \text{ LEX. STRESS}) =_c \text{PRIM} \wedge \forall S': S < S' \leq (\natural(X) S_{\text{max}}) \wedge (S' \text{ LEX. STRESS}) \neq \text{PRIM}$ , where  $<$  is a precedence relation on syllables.

- (20) a.  $@\text{IK-1}(\ast) := (\natural(T(\ast) T_{\text{max}}) S_{\text{prim}} \text{ ToBI}) = L^*$   
 b.  $@\text{IK-3}(\ast) := (\natural(T(\ast) T_{\text{max}}) S_{\text{prim}} \text{ ToBI}) = H^* \wedge (\natural(T(\ast) T_{\text{max}}) S_{\text{prim}+1} \text{ ToBI}) = L$

We illustrate these templates in action by analyzing the production of a declarative utterance in (21).<sup>5</sup> This example features *komnata moego brata* 'my brother's room' as the topic, which receives an IK-3 accent ( $H^*L$ ), and *napominaet xlev* 'resembles a pigsty' as the focused VP, with an IK-1 ( $L^*$ ) accent realized on the verb. A Praat picture featuring pitch movement, syllable and word boundaries, and annotated accents is given in Figure 2.<sup>6</sup>

- (21) Komnata moego brata napominaet xlev.  
 room(F).SG.NOM my.M.GEN brother(M).SG.GEN resemble.PRS.3SG pigsty(M).SG.ACC  
 'My brother's room resembles a pigsty.'

<sup>5</sup>The recording has kindly been provided to us by S. Sedunova.

<sup>6</sup>The speaker produced a rather reduced realization of the possessive pronoun *moego* 'my', but in the p-diagrams below we annotate it as a tri-syllabic, [məi'vo].

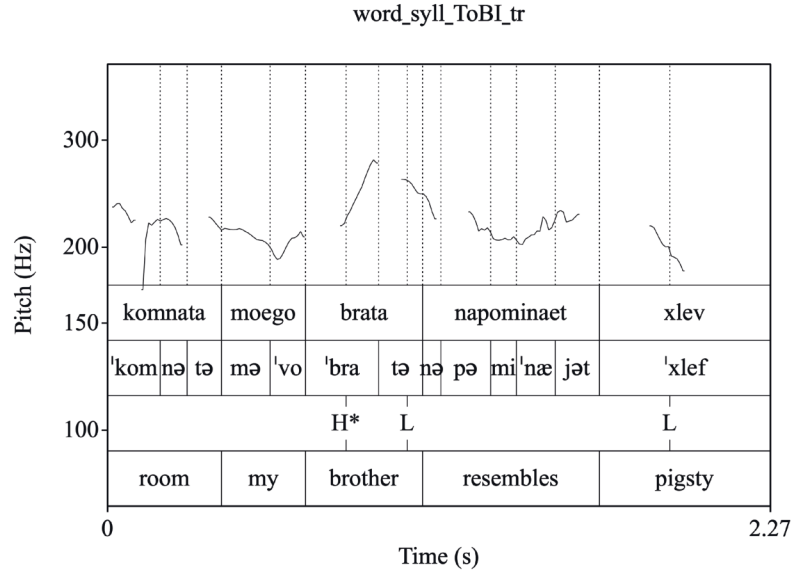
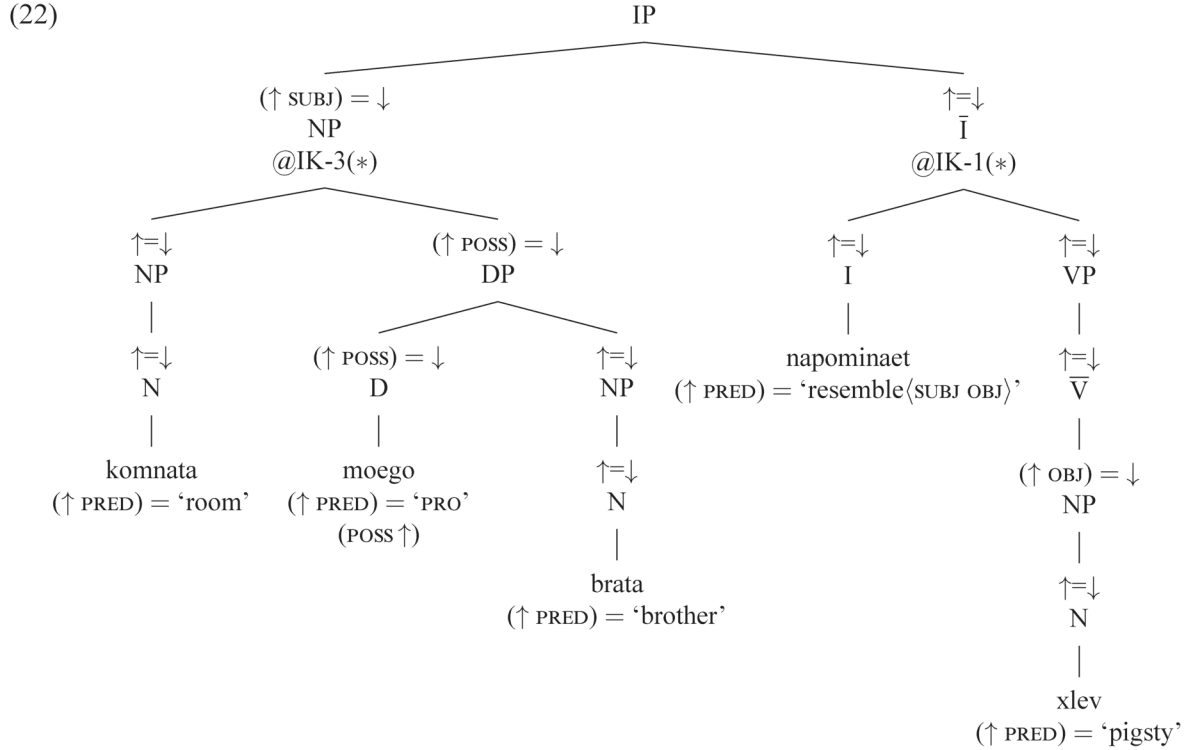


Figure 2: Praat picture illustrating the realization of the utterance *komnata moego brata napominaet xlev* ‘my brother’s room resembles a pigsty’

By the refined rules based on (13), this example can be assigned the c-structure in (22).



The transfer of vocabulary matches the syntactic forms to their phonological forms, providing syllables, prosodic word boundaries and lexical stress patterns for each lexical item. The following p-diagram (23) shows these syllables in linear order, the lexical stress patterns assigned to them, and the prosodic boundaries between wordforms.<sup>7</sup>

<sup>7</sup>A reviewer points out that the phonological forms given in SEGMENTS should come in slashes. We leave them out to avoid formatting issues.

|      |             |                |                |                |                |                |                |                |                |                |                 |                 |                 |                 |                       |
|------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------------|
| (23) | SEGMENTS    | kom            | na             | ta             | mo             | e              | go             | bra            | ta             | na             | po              | mi              | na              | et              | xlev                  |
|      | PHRASING    | ( $\omega$     | ) $\omega$     | ( $\omega$     | ) $\omega$     | ( $\omega$     | ) $\omega$     | ( $\omega$     | ) $\omega$     | ( $\omega$     | ) $\omega$      |                 |                 | ) $\omega$      | ( $\omega$ ) $\omega$ |
|      | LEX. STRESS | prim           |                |                |                |                | prim           | prim           |                |                |                 |                 | prim            |                 | prim                  |
|      | V. INDEX    | S <sub>1</sub> | S <sub>2</sub> | S <sub>3</sub> | S <sub>4</sub> | S <sub>5</sub> | S <sub>6</sub> | S <sub>7</sub> | S <sub>8</sub> | S <sub>9</sub> | S <sub>10</sub> | S <sub>11</sub> | S <sub>12</sub> | S <sub>13</sub> | S <sub>14</sub>       |

The next step, the transfer of structure, builds on that structure and feeds phonological boundary information as well as ToBI accents through IK-templates as defined in (20). Note that we omit the formal constraints which match syntactic and phonological boundaries, but see Bögel (2015: 79, 162).<sup>8</sup>

|      |           |                     |                |                |                |                |                |                |                     |                     |                 |                 |                 |                 |                                |
|------|-----------|---------------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------------|---------------------|-----------------|-----------------|-----------------|-----------------|--------------------------------|
| (24) | SEGMENTS  | kom                 | na             | ta             | mo             | e              | go             | bra            | ta                  | na                  | po              | mi              | na              | et              | xlev                           |
|      | PHRASING  | ( $\phi$ ( $\omega$ | ) $\omega$     | ( $\omega$     | ) $\omega$     | ( $\omega$     | ) $\omega$     | ( $\omega$     | ) $\omega$ ) $\phi$ | ( $\phi$ ( $\omega$ | ) $\omega$      |                 |                 | ) $\omega$      | ( $\omega$ ) $\omega$ ) $\phi$ |
|      | L. STRESS | prim                |                |                |                |                | prim           | prim           |                     |                     |                 |                 | prim            |                 | prim                           |
|      | ToBI      |                     |                |                |                |                |                | H*             | L                   |                     |                 |                 |                 |                 | L*                             |
|      | V. INDEX  | S <sub>1</sub>      | S <sub>2</sub> | S <sub>3</sub> | S <sub>4</sub> | S <sub>5</sub> | S <sub>6</sub> | S <sub>7</sub> | S <sub>8</sub>      | S <sub>9</sub>      | S <sub>10</sub> | S <sub>11</sub> | S <sub>12</sub> | S <sub>13</sub> | S <sub>14</sub>                |

This proposal shows how the configurational analysis of King (1995) can be combined with insights from the work on Russian prosody to yield a fully integrated approach to Russian clause structure. We hope that it can be extended further to cover more phenomena for which the data and analyses in alternative frameworks are available. We overview certain such phenomena in the next section.

#### 4 Directions for future research

In a recent critique of the GB analysis of Russian proposed by King (1995), Zimmerling (2014: 228–231) notes that the model has no way of accommodating non-VSthetic sentences, cf.:

- (25) a. Prišla vesna.  
come.PST.F spring(F).SG.NOM  
b. Vesna prišla.  
'Spring came.' {a=b}

Indeed, this pertains to the LFG model of King (1995) as well. Since *prišla* 'came' in (25a–b) is finite, it is located in I. Thus, the only way for the grammar to license *vesna* 'spring' in the preverbal position would be through topicalization or focalization, see (13a). However, preverbal foci in this model can only be contrastive, which is not necessarily the case for (25b).

Zimmerling (2014) additionally differentiates two types ofthetic sentences, first and foremost on a semantic basis. The first type is illustrated by (25) and is characterized by the predicate having an atypical argument structure that makes a distinction between topic and focus less obvious and natural: the whole sentence simply indicates that a particular moment in time has arrived, and there are few other verbs that can be predicated of the word 'spring'. The second type ofthetic sentences are known in the Russian literature as "utterances without an inherent theme" (Yanko 1991). Such utterances have normal argument structure but arise in discourse through an implication relation (Zimmerling 2014: 224–226). In (26), the proposition 'grandma is sleeping' implies the speaker's need for the addressee to be quiet.

- (26) Tiše! Babuška spit.  
quiet(ADV).CMPR grandmother(F).SG.NOM sleep.PRS.3SG  
'Quiet! Grandma is sleeping.'

Indeed, for many such sentences, the VS word order sounds significantly more degraded than the standard SV order, even though, again, it is VS that is predicted by King (1995) forthetic sentences. It is not clear how this problem can be resolved within a purely positional approach.

<sup>8</sup> A reviewer wonders whether both of the L-accents here could be analyzed as boundary tones. While this is indeed a possibility, the applicability of boundary tones to the analysis of Russian prosody has been a point of debate, see Knyazev & Savel'eva (2021).

Additionally, the syntax-prosody interface should be flexible enough to accommodate various phenomena which disrupt the normal flow of pitch accent assignment. In Section 3 we claimed that the last  $\omega$  within a  $\phi$  carries the pitch accent. This is indeed the general rule. However, there are exceptions to this. A case in point is inversion within the noun phrase (Lyutikova 2012: 92–97). In spoken Russian, the  $N^0$  of an NP occasionally inverts to the initial position within its phrase. This is the configuration assumed by *trubu* (pipe.ACC) in the noun phrase *trubu železnuju* ‘a metal pipe’ in (27). In this case, it is *trubu* that carries the pitch accent.

- (27) {Na metallobase} {ja kupil} {trubu železnuju}  
on metal\_station(F).SG.LOC I.NOM buy.PST.M pipe(F).SG.ACC iron(ADJ).F.ACC  
‘I bought a metal pipe from a scrap dealership.’ (RNC Multimedia Subcorpus).

However, in nouns with sortal inversion (Lyutikova 2012: 73–76), such as biological names of plants, where postposed adjectives are normal, the pitch accent assignment proceeds as normal:

- (28) V prošlom sezone rešil poprobovat’ vyrastit’ šalfej  
in last.M.LOC season(M).SG.LOC decide.PST.M try(PFV).INF grow(PFV).INF sage(M).SG.ACC  
**lekarstvennyj**  
medicinal.M.ACC  
‘Last season, I decided to try and grow *salvia officinalis*.’ (Internet), with  $L^*$  on *-kar-* of *lekarstvennyj* ‘*officinalis*’.

In a transformational approach, the difference between (27) and (28) can be explained by their derivational history: (27) is argued by Lyutikova (2012) to be derived via postsyntactic phrasal movement that occurs after the accent carrier has already been chosen, whereas (28) features syntactic head movement. In LFG, such an option is not available. Hence, the intonational difference must follow from a difference either in the c-structures of these examples, or in the information-structure status of the modifiers. Note, however, that in (27) there seems to be no reason to suppose the fronting of *trubu* ‘pipe’ for any information-structure reasons, and the word order choice in this case is purely stylistic and motivated by the peculiarities of spoken Russian.

## 5 Conclusions

In this paper, we have critically examined the analysis of Russian discourse-configurationality proposed in King (1995), concluding that, in spite of its age, it has remained the only consistent non-transformational, constituency-based account to date. However, the analysis is also outdated in that it does not take into account recent developments in both the LFG framework and the descriptive and theoretical studies of Russian. In this paper, we have attempted to bridge this gap by combining King’s analysis with the syntax-prosody interface model of Bögel (2015). In particular, we have shown how the standard Russian model of ‘intonation contours’ can be integrated with LFG in a fairly natural way. We hope that this study will open the way to further development of an LFG analysis of the syntax of Russian, so that it can stand on its own vis-à-vis the currently more developed transformational approaches.

## Acknowledgements

The current state of LFG is unimaginable without Miriam and Tracy’s contributions, which, apart from their groundbreaking work on information structure which we engage with in this paper, also span argument structure, case marking, complex predicates, computational LFG (including the ParGram project) and many other topics. Their role in the LFG community has been equally important – both in their official capacity as editors of the Proceedings and as voices of reason providing valuable feedback, criticism, and stimulating discussion at the LFG conferences. We cannot overstate our gratitude to Miriam and Tracy for their joint editorship of the Proceedings for more than a decade, which established the

Proceedings as a high-quality, professional venue for outstanding linguistic research. The second author of this article would also like to personally thank Miriam and Tracy (as well as the editors of this volume) for their clemency with respect to numerous missed deadlines.

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# Prepositional marking of adjective phrases in Catalan

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## 1 Introduction

This paper proposes a description of the distribution of the preposition *de* before adjective phrases in Catalan. This preposition appears before an adjective phrase (AP) only if certain conditions are met: (a) the AP is part of a noun phrase (NP); (b) the NP in question is indefinite; (c) there is no overt head noun in the NP and the semantic restrictor of the NP is anaphoric; and (d) the AP is immediately postnominal (is in the position that would immediately follow the head noun if there were one).<sup>1</sup> In any other situation, the preposition *de* cannot appear before an AP. At the level of the theoretical framework, this phenomenon shows that we cannot account for the distribution of this ‘adjectival’ preposition by the standard assumptions about c-structure rules.

We start out by describing the distribution of adjectival *de*, in Section 2. In Section 3, we consider an account of the relevant facts in which adjectival *de* has a special lexical entry as a noun, so that an NP with this particle has the same c-structure as an NP with a full noun head. In this account, adjectival *de* occupies the N position, accounting for the incompatibility of the particle with an overt noun. Some problems will be shown to exist with this proposal, making it untenable. An alternative analysis will be proposed in Section 4 in which adjectival *de* is licensed by a rule similar to the morphological rules in a lexicalist realizational approach in which the word-formation component is not encapsulated from the syntactic component but rather uses the information present in the c- and f-structures for its rules, along the lines of Alsina (2020, 2022, 2023, 2024). Just as morphological rules can license affixes on the basis of the f-structure information, so too the same kind of rules can license c-structure categories with associated lexical items using information present in the syntax (both c- and f-structure). Section 5 presents the facts of coordination as further evidence for the proposed analysis.

## 2 The distribution of adjectival *de*

The preposition *de* is widely used in Romance languages as a marker of partitivity or indefiniteness, with a distribution that varies considerably from language to language.<sup>2</sup> Catalan has a unique use of this preposition, not found in other languages of the family, as a marker of indefiniteness before APs in headless NPs. Adjectives are normally used without a preposition, whether they function predicatively, as in (1a), or as prenominal modifiers, as in (1b).<sup>3</sup>

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<sup>1</sup>The NP may be introduced by a determiner or a pre-head quantifier, which then precedes the sequence *de*-AP, as in (3b), (9b), (10b), among others, showing that the preposition does not introduce the NP.

<sup>2</sup>This preposition has many other uses, many of them grammaticalized and semantically empty, as noted in Vincent & Börjars (2010).

<sup>3</sup>In the examples that follow, the NP of interest is shown in brackets. And the following convention is used: the notation “(\*...)” indicates that the material inside the parentheses makes an otherwise good sentence ungrammatical; the notation “\*(...)” indicates that the sentence is ungrammatical without the material inside the parentheses and grammatical otherwise. For example, *és (\*de) dolça* indicates that the sequence *és dolça* is good and *és de dolça* is ungrammatical; conversely, *una \*(de) dolça* is equivalent to *una de dolça* and *\*una dolça*. In addition, while the Leipzig glossing rules are followed in general, only overtly marked tense-aspect-mood is glossed, in order to simplify the glosses, so that present and indicative are not shown in the glosses.

- (1) a. Sí que és (\*de) dolça, aquesta coca.  
yes that is DE sweet.F.SG this.F.SG pie.F.SG  
'This pie is indeed sweet.'  
b. Aquesta coca és [NP una (\*de) dolça metzina].  
this.F.SG pie.F.SG is a.F.SG DE sweet.F.SG poison.F.SG  
'This pie is a sweet poison.'

As postnominal modifiers within an NP with an overt noun, adjectives also lack a preposition, whether the NP is definite, as in (2a), or indefinite, as in (2b).

- (2) a. He comprat [NP la coca (\*de) més dolça que hagi  
have.1SG buy.PTCP the.F.SG pie.F.SG DE more sweet.F.SG that have.SBJV.2SG  
tastat mai ].  
taste.PTCP ever  
'I bought the sweetest pie you have ever tasted.'  
b. He comprat [NP una coca (\*de) molt dolça ].  
have.1SG buy.PTCP a.F.SG pie.F.SG DE very sweet.F.SG  
'I bought a very sweet pie.'

Nevertheless, in some indefinite NPs,<sup>4</sup> under certain conditions, an AP must be preceded by the preposition *de*, as in (3):<sup>5</sup>

- (3) a. Parlant de coques, no n'hi ha [NP \*(de) més dolces ].  
talk.GER DE pie.F.PL not EN.HI have.3SG DE more sweet.F.PL  
'Talking about pies, there aren't any sweeter ones.'  
b. Parlant de coques, n'he comprada [NP una \*(de) molt dolça ].  
talk.GER DE pie.F.PL EN have.1SG buy.PTCP.F.SG a.F.SG DE very sweet.F.SG  
'Talking about pies, I bought a very sweet one.'

The descriptive goal of this paper is to account for the situations in which this preposition is required and those in which it is not possible, as in (1)–(2) vs. (3).

Some determiners, both definite and indefinite, can introduce an NP with or without an overt noun head. Among definite determiners with this option, we find the definite article, the demonstratives, and the interrogative determiner *quin/-a* 'which'. For example, the definite article can be used with an overt noun, as in (2a), or without an overt noun, if the context includes an appropriate antecedent that can provide the semantic restrictor for the nounless NP, as in (4):

- (4) Parlant de coques, t'agradarà saber que he comprat [NP la més  
talk.GER DE pie.F.PL 2SG like.FUT.3SG know.INF that have.1SG buy.PTCP the.F.SG more  
dolça que hagi tastat mai ].  
sweet.F.SG that have.SBJV.2SG taste.PTCP ever  
'Talking about pies, you will be pleased to know that I bought the sweetest one you have ever tasted.'

Many indefinite determiners and quantifiers can also be used either with an overt noun or with no noun in the NP they introduce. When the noun is absent, the semantic restrictor of the NP is provided by an appropriate NP in the discourse, which has to agree in gender with the headless NP. We find this option with the indefinite determiners *un/-a* 'a'/'some', *algun/-a* 'some', *quant/-a* 'how much/many', *tant/-a* 'so

<sup>4</sup>Examples such as (20) show the relevance of definiteness for adjectival *de*.

<sup>5</sup>There is no basis for analyzing the adjective in these NPs as an instance of a fused modifier-head in Huddleston & Pullum's (2002: 415–417) terminology.

much/many', quantifiers such as *molt/-a* 'much/many', *poc/-a* 'few/little', all cardinal numerals, such as *dos/dues* 'two', *tres* 'three', etc., as illustrated in (5)–(6).

- (5) a. [NP Alguns problemes ] no tenen solució.  
           some problems not have.3PL solution  
           'Some problems have no solution.'  
       b. Molts problemes es resolen sols, però [NP alguns ] no tenen solució.  
           many problems REFL solve.3PL alone but some not have.3PL solution  
           'Many problems get solved on their own, but some have no solution.'
- (6) a. No m' esperava que compréssis [NP tants tomàquets ].  
           not 1SG expect.PST.1SG that buy.PST.SBJV.2SG so.many tomatoes  
           'I didn't expect you to buy so many tomatoes.'  
       b. Volia tomàquets, però no [NP tants ].  
           want.PST.1SG tomatoes but not so.many  
           'I wanted tomatoes, but not so many.'

Whether the noun is present or not in the NP often has no other syntactic effect in the NP. This is the case when the noun is final in the NP, as we see in the bracketed sequences in (5a) and (6a): the nounless counterparts shown in (5b) and (6b) respectively are identical to the corresponding versions in (5a) and (6a), except that the head noun is missing. The same can be said when the noun in an NP introduced by an indefinite determiner is followed by a prepositional phrase or a clause, such as a relative clause, in the same NP, as we see comparing the following pairs of examples:

- (7) a. [NP Alguns problemes de matemàtiques ] no tenen solució.  
           some problems of mathematics not have.3PL solution  
           'Some mathematics problems have no solution.'  
       b. Molts problemes es resolen sols, però [NP alguns de matemàtiques ] no tenen  
           many problems REFL solve.3PL alone but some of mathematics not have.3PL  
           solució.  
           solution  
           'Many problems get solved on their own, but some math ones have no solution.'
- (8) a. Hem fet la salsa amb [NP molts tomàquets que no havien madurat ].  
           have.1PL made the sauce with many tomatoes that not have.PST.3PL ripen.PTCP  
           'We made the sauce with many tomatoes that had not ripened.'  
       b. No sabíem què fer amb tants tomàquets i hem fet la salsa amb  
           not know.PST.1PL what do.INF with so.many tomatoes and have.1PL made the sauce with  
           [NP molts que no havien madurat prou ].  
           many that not have.PST.3PL ripen.PTCP enough  
           'We didn't know what to do with so many tomatoes so we made the sauce with many that  
           hadn't ripened enough.'

However, a difference emerges when the noun is followed by an adjective phrase modifier: the AP directly follows the noun, but, in the nounless counterpart of the indefinite NP, the determiner or quantifier, if there is one, is immediately followed by the preposition *de* right before the AP, as we see comparing the following pairs of examples:<sup>6</sup>

<sup>6</sup>As is clear, all of the NPs in which adjectival *de* appears are instances of ellipsis: NPs in which there is no (overt) head noun and the semantic restrictor of the NP is anaphoric to an appropriate discourse antecedent. The relevant NPs in (5b)–(8b), which lack adjectival *de*, are also elliptical in this sense.

- (9) a. [NP Alguns problemes psicològics ] no tenen solució.  
 some.M.PL problem.M.PL psychological.M.PL not have.3PL solution  
 ‘Some psychological problems have no solution.’  
 b. Molts problemes es resolen sols, però [NP alguns de  
 many.M.PL problem.M.PL REFL solve.3PL alone.M.PL but some.M.PL DE  
 psicològics ] no tenen solució.  
 psychological.M.PL not have.3PL solution  
 ‘Many problems get solved on their own, but some psychological ones have no solution.’
- (10) a. Hem fet la salsa amb [NP molts tomàquets verds ].  
 have.1PL made the sauce with many.M.PL tomato.M.PL green.M.PL  
 ‘We made the sauce with many green tomatoes.’  
 b. No sabem què fer amb tants tomàquets i hem fet la  
 not know.PST.1PL what do.INF with so.many.M.PL tomato.M.PL and have.1PL made the  
 salsa amb [NP molts de verds ].  
 sauce with many.M.PL DE green.M.PL  
 ‘We didn’t know what to do with so many tomatoes so we made the sauce with many green ones.’

We will refer to the preposition *de* that appears in examples like (9b) and (10b) as the adjectival marker or adjectival *de*.<sup>7</sup> When the headless indefinite NP is the object of a verb and has an anaphoric restrictor, the presence of the partitive clitic *en* is required on the verb, or verb complex.<sup>8</sup> Given the frequency with which the partitive clitic and the adjectival marker *de* co-occur in a clause, in examples like (3), it might give the impression that the presence of the clitic is a necessary condition for the use of the adjectival marker (see IEC (Institut d’Estudis Catalans) 2016: §15.5.1.4, 14.1c, 16.3.2.1, 16.5.2.2b, 18.6.3.1c, and 19.3.4.2 for a description that relates the two phenomena). In fact, the two phenomena are independent, although they share some features. The partitive clitic is used in many situations in which adjectival *de* is not possible: whenever the GF that corresponds to the clitic does not include an AP. And the adjectival marker *de* is used in many cases where the partitive clitic is not possible, as in (9b) and (10b). What they share is that the GF that corresponds to the clitic and the GF that includes the relevant AP must be indefinite and have an anaphoric semantic restrictor.<sup>9</sup>

The presence or absence of adjectival *de* is not optional: it is required before an AP in an indefinite NP with an anaphoric semantic restrictor if it immediately follows the position in which the head noun would appear if it were present, and it is necessarily absent before an AP in any other situation. The well-formed NPs in brackets in (9a)–(10a) with overt Ns become ungrammatical if *de* is added before the APs: \*[NP alguns problemes de psicològics], \*[NP molts tomàquets de verds]. And, conversely, the

<sup>7</sup>A reviewer asks whether these structures could not be analyzed as instances of the partitive construction with the preposition *de* signalling the NP status of its complement, which happens to have an ellipted noun. So, the relevant NP in (9b) would have a structure like “some [problems] of [the] psychological [problems/ones],” where the bracketed constituents would be phonologically nul. There are several problems with this suggestion. The main one is that the partitive construction in Catalan, as in other Romance languages, is an NP consisting of an indefinite determiner or quantifier followed by the preposition *de* + a definite NP, as in *alguns dels problemes* ‘some of the problems’, *un dels meus amics* ‘one of my friends’, *dues d’aquelles propostes* ‘two of those proposals’, etc. All of these NPs become ungrammatical if they lack the marker of definiteness: *\*alguns de problemes*, *\*un de meus amics*/*\*un d’amics meus*, *\*dues de propostes*, etc. Therefore, the sequence of *de*+AP in the bracketed sequences in (9b)–(10b) cannot be analyzed as the *de*+NP portion of the partitive construction with an elliptical N, because it lacks the marker of definiteness.

<sup>8</sup>See the analysis of the partitive clitic in Catalan in Alsina (2022), where it is claimed that it always corresponds to an object, even when it corresponds to the single direct argument of an intransitive verb, not limited to unaccusatives. See also Alsina & Yang (2018).

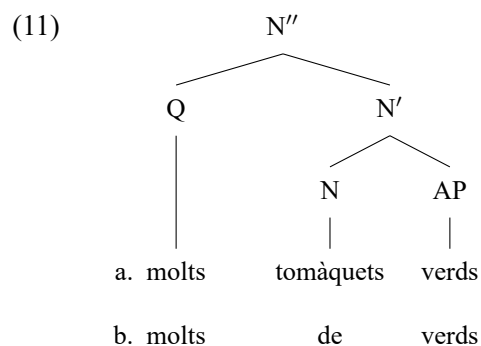
<sup>9</sup>A distinction must be made between two homophonous clitics, both spelled as *en/n’/’n/-ne* in Catalan: the partitive clitic and the genitive clitic. They are subject to different conditions. The genitive clitic corresponds to a complement (of a noun, verb, or adjective) that is alternatively expressed as a PP introduced by the preposition *de* and it is not subject to the indefiniteness condition that characterizes the partitive clitic. The genitive clitic is found in examples such as *N’he llegit el primer capítol* ‘I have read the first chapter (of it)’.

well-formed NPs in brackets in (9b)–(10b) without overt Ns become ungrammatical if adjectival *de* is removed: \*<sub>[NP]</sub> alguns psicològics], \*<sub>[NP]</sub> molts verds].

### 3 An analysis in which *de* is an expletive noun

Given this complementarity between an overt noun and adjectival *de* in indefinite NPs, it is tempting to assume an analysis in which both elements (overt noun and preposition *de*) occupy the same c-structure position: that of the head noun. The analysis presented in this section has not actually been proposed before, but it seems reasonable to give it due consideration. At first sight, all that is required is to assume that the adjectival marker is an expletive noun and a constraint preferring headed phrases over headless phrases. This analysis needs to be constrained further, as we shall see. The constraint just mentioned can be seen as an Optimality Theoretic (OT) constraint requiring the presence of the head of a phrase: Obligatory Heads (OB-HD), commonly used in the OT literature (see, for example, Grimshaw 1997). Everything else being equal, OB-HD makes us choose a phrase with a head over a phrase without a head.<sup>10</sup> Let us also assume, as is common in much work in LFG, that there are no empty categories and that all categories are optional. This means that there is no such thing as a null noun and that a phrase that has no word filling its head in fact has no head.

To illustrate this analysis, the c-structure of the NPs <sub>[NP]</sub> *molts tomàquets verds*] and <sub>[NP]</sub> *molts de verds*], used in (10), would be as shown in (11): in (11a), the full noun *tomàquets* occupies the N position; in (11b), the expletive noun *de* occupies the same position.<sup>11</sup>



Both phrases have the same structure, the only difference being whether the head N position is filled by a full noun or by the expletive noun *de*. This allows us to keep the c-structure rules simple, in that we do not need different sets of rules for NPs with a noun head and for NPs with the preposition *de* instead of a head noun. Let us assume the following set of rules for generating NPs (based on Alsina 2011):<sup>12</sup>

- (12)
- a. NP  $\rightarrow$  D N''
  - b. N''  $\rightarrow$  Q N''
  - c. N'  $\rightarrow$  N' XP
  - d. N  $\rightarrow$  A<sub>p</sub> N

<sup>10</sup> As an OT constraint, it is violated in many optimal (or grammatical) structures, if a higher ranking constraint needs to be satisfied, including, for example, coordination structures, which are plausibly analyzed as headless.

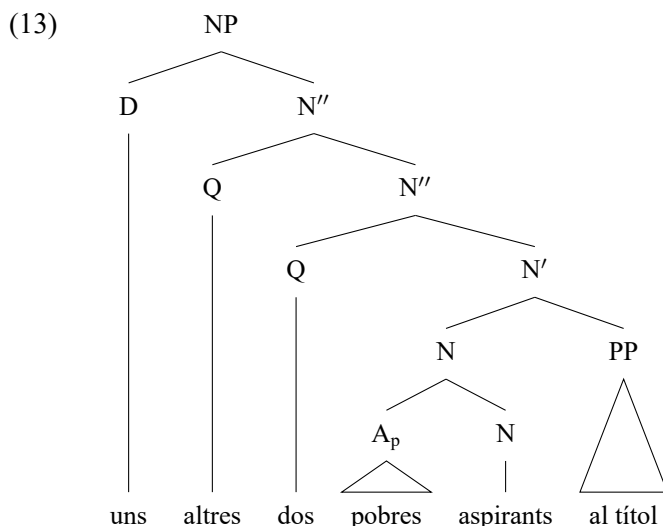
<sup>11</sup> The c-structure (11) is generated by the c-structure rules in (12) with the conventions given in the paragraph following (12).

<sup>12</sup> The rules in (12) treat NP and N'' as different categories, diverging from the position that treats them as the same category, and do not assume the DP hypothesis, according to which nominal phrases have a higher layer of structure called the DP, whose head is the D (determiner) and a lower layer that would be the NP proper. One could replace rule (12a) and (12b) by (ia) and (ib) respectively, using the DP and equating N'' to NP. However, this would be a notational variant of rules (12a)–(12b) with no empirical consequence.

- (i)
- a. DP  $\rightarrow$  D NP
  - b. NP  $\rightarrow$  Q NP

The following conventions are used in interpreting these rules. First, adopting Bresnan's Economy of Expression (Bresnan et al. 2016: 90), all categories are optional and a category node is only used if it is needed to satisfy an independent syntactic or semantic principle. Second, departing from standard  $X'$  theory conventions, a category with  $n$  number of bars on the right of the arrow is interpreted as a set of identical categories with a number of bars equal to or smaller than  $n$ . For example,  $N''$  on the right of the arrow in (12b) is interpreted as the set  $\{N'', N', N\}$ . Third, the category  $XP$  in (12c) is interpreted as the set consisting of AP, PP, and CP, which are the types of complements and modifiers that a noun can take. The category  $D$  corresponds to determiners, such as the definite article, demonstratives, and a few other elements constrained to appear in NP-initial position;  $Q$  corresponds to certain quantifiers, such as *molt* 'much', *dos* 'two', *últim* 'last', *altre* 'other', etc., which occur after  $D$ , if there is one, and before the head noun, if there is one;  $A_p$  corresponds to prenominal adjectives such as *bon* 'good', *mal* 'bad', *pobre* 'sad', etc. Following Sadler & Arnold (1994), rule (12d) introduces a prenominal adjective as a daughter of  $N^0$  and a sister of  $N^0$ : in Sadler & Arnold's (1994) terms, it's an A-N 'small' construction. This entails that postnominal phrases, whether complements or modifiers of the noun, are in a higher position than the prenominal adjectives (see (13) for an example). All rules in (12) except for (12a) allow for a recursive application, which gives rise to more than one instance of the non-head category.

The c-structure representation of an NP such as *uns altres dos pobres aspirants al títol* 'two other sad contenders to the title' using the rules in (12) would be as shown in (13):



An attractive consequence of treating the adjectival marker *de* as an expletive noun is that we can use the set of rules in (12) to generate the structure of both NPs with a noun head and NPs with the adjectival marker.<sup>13</sup> Another consequence of this is that it accounts for the fact that the adjectival marker *de* does not appear whenever an AP appears in an NP, but only when this AP immediately follows the position where a noun would appear if it were present. In other words, if another complement or modifier of the NP appears preceding the AP, this AP is not introduced by the adjectival marker. Consider the NP in (14), which allows its PP and AP modifiers to appear in either order, as shown in (14a)–(14b); when the head noun is omitted and the semantic restrictor of the NP is anaphoric, the adjectival marker *de* only appears when the AP is the first phrasal constituent in the NP, as in (15), where the adjectival marker is shown in boldface. In (15) the omission of the head noun requires the presence of the partitive clitic on the verb, glossed as EN, as the NP is an object (even though it is the only argument of the verb).

- (14) a. Passaran [NP uns trens [PP de càrrega] [AP molt llargs]].  
 pass.FUT.3PL some.M.PL train.M.PL of freight very long.M.PL

<sup>13</sup>As we shall see further on in this section, not all NPs lacking a lexical noun head have the adjectival marker in its place.

- b. Passaran [NP uns trens [AP molt llargs] [PP de càrrega]].  
 pass.FUT.3PL some.M.PL train.M.PL very long.M.PL of freight  
 ‘Some very long freight trains will pass through.’
- (15) a. En passaran [NP uns [PP de càrrega] (\*de) [AP molt llargs]].  
 EN pass.FUT.3PL some.M.PL of freight DE very long.M.PL  
 b. En passaran [NP uns de [AP molt llargs] [PP de càrrega]].  
 EN pass.FUT.3PL some.M.PL DE very long.M.PL of freight  
 ‘Some very long freight ones will pass through.’

Other examples that illustrate the same fact, namely, that the adjectival marker *de* only appears before an AP if it is the first phrase in the NP following the head position, are the following:<sup>14</sup>

- (16) a. Adquirim [NP tres finques [AP hipotecades] [PP en bon estat]].  
 purchase.1PL three property.F.PL mortgaged.F.PL in good state  
 b. Adquirim [NP tres finques [PP en bon estat] [AP hipotecades]].  
 purchase.1PL three property.F.PL in good state mortgaged.F.PL  
 ‘We are purchasing three mortgaged properties in good condition.’
- (17) a. N’adquirim [NP tres d’ [AP hipotecades] [PP en bon estat]].  
 EN purchase.1PL three DE mortgaged.F.PL in good state  
 b. N’adquirim [NP tres [PP en bon estat] (\*d’) [AP hipotecades]].  
 EN purchase.1PL three in good state DE mortgaged.F.PL  
 ‘We are purchasing three mortgaged ones in good condition.’
- (18) a. Volen tastar [NP tomàquets [AP arrebossats] [AP fregits]].  
 want.3PL taste.INF tomato.M.PL battered.M.PL fried.M.PL  
 b. Volen tastar [NP tomàquets [AP fregits] [AP arrebossats]].  
 want.3PL taste.INF tomato.M.PL fried.M.PL battered.M.PL  
 ‘They want to taste fried battered tomatoes.’
- (19) a. En volen tastar [NP \*(d’) [AP arrebossats] (\*de) [AP fregits]].  
 EN want.3PL taste.INF DE battered.M.PL DE fried.M.PL  
 b. En volen tastar [NP \*(de) [AP fregits] (\*d’) [AP arrebossats]].  
 EN want.3PL taste.INF DE fried.M.PL DE battered.M.PL  
 ‘They want to taste fried battered ones.’

The examples (14)–(19) provide further support for the idea that the adjectival marker *de* is used in place of the noun head of the NP. It is not that this marker is used whenever there is an AP modifier in an NP with no head noun, because examples like (15a), (17b), (19a), and (19b) show that this is not the case. The AP has to be adjacent to the position of the head noun if the noun were present.

However, the idea that *de* is an expletive noun (in addition to having an alternative lexical entry as a preposition) is not sufficient by itself to account for its distribution. In the first place, it can only be used in indefinite NPs. It is not enough that the head noun is missing, because some definite NPs can also lack a noun head, but in such cases the adjectival marker *de* cannot be present, as in (20). See also example (4). The adjectives that do not accept the adjectival marker in (20) are required to take it in other contexts, as in (21).

- (20) a. Agafeu aquelles peces, però deixeu [NP les (\*de) [AP grogues]].  
 take.2PL the.F.PL part.F.PL but leave.2PL the.F.PL DE yellow.F.PL  
 ‘Take those parts, but leave the yellow ones.’

<sup>14</sup>The form *d’* used in (17), (19), and elsewhere is a phonologically conditioned variant of *de*, used before a word beginning with a vowel.

- b. Primer resollem els problemes fàcils i després estudiarem [NP aquests  
first solve.1PL the.M.PL problem.M.PL easy.PL and later study.FUT.1PL these.M.PL  
(\*de) [AP més difícils]].  
DE more difficult.PL  
'First we solve the easy problems and then we will study these more difficult ones.'
- (21) a. En tenim [NP tres de [AP grogues]].  
EN have.1PL three DE yellow.F.PL  
'We have three yellow ones.'
- b. N'hem estudiat [NP alguns de [AP més difícils]].  
EN have.1PL study.PTCP some.M.PL DE more difficult.PL  
'We have studied some more difficult ones.'

In the second place, the adjectival marker *de* must be followed by an AP: it cannot be final in the NP, as in (22a), and cannot be followed by a PP (22b) or a CP (22c):<sup>15</sup>

- (22) a. En tenim [NP tres (\*de)].  
EN have.1PL three DE  
'We have three.'
- b. N'adquirim [NP tres (\*d')] [PP en bon estat]].  
EN purchase.1PL three DE in good state  
'We are purchasing three in good condition.'
- c. N'hem estudiat [NP alguns (\*de) [CP que no tenen solució]].  
EN have.1PL study.PTCP some.M.PL DE that not have.3PL solution  
'We have studied some that have no solution.'

In the third place, it is not sufficient for the AP to occur in an indefinite NP that lacks a noun: the headless NP must be interpreted with an anaphoric restrictor. If the determiner that introduces the headless NP is such that it specifies a semantic restrictor, the adjectival marker is not possible, even if all the other conditions are satisfied. This is what happens with determiners such as *algú* 'someone' or *ningú* 'no one' (see (26)). That such elements are determiners can be argued for on the basis of the fact that (a) they are always initial in the NP and (b) can be followed by *altre* 'other', a word of category Q, which therefore appears between a determiner and a noun, never after a noun (see Alsina 2011, who argues against the claim in Brucart 2002: §7.1.3.2 that words such as *algú* are nouns). This is illustrated in (23):

- (23) a. un altre problema  
an other problem
- b. \*un problema altre  
a problem other
- c. aquell altre problema  
that other problem
- d. \*aquell problema altre  
that problem other

Thus, the fact that we have grammatical NPs such as (24a) and (25a), rather than (24b) and (25b), is clear evidence that the indefinite expressions *algú* 'someone' and *ningú* 'no one' are determiners, as opposed to nouns, given that *altre* precedes the noun it modifies.

<sup>15</sup>Notice that the NPs in (22) are all acceptable if the adjectival marker is missing or if it is replaced by a noun (in this case, leaving out the partitive clitic), as in *Tenim tres finques* 'We have three properties', *Adquirim tres finques en bon estat* 'We are purchasing three properties in good condition', or *Hem estudiat alguns problemes que no tenen solució* 'We have studied some problems that have no solution'.

- (24) a. algú altre  
           someone other  
           ‘someone else’  
       b. \*altre algú  
           other someone
- (25) a. ningú altre  
           no.one other  
           ‘no one else’  
       b. \*altre ningú  
           other no.one

Furthermore, these determiners carry the semantic restrictor ‘human’ or ‘person’. When these determiners are followed by an adjective phrase, this AP is not introduced by the marker *de*, as shown in (26):

- (26) a. Busquem [NP algú (\*d’) [AP intel·ligent i preparat]].  
           seek.1PL someone DE intelligent and prepared  
           ‘We are looking for someone intelligent and prepared.’  
       b. No conec [NP ningú (\*de) [AP més alegre]].  
           not know.1SG no.one DE more cheerful  
           ‘I don’t know anyone more cheerful.’

This is in contrast to determiners such as *algun* ‘some’ or *cap* ‘none, any’, which do not specify a semantic restrictor and require the marker *de* when there is no head noun and they are followed by an AP. Whereas determiners that specify their semantic restrictor (such as *algú* and *ningú*) cannot co-occur with a head noun (as in \**algú professor* ‘someone professor’ or \**ningú atleta* ‘no one athlete’),<sup>16</sup> those determiners that do not specify their semantic restrictor (such as *algun* ‘some’ or *cap* ‘no’/‘any’) can co-occur with a head noun (as in *algun professor* ‘some professor’ or *cap atleta* ‘no athlete’), but they do not have to. (Note that *algun* and *cap* are the semantically unrestricted counterparts of *algú* and *ningú*, respectively.) In addition, the semantically unrestricted determiners *algun* and *cap* require the marker *de* if they are immediately followed by an AP, as in (27):

- (27) a. En busquem [NP algun \*(d’) [AP intel·ligent i preparat]].  
           EN seek.1PL some DE intelligent and prepared  
           ‘We are looking for an intelligent and prepared one.’  
       b. No en conec [NP cap \*(de) [AP més alegre]].  
           not EN know.1SG any DE more cheerful  
           ‘I don’t know a more cheerful one.’

Addressing these problems within the approach in which the adjectival marker *de* is an expletive noun requires attributing to this marker several properties that are not found in other nouns of the language. The first one is the claim that this is a noun that has no meaning. In addition, this noun has to carry the information that the NP is indefinite, or [DEF –]; it also has to specify that it is followed by an AP; and it has to specify that its semantic restrictor is anaphoric. None of these properties is found elsewhere on a noun, either separately or jointly. As a general rule, nouns are not restricted in terms of definiteness: there is no such thing as an indefinite noun, or a definite one.<sup>17</sup> Pronominal elements that lexically specify

<sup>16</sup>Such NPs are marginally acceptable if the noun is reanalyzed as an adjective, so that *ningú atleta* would be interpreted as ‘no one who has the property of being an athlete’. The fact that nouns and adjectives in Catalan (as in other Romance languages) have identical behavior in terms of inflectional morphology allows elements from one class to show syntactic behavior of the other class.

<sup>17</sup>Proper nouns can be considered to be inherently definite, but notice that they can lose their definite reference under certain circumstances (e.g., *another John Smith*, *the John Smith I’m talking about*, etc.) that show that it is the determiner that is the carrier of definiteness.

a semantic restrictor and can function as definite or indefinite NPs are in fact determiners, not nouns, as has been argued for in Alsina (2011) concerning the indefinite pronouns *algú* and *ningú*; the same claim can be made for definite pronouns, such as *ell* ‘he/him’, following Postal’s (1969) proposal that pronouns are determiners (see also Wiltschko 1998 and Höhn 2016, among many others).<sup>18</sup> As a rule, nouns are allowed to be followed by an AP, but do not have to, whereas the expletive noun *de* has to be followed by an AP. And nouns specify their own semantic restrictor, which is not anaphoric on some other expression in the discourse. Finally, morphologically, the marker *de* does not behave in any way like a noun: most obviously, it lacks the ability to vary depending on the number feature of the NP. Nouns regularly show a singular/plural alternation, agreeing in the number feature with their accompanying determiner, quantifiers, adjectives, etc. The plural form of a noun is characterized by the presence of the suffix *-s*, which is absent in the singular form, as seen in nouns such as *problema* (singular) and *problemes* (plural). No such alternation occurs with *de*, which is invariable, even though the NP that it heads may be either singular or plural, as shown by the accompanying D, Q or AP, which show the corresponding number morphology (e.g. plural NPs in (21) and singular NPs in (27)).<sup>19</sup>

#### 4 The marker, licensed by a special rule

The problems just noted for treating the adjectival marker as an expletive noun point to the need to analyze it in a different way. The alternative to be proposed here treats this marker as a preposition that is required under very specific conditions. The conditions are (a) that it is the initial element in an AP, (b) that this AP is the leftmost category in an N’, (c) that this N’ is indefinite (i.e., that it maps onto an f-structure with the feature [DEF –]), and (d) that the semantic restrictor of this N’ is anaphoric (identified with the semantic restrictor of some other expression in the discourse). The marker is not used unless all of these conditions are met. The adjectival marker licensing rule can be represented as follows:

$$(28) \quad \text{Adjectival } de \text{ licensing rule: } AP \longrightarrow \begin{array}{c} P \quad AP \\ | \\ {}_i[\text{IDX } de] \end{array}$$

$$\begin{array}{ll} \text{a.} & c[N' \text{ — } \dots]_1 \\ \text{b.} & f[\text{DEF —}]_1 \\ \text{c.} & \begin{array}{l} \left[ \begin{array}{l} \text{NEW} \left\{ \dots [\text{RESTR } \alpha]_1 \dots \right\} \\ \text{OLD} \left\{ \dots [\text{RESTR } \alpha] \dots \right\} \end{array} \right]_i \end{array} \end{array}$$

This rule requires an AP to consist of a P and an AP, where the P is identified by the lexical index (IDX) ‘de’, provided the following three conditions are met: a) at the level of c-structure, the AP occupies the initial position in an N’ constituent, signalled by the horizontal line; b) at the level of f-structure, the feature structure that corresponds to the N’, as indicated by coindexation, has the feature [DEF –]; and c) at the level of information structure (i-structure), the element that corresponds to the N’, with the same index, has the same semantic restrictor as an element in the list of old discourse elements. This is a c-structure

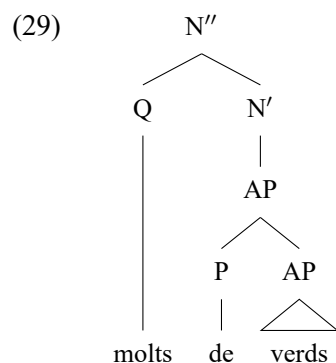
<sup>18</sup>Pronoun is a concept at the level of f-structure and semantics that has a variety of forms of expression at the level of c-structure and morphology: there are pronouns encoded as affixes on the verb (such as so-called clitics in Romance), there are null pronouns (pronouns at f-structure and semantics that have no counterpart at c-structure or morphology), there are pronouns that correspond to Q words or adjectives (as is the case of possessive pronouns in Catalan, such as *meu/meva* ‘my’/‘mine’) and probably other types. The claim made here is that pronouns that specify their own semantic restrictor and can appear as the sole element in an NP are determiners. A pronominal determiner cannot co-occur with a head noun because of consistency, as each of them would specify a PRED value.

<sup>19</sup>This is unlike what happens with nouns that are always used in the plural form (pluralia tantum nouns), which are morphologically marked with the plural suffix and co-occur with Ds, Qs, and APs that must also be plural. Examples of such nouns are *escacs* ‘chess’, *tisores* ‘scissors’, *ulleres* ‘glasses’, etc., which occur in NPs in which all agreeing elements are also plural: *els escacs francesos* ‘the.M.PL chess.PL French.M.PL’, *unes ulleres fosques* ‘some.F.PL glasses.PL dark.F.PL’, etc.

rule that accesses information at different levels and selects a specific lexical item (*de*) in a specific position. The left subscripts *l, c, f*, and *i* in the structures in (28) indicate the level of representation to which the structures belong: lexical information, c-structure, f-structure, and i-structure, respectively. The right subscripts, or coindexes, indicate the correspondence between levels.

The prepositional marker *de* licensed by this rule is a purely formal element that carries no information at any level (no semantic or f-structure information), except that it occupies a position at c-structure.<sup>20</sup> In this respect, it can be viewed as a morphological realization of the information specified in rule (28). This takes the view of inflectional morphology and of the relation between morphology and syntax defended in Alsina (2020, 2022, 2023, 2024): inflectional morphology is the result of applying word formation rules (such as affixation rules) to a lexeme on the basis of information in the f-structure and other structures beyond the level of the word, such as i-structure.<sup>21</sup> Just as word forms arise as a result of the application of rules that make use of syntactic information, a whole word with its c-structure position may also be the result of this kind of rule. And this is the situation with the adjectival marker *de*.

Let us see how rule (28) works. It produces an AP that immediately dominates a P and an AP, where the P position is occupied by the item *de*, if the dominating AP is the leftmost constituent in an N'. The c-structure rules in (12) and the conventions for interpreting and applying them allow the application of rule (28) only when the N' has no noun head (and consequently no N position) and the only constituent in the N' is an AP. The phrase *molts de verds* 'many green ones', used in (10b), has the structure in (29):



Rule (12c), which licenses an AP in an NP, is repeated here for convenience.

$$(12c) \quad N' \longrightarrow N' \quad XP$$

By Economy of Expression, the nodes licensed by this rule are only used if they dominate at least a word. If the noun phrase included an overt noun head, the structure would be as in (30):

$$(30) \quad [_{N''} \text{molts } [_{N'} [_{N} \text{tomàquets} ] [_{AP} \text{verds}]]]$$

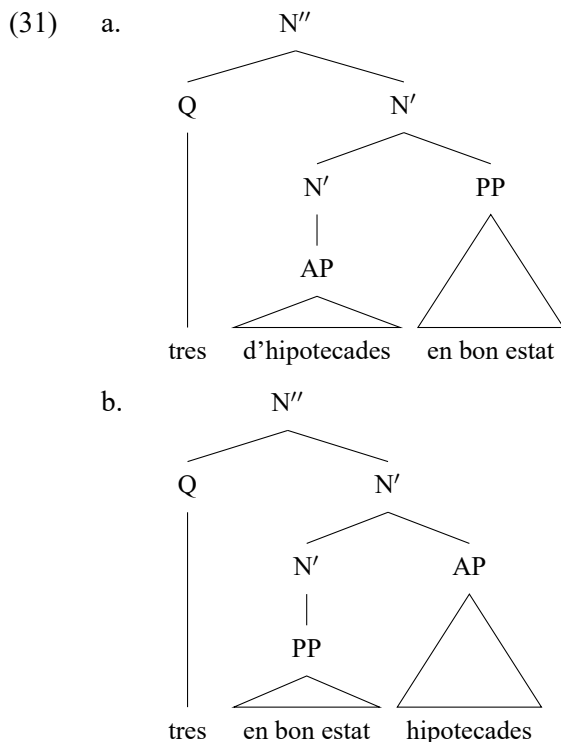
In (30), the first constituent in the N' is the N *tomàquets*. Consequently, the AP is not the leftmost constituent in the N' and rule (28) cannot apply; so the AP in (30) lacks the adjectival marker. The P introduced by rule (28) is a non-projecting category, as it does not project a PP phrase (see Toivonen 2003 for the notion of non-projecting category). Notice that the condition that the AP has to be the leftmost constituent in N' does not allow an iterative or recursive application of rule (28) as the AP that follows *de* is not the leftmost constituent in N'.

As seen earlier, the absence of a noun in a noun phrase is not a sufficient condition from the c-structure point of view for the application of rule (28). For an AP to include the adjectival marker, it cannot be preceded by another constituent in the N' that immediately dominates it. This is what happens in examples

<sup>20</sup>Some instances of the preposition *de*, different from those analyzed in this paper, can be argued to make some semantic or f-structure contribution. For example, it can signal source of movement, as in *He tornat de París* 'I have returned from Paris' vs. *He tornat a París* 'I have returned to Paris'.

<sup>21</sup>By contrast, derivational morphology, or lexeme formation, does not use for its rules information present in the syntactic context in which a word is used.

like (15), (17), and (19): the adjective *hipotecades* in (17) is preceded by the adjectival marker *de* only when it precedes the other modifier of the NP, the PP *en bon estat*, as in (17a), but not when it follows it, as in (17b). The c-structures of the two NPs *tres d'hipotecades en bon estat*, from (17a), and *tres en bon estat hipotecades*, from (17b), are shown in (31a) and (31b) respectively:



Rule (12c), which licenses an XP (AP, PP, or CP) in the N', applies iteratively in both (31a)–(31b), licensing an AP and a PP in both cases, but in different order. In (31a), there is no constituent to the left of the AP in the N'; therefore, rule (28) applies licensing the adjectival marker. In (31b), the AP within the N' has an N' to its left, which dominates a PP; so, rule (28) cannot apply to this AP and the adjectival marker is not licensed.

The second condition in (28) requires the N' that contains the AP to map onto an f-structure with the feature [DEF –]. In other words, the licensing of the adjectival marker is restricted to indefinite noun phrases. This condition is needed to account for the fact that this marker fails to occur in headless definite noun phrases, as shown in examples such as (4) and (20). A noun phrase such as *les grogues* 'the yellow ones', from (20a), satisfies all of the conditions in (28), except for the indefiniteness requirement. So, it is necessary to indicate that an AP is assigned the adjectival marker only if it is part of an indefinite noun phrase.

Finally, the last condition in (28) specifies that, in order to license the adjectival marker, there has to be an anaphoric dependency between the noun phrase containing the AP and a participant already present in the discourse, such that the two share their semantic restrictor. This condition has an important overlap with the c-structure condition (condition a) of (28), which only allows the adjectival marker in headless noun phrases. The semantic restrictor of a noun phrase is normally lexically specified by the head noun; therefore, if a noun phrase lacks a noun as its head, it will most likely not have a fixed semantic restrictor, but will allow its semantic restrictor to be determined by a discourse antecedent. However, there are some determiners that have lexically specified semantic restrictors. Because of this they are incompatible with a head noun in their noun phrase, as a head noun would also specify a semantic restrictor. This is the case of the indefinite determiners *algú* 'some one' and *ningú* 'no one', illustrated in (26). The counterparts of these words that do not lexically specify a semantic restrictor are the determiners *algun* 'some' and *cap* 'no'/'none', illustrated in (27). Minimal contrasts such as *algú intel·ligent* 'someone intelligent' and

*algun d'intel·ligent* 'an intelligent one' are accounted for by the condition in rule (28) that only allows the insertion of the adjectival marker if the noun phrase has an anaphoric restrictor. Both noun phrases are identical at the level of c-structure, leaving aside the adjectival marker: a determiner followed by an N', which consists only of an AP:

- (32) a. [NP [D algú] [N' [AP intel·ligent]]]  
 b. [NP [D algun] [N' [AP d'intel·ligent]]]

They are also identical at the level of f-structure: crucially, they both have the feature [DEF –]. They only differ at the level of semantic structure and i-structure, since *algú* lexically carries the information that its semantic restrictor is 'human' and *algun* has no lexically specified semantic restrictor, which allows the noun phrase that contains the latter to share its restrictor with some appropriate antecedent in the discourse. The appearance of the adjectival marker in (32b) but not in (32a) has to be attributed to this semantic difference (see the contrast in (26) vs. (27)).

In sum, the adjectival marker *de* in Catalan is inserted, or licensed, by a rule that is sensitive to different levels of representation: c-structure, f-structure, and i-structure. That marker carries no syntactic or semantic information in its lexical entry. The relevant rule requires the marker to be used when a set of conditions are met:<sup>22</sup> as part of an adjective phrase in the leftmost position in an N', if the noun phrase is indefinite and its semantic restrictor is anaphoric on a previous element in the discourse.

## 5 The facts of coordination

When the noun phrase in which the adjectival marker is licensed includes coordination of adjectives, an apparently puzzling situation arises: the marker is sometimes present introducing the second conjunct and sometimes not. (33) contains examples in which the marker is repeated before the second conjunct and (34) contains examples in which the marker is not repeated.

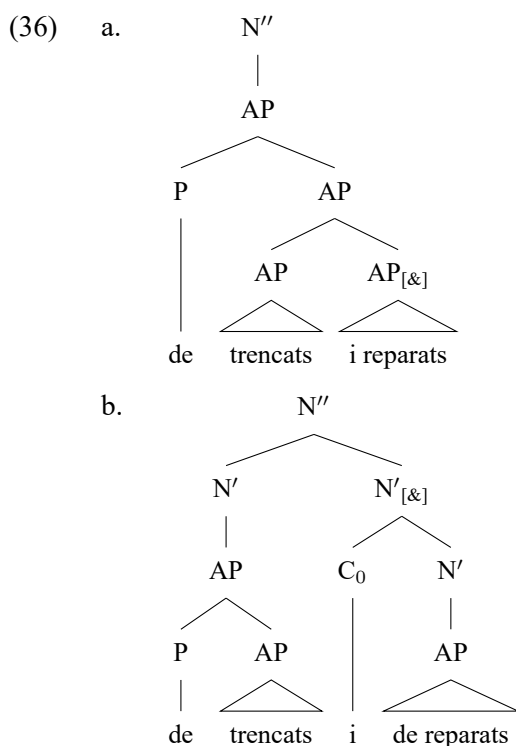
- (33) a. Parla de gerros, en tinc de sencers i \*(de) trencats.  
 talk.GER of vases, EN have.1SG DE whole.M.PL and DE broken.M.PL  
 'Talking about vases, I have some whole ones and some broken ones.'  
 b. De tomàquets, n' he comprat molts de verds i \*(de) madurs.  
 of tomatoes EN have.1SG buy.PTCP many.M.PL DE green.M.PL and DE ripe.M.PL  
 'As for tomatoes, I have bought many green ones and ripe ones.'
- (34) a. Parla de llibres, en tinc un de nou i (\*d') immaculat.  
 talk.GER of books, EN have.1SG one DE new and DE immaculate  
 'Talking about books, I have a new and immaculate one.'  
 b. D'aprenents, no en conec cap d' intel·ligent i (\*de) ben preparat.  
 of apprentices not EN know.1SG any DE intelligent and DE well prepared  
 'As for apprentices, I don't know any intelligent and well prepared one.'

A close consideration of these examples reveals that the ungrammaticality of leaving out the second marker in (33) is more of a semantic nature, than a syntactic one. If the marker is left out in the second conjunct in an example like (33a), it implies that I have some vases that are both whole and broken, which is semantically anomalous, as opposed to some that are whole and some that are broken. It is possible to construct minimal pairs in which both the presence and the absence of the adjectival marker before the second conjunct is possible, but with a difference in meaning:

<sup>22</sup> The 'partitive' semantics associated with the adjectival marker is a consequence of the condition that restricts the application of rule (28) to indefinite NPs.

- (35) a. Parla<sub>talk</sub> de gerros, en tinc<sub>EN have</sub> de trencats<sub>1SG DE broken</sub> i reparats<sub>M.PL and repaired</sub>.  
 talk.GER of vases, EN have.1SG DE broken.M.PL and repaired.M.PL  
 ‘Talking about vases, I have some that are broken and repaired.’  
 b. Parla<sub>talk</sub> de gerros, en tinc<sub>EN have</sub> de trencats<sub>1SG DE broken</sub> i de reparats<sub>M.PL and DE repaired</sub>.  
 talk.GER of vases, EN have.1SG DE broken.M.PL and DE repaired.M.PL  
 ‘Talking about vases, I have some broken ones and some repaired ones.’

We don’t need to make any new assumption in order to explain the possibility of having or not having the adjectival marker before the second conjunct in what looks like the coordination of adjective phrases or to explain the difference in meaning in cases like (35). It depends on whether the coordinate structure is the N’ or the AP immediately dominated by the N’. Since each N’ involved contains no other constituent than the AP, leaving aside the coordinating conjunction, it may give the impression that it should make no difference whether the coordinate structure is one or the other. But it does make a difference both in semantic and syntactic and morphological terms. The c-structure of the object noun phrase in (35a) is as in (36a) and that of (35b) is as in (36b):<sup>23</sup>



As we can see, coordination can take place either at the level of the AP, as in (36a), or at the level of the N’, as in (36b). If the coordinate structure is the AP, there is only one N’ that the AP can be the leftmost constituent of, which is one of the necessary conditions for the application of rule (28). So, the adjectival marker P is inserted before the two conjoined adjective phrases. And there is no possibility of inserting it before the second one, as this AP is not the leftmost constituent in the N’, as seen in (36a). In addition, since there is only one N’, there is only one set of entities denoted by this expression: the set of vases that are both broken and repaired. On the other hand, if the coordinate structure is the N’, there are two N’s, each one containing an AP, as in (36b). Therefore, each AP is the leftmost constituent in an N’ and, so, rule (28) applies to each AP licensing the P position that hosts the adjectival marker. As there are two N’s in the coordinate structure, there are two different sets of entities denoted by these N’s: the set of vases

<sup>23</sup>I follow Przepiórkowski (2025) in assuming that the coordinating conjunction in a coordinate structure is part of the second (or last) conjunct. The category of the conjunct containing the coordinating conjunction is notated with the subscripted symbol [&], as in AP<sub>[&]</sub>. The constituent containing the conjunction, such as X<sub>[&]</sub>, immediately dominates the conjunction, Co, and a constituent of the same category as itself, e.g. X.

that are broken and the set of vases that are repaired. Thus, the morphological difference between the two sequences (presence or absence of the adjectival marker before the second adjective in the coordination) correlates with a semantic difference (whether we are talking about two different sets of entities each one having the property denoted by one of the adjectives or about a single set of entities that have the two properties denoted by the adjectives).

Now we can explain the facts of (33) and (34). The absence of the second instance of the preposition would be possible in (33) if we had coordination of the AP, as in (36a), but this would imply that we have a single set of entities to which we apply the two properties in the coordinate AP: if we deleted the second instance of the preposition in example (33a), we would need to have vases that are both whole and repaired, which is a contradiction. The second instance of the preposition signals that we have two N's, in N' coordination: the set of entities denoted by each N' has the property denoted by one of the adjectives. As for (34), repeating the preposition before the second conjunct would indicate that we have N' coordination. Thus, we would have two sets of entities, but this is in contradiction with the fact that we are using a singular determiner, *un* 'one' or *cap* 'none', which prevents the interpretation that we have two sets of entities. In sum, the facts about coordination provide striking support for the analysis of the adjectival marker proposed in this paper.

## 6 Conclusion

This paper has proposed an analysis of the distribution of the adjectival marker *de* in Catalan. An essential part of the analysis is the idea that c-structure positions with their corresponding lexical items can be licensed by rules that refer not only to c-structure information, but also to information present at f-structure or at other levels that go beyond the word such as i-structure. The rule that licenses the adjectival marker resembles a morphological rule of the type proposed in Alsina (2020, 2022, 2023, 2024). A crucial assumption in this conception of morphology is the idea that the word formation module is not encapsulated from the syntax and that the principles of word formation can use information present in the syntax. In addition, just as the word forms associated with particular c-structure positions depend on syntactic information, so does the licensing of particular c-structure positions with their associated words. This is what happens with the adjectival marker in Catalan, as this word and the position it occupies at c-structure are licensed by a rule that refers to information at c-structure, f-structure, and i-structure. This is unlike what happens with standard c-structure rules in LFG, which do not license a node in the c-structure with its associated lexical item on the basis of information present in the syntax.

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# The morphosyntax of information structure

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## 1 Introduction

In this paper we make some simple points regarding morphosyntactic exponence in light of i(nformation)-structure:

1. Exponence is sensitive to i-structural information.
2. Null subjects in so-called *pro*-drop languages are the i-structurally unmarked case, whereas non-null subjects are i-structurally marked.
3. Morphosyntactic effects of i-structure are typologically diverse and can shed new light on recalcitrant phenomena; this is demonstrated by an analysis of the Ojibwe inverse as a voice marker conditioned by i-structural information.

Our framework of analysis is  $L_RFG$  (among others, Melchin, Asudeh & Siddiqi 2020, Asudeh & Siddiqi 2022, Asudeh, Bögel & Siddiqi 2023, Asudeh & Siddiqi 2023, Asudeh, Melchin & Siddiqi 2024, Asudeh & Siddiqi 2024, 2026).  $L_RFG$  is a constraint-based framework and architecture closely related to LFG.

This paper also introduces a new idea to  $L_RFG$ : the *syntacticon*, a new way of treating the source of exponence in terms of a list of terminal nodes that are similar to LFG lexical entries, except syntacticon entries are *purely* syntactic elements that populate the terminal nodes of  $L_RFG$  c-structures, much as lexical entries in LFG serve as terminal nodes in LFG c-structures. The crucial difference between  $L_RFG$ 's syntacticon entries and LFG's lexical entries is that the former lack specification of any *form*, unlike LFG's lexical entries, which have a form (and features) delivered by a separate morphological component. It will emerge that the syntacticon directly captures a key idea from Distributed Morphology while simultaneously creating a tighter fit between  $L_RFG$  and standard LFG in how c-structure terminals are treated.

In focusing on the empirical topics of null subject pronouns, morphosyntax, and information structure, we hope to honour the long and varied careers of Miriam Butt and Tracy Holloway King. In particular we use their simple two-feature i-structure system,  $[\pm NEW, \pm PROM]$  (Butt & King 1996, 1997, Choi 1996, 1999), as the basis for our analyses below, twinned with a version of the semantic structure to i-structure mapping theory of Dalrymple & Nikolaeva (2011), which uses Glue Semantics (Dalrymple et al. 1993, Dalrymple 1999, Asudeh 2012, Dalrymple et al. 2019, Asudeh 2022, 2023). Note that the purpose of this paper is not in any way to argue for the  $L_RFG$  approach over an LFG alternative: the generalizations and aspects of the analysis could easily be accommodated in standard LFG, but that would be in the context of an assumption of *strong lexicalism* (Chomsky 1970, Lapointe 1980), which  $L_RFG$  does not adhere to.

The paper is structured as follows. The next section, Section 2, very briefly introduces  $L_RFG$  with an expository example. We introduce the syntacticon in Section 2.1. The following section, Section 3,

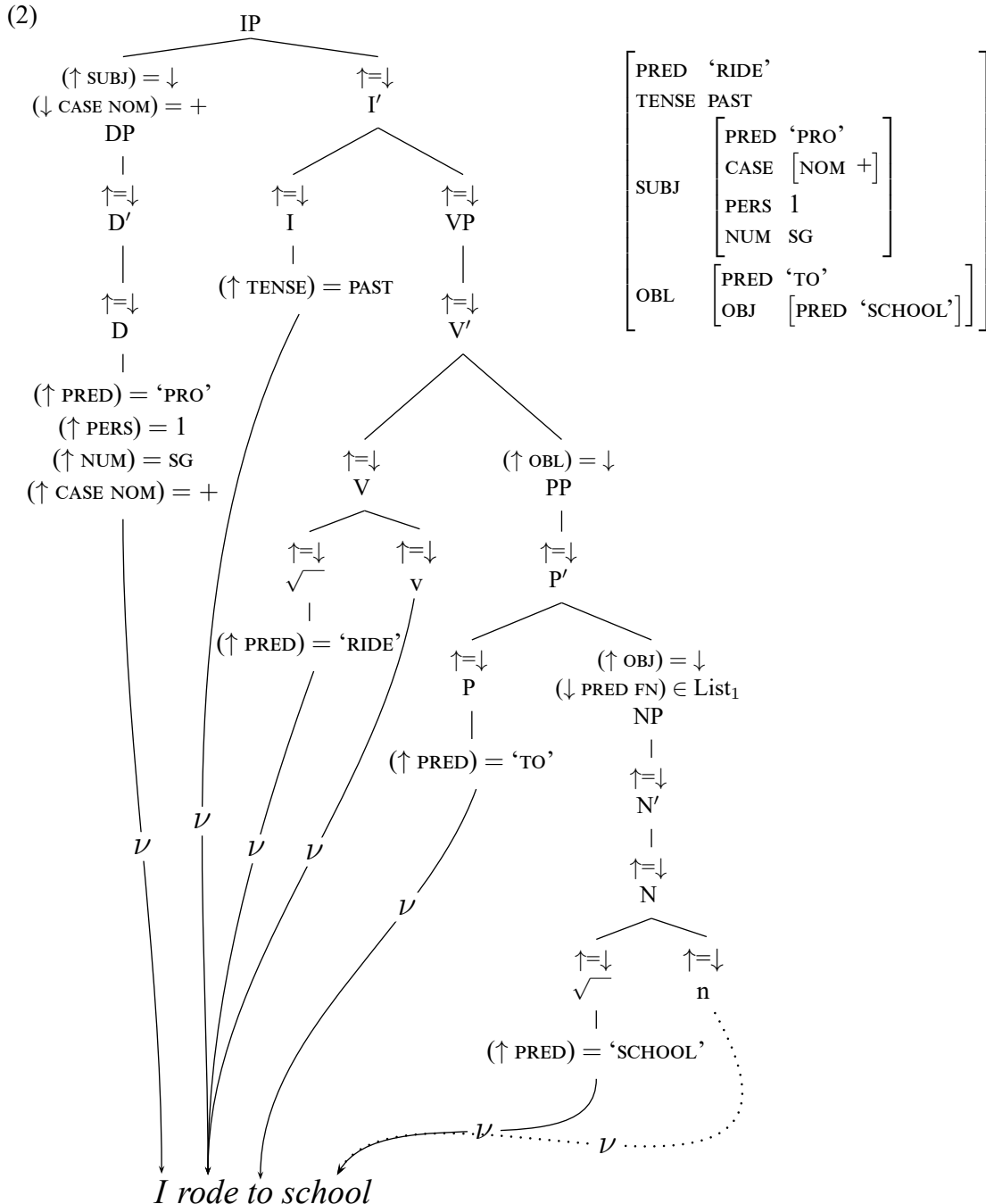
provides a brief outline of how information structure functions in L<sub>R</sub>FG. Analyses of our two phenomena are then provided in Section 4 and Section 5. We wrap up with some concluding remarks in Section 6.

## 2 An example of L<sub>R</sub>FG analysis

In this section we briefly present a sample L<sub>R</sub>FG analysis of (1) for the uninitiated.

(1) I rode to school.

The c-structure for (1) is shown on the left side of (2), the corresponding f-structure on the right.



The c-structure above looks like a mix of a tree in Minimalism (Chomsky 1995) and a tree in LFG (Kaplan & Bresnan 1982, Bresnan et al. 2016, Dalrymple et al. 2019). The f-structure is a standard LFG f-structure. As in LFG, L<sub>R</sub>FG c-structures are licensed transparently by annotated phrase-structure rules

and some analytic claims are directly captured by the rules themselves. For example, it would be the rule for the IP that licenses a DP subject in SpecIP and requires it to have nominative case.

## 2.1 The syntacticon

The terminal nodes are populated from a repository of the language's possible exponenda, which we call a *syntacticon*. The syntacticon is the 'third list' in Distributed Morphology (Halle & Marantz 1993), which lacks a standard name. This list houses the feature bundles that make up terminal nodes in the syntax. Rather than referring to this repository as the 'third list' or engaging in other sorts of onomastic evasiveness, we've named this the syntacticon. Items in the syntacticon consist of a category that labels some node  $n$  associated with some equations or constraints co-describing other levels of structure that the node  $n$  corresponds to (f-structure, s(ematic)-structure, i(nformation)-structure). The category and the co-descriptive features constitute the *exponenda* that a vocabulary item (VI) *matches* and maps to an exponent v(ocabulary)-structure.<sup>1</sup> Thus, VIs are functions from exponenda to exponents.

A syntacticon in L<sub>R</sub>FG is similar to a lexicon in LFG with the following differences:

1. Unlike LFG lexical entries, syntacticon entries are not stored with a *form*. The form is the realization of the v-structure that is the *exponent* of the information in the syntacticon entry.
2. Unlike some versions of LFG lexicons, syntacticons are only inert lists: there is no capacity to generate syntacticon entries from other syntacticon entries (cf. lexical rules).

A subset of the syntacticon relevant to (1) is thus inferable from the c-structure in (2):

- (3)    a.    D    (↑ PRED) = 'PRO'  
                   (↑ PERS) = 1  
                   (↑ NUM) = SG  
                   (↑ CASE NOM) = +  
       b.    P    (↑ PRED) = 'TO'  
       c.    {√, I, v}    (↑ PRED) = 'RIDE'  
                                   (↑ TENSE) = PAST  
       etc.

As illustrated by the VI for suppletive *rode* in (3c), there can also be cases of *spanning* (among others, Haugen & Siddiqi 2016). In *vocabulary spanning*, a VI lists more than one category because it *spans* multiple positions of exponence.<sup>2</sup> The nodes in question must be labelled such that they exhaust the set of categories in the VI. Thus, *rode* expresses the tense information in I, the PRED associated with the root, and the verbalizer (since *rode* must be a verb). An alternative form of spanning is *Pac-Man spanning*, indicated by the dotted line in (2), which ensures that every node is associated with some exponent (Asudeh et al. 2023). Unlike *rode*, *school* is not listed in the syntacticon as vocabulary spanning a nominalizer *n*, because *school* also occurs in other categories, such as a verb in *to school (someone)*.

## 3 Information structure in L<sub>R</sub>FG

We build on Butt & King's (1996, 1997) simple theory of information structure for LFG, which in turn was influenced by Choi's work in Optimality Theory (Choi 1996, 1999) and LFG (Choi 1997). This work uses two features, [ $\pm$ NEW] and [ $\pm$ PROMINENT], to cross-classify information-structure roles as follows:

<sup>1</sup> A VI may list multiple nodes for exponence, as is the case for *ride*; see discussion beneath (3).

<sup>2</sup> We suppress the set brackets for readability when there is no vocabulary spanning and therefore only one category in play, using the notation, e.g., D instead of {D}.

|     |        |              |                        |
|-----|--------|--------------|------------------------|
| (4) |        | [+PROMINENT] | [−PROMINENT]           |
|     | [+NEW] | FOCUS        | COMPLETIVE INFORMATION |
|     | [−NEW] | TOPIC        | BACKGROUND INFORMATION |

The following example from Dalrymple & Nikolaeva (2011: 58, (5a–b)) serves to illustrate:

- (5) a. What is Bill eating?  
 b. He is eating pizza in the kitchen.  
 TOPIC BACKGROUND FOCUS COMPLETIVE

We also build on Dalrymple & Nikolaeva’s conception of information structure as a projection of semantic structure, such that information structure more or less literally packages meaning by grouping Glue meaning constructors by i-structure role.

Information structure for us is a feature structure, a.k.a. attribute-value matrix, that has up to four features: FOCUS, TOPIC, BACKGROUND (INFORMATION), and COMPLETIVE (INFORMATION). We also want to associate particular roles with particular valuations of the features NEW and PROMINENT. In sum, we make the following formal assumptions about information structure:

1. Information structure is an attribute-value matrix, with the standard constraint that no attribute (feature) can have more than one value.
2. Attributes are symbols.
3. Values are *hybrid objects*, i.e. sets that have members, just like standard sets, but also have features (attribute-value pairs) that characterize the set as a whole.<sup>3</sup>
4. The members of these sets are Glue meaning constructors or information structures.<sup>4</sup>

An i-structure thus schematically looks like this according to these assumptions:

$$(6) \left[ \begin{array}{l} \text{FOCUS} \\ \text{TOPIC} \\ \text{COMPLETIVE} \\ \text{BACKGROUND} \end{array} \left[ \begin{array}{l} \left[ \begin{array}{l} \text{NEW} \oplus \\ \text{PROMINENT} \oplus \\ \{ \dots \} \end{array} \right] \\ \left[ \begin{array}{l} \text{PROMINENT} \oplus \\ \{ \dots \} \end{array} \right] \\ \left[ \begin{array}{l} \text{NEW} \oplus \\ \{ \dots \} \end{array} \right] \\ \left[ \begin{array}{l} \{ \dots \} \end{array} \right] \end{array} \right]$$

The information structure for example (5) is shown in (7), where we have indicated the contents of the various i-structure roles using placeholders whose correspondence to elements of the sentence should be clear:

<sup>3</sup>Hybrid objects are also used in many LFG analyses of coordination; see Dalrymple et al. (2019: 49) for further discussion and references.

<sup>4</sup>Although we do not explore this further here, it seems to us that the strategy in Dalrymple & Nikolaeva (2011) of having heads and their arguments map to the same information structure is not general enough to handle the i-structures of, e.g., embedded clauses and sentential subjects. An embedded clause or sentential subject is surely capable of having its own information structure, at least in principle. It seems an a priori mistake to conflate this i-structure with the i-structure of the outer clause that takes a clause as an argument. Ultimately, this seems like something that should be settled empirically in future work.

$$(7) \quad \left[ \begin{array}{l} \text{FOCUS} \\ \text{TOPIC} \\ \text{COMPLETIVE} \\ \text{BACKGROUND} \end{array} \left[ \begin{array}{l} \text{NEW} \oplus \\ \text{PROMINENT} \oplus \\ \left\{ \left[ \left\{ \text{pizza} \right\} \right] \right\} \\ \text{PROMINENT} \oplus \\ \left\{ \left[ \left\{ \text{he} \right\} \right] \right\} \\ \text{NEW} \oplus \\ \left\{ \left[ \left\{ \text{in} \right\} \right], \left[ \left\{ \text{the} \right\} \right], \left[ \left\{ \text{kitchen} \right\} \right] \right\} \\ \left\{ \left[ \left\{ \text{is}_{tense} \right\} \right], \left[ \left\{ \text{eat} \right\} \right], \left[ \left\{ \text{-ing}_{aspect} \right\} \right] \right\} \end{array} \right] \right]$$

Note that we treat **NEW** and **PROMINENT** as privative features and use the notation  $\oplus$  introduced in Dowle & Asudeh (2025) to designate a privative feature. This notation is meant to contrast with using the standard plus (+) for privative features, which can confusingly imply that there could alternatively be a minus (−) value, i.e. that the feature is binary, given that the +/− distinction is used to capture contrasting binary values. However, a privative feature is either present with the  $\oplus$  value or absent entirely: it does not have opposing + and − values for the same feature.<sup>5</sup>

The rules for describing the c-structure of (5) are similar to those postulated by Dalrymple & Nikolaeva with a couple of key differences that we return to shortly:

- $$\begin{aligned}
 (8) \quad IP &\longrightarrow \begin{array}{cc} \text{DP} & \text{I}' \\ (\uparrow \text{SUBJ}) = \downarrow & \uparrow = \downarrow \\ (@\text{TOPIC}) & \uparrow_{\sigma_L} = \downarrow_{\sigma_L} \end{array} \\
 (9) \quad V' &\longrightarrow \begin{array}{cc} \text{V} & \text{DP} \\ \uparrow = \downarrow & (\uparrow \text{OBJ}) = \downarrow \\ @\text{FOCUS} & @\text{FOCUS} \end{array} \\
 (10) \quad V' &\longrightarrow \begin{array}{cc} \text{V} & \text{DP} \\ \uparrow = \downarrow & (\uparrow \text{OBJ}) = \downarrow \\ @\text{BACKGROUND} & @\{\text{TOPIC} \mid \text{FOCUS}\} \end{array} \\
 (11) \quad V' &\longrightarrow \begin{array}{cc} \text{V}' & \text{PP} \\ \uparrow = \downarrow & \downarrow \in (\uparrow \text{ADJ}) \\ \uparrow_{\sigma_L} = \downarrow_{\sigma_L} & @\text{COMPLETIVE} \end{array} \\
 (12) \quad \text{DF} &= \{\text{TOPIC} \mid \text{FOCUS} \mid \text{COMPLETIVE} \mid \text{BACKGROUND}\} \\
 (13) \quad \text{IS-ROLE}(X) &:= \downarrow_{\sigma_L} \in (\uparrow_{\sigma_L} X) \\
 (14) \quad \text{TOPIC} &:= ((\text{DF} \downarrow_{\sigma_L}) \text{PROMINENT}) = \oplus \\
 &\quad (@\text{IS-ROLE}(\text{TOPIC}))
 \end{aligned}$$

Just as in Dalrymple & Nikolaeva, we optionally associate the  $@\text{TOPIC}$  macro with the SpecIP subject position in English. Thus, a subject can always also be a topic. The IP rule in (8) captures this distribution for English and languages like it. In contrast, the  $@\text{TOPIC}$  macro captures the i-structure marking and function of topics cross-linguistically.

We are now in a position to round out our set of i-structure macros:

<sup>5</sup> A reviewer wonders what the motivation is for using such privative features and whether certain circumstances might require a binary opposition. First, the theoretical motivation is that  $L_{\text{R}}\text{FG}$  assumes the possibility of underspecification and feature containment in order for its competition/blocking mechanism, **MostInformative**, to work (Asudeh & Siddiqi 2023). If a position is specified as merely  $[\text{PROM} \oplus]$ , then a vocabulary item that is specified as  $[\text{PROM} \oplus, \text{NEW} \oplus]$  is *overspecified* (does not subsume the expendum's features) and is not in the competition. Secondly, we can still capture the effect of a mooted negative binary feature, e.g.  $[\text{NEW} -]$ , by using a negative existential constraint:  $\neg(\uparrow_{\sigma_L} \text{NEW})$ .

$$(15) \quad \text{FOCUS} := ((\text{DF} \downarrow_{\sigma\iota}) \text{ PROMINENT}) = \oplus \\ ((\text{DF} \downarrow_{\sigma\iota}) \text{ NEW}) = \oplus \\ @\text{IS-ROLE}(\text{FOCUS})$$

$$(16) \quad \text{COMPLETIVE} := ((\text{DF} \in \downarrow_{\sigma\iota}) \text{ NEW}) = \oplus \\ @\text{IS-ROLE}(\text{COMPLETIVE})$$

$$(17) \quad \text{BACKGROUND} := @\text{IS-ROLE}(\text{BACKGROUND})$$

Note that we here assume that the COMPLETIVE role is necessarily associated with ADJUNCTS, which is reflected in its inside-out specification.

Let's exemplify our approach with a *predicate focus* (a.k.a. *wide focus*) example from Dalrymple & Nikolaeva (2011: 76ff., (27)) to see how our modification of their system works:

- (18) a. What did John do?  
b. John married Rosa.  
      TOPIC      FOCUS

(19) Syntacticon:

$$\sqrt{\quad} \quad (\uparrow \text{ PRED}) = \text{'JOHN'}$$

$$\sqrt{\quad} \quad (\uparrow \text{ PRED}) = \text{'ROSA'}$$

$$\sqrt{\quad} \quad (\uparrow \text{ PRED}) = \text{'MARRY'}$$

$$\text{I} \quad (\uparrow \text{ TENSE}) = \text{PAST}$$

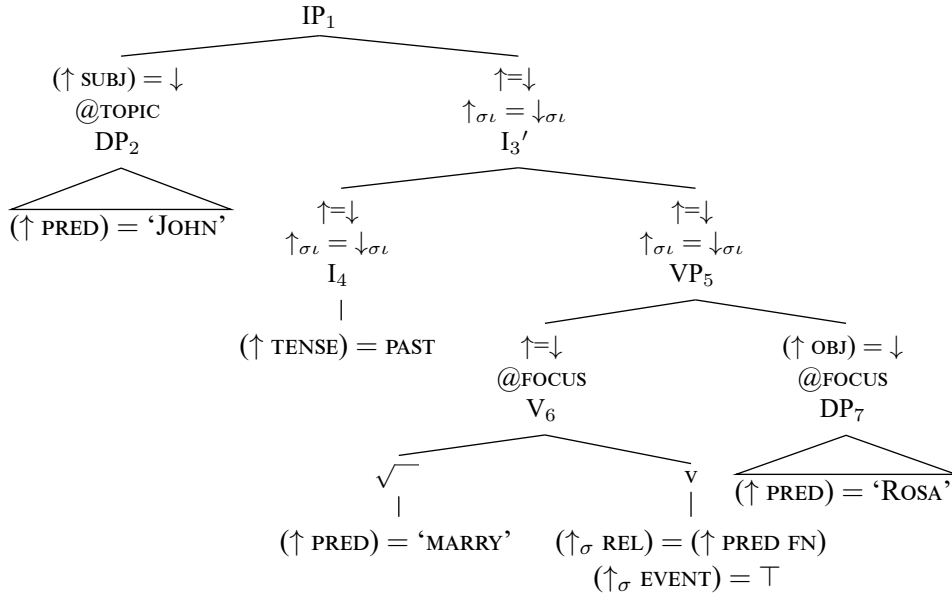
$$\text{v} \quad (\uparrow_{\sigma} \text{ REL}) = (\uparrow \text{ PRED FN})$$

$$(\uparrow_{\sigma} \text{ EVENT}) = \top$$

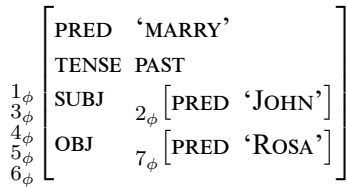
(20) Vocabulary items:

- a.  $\langle \{N\}, (\uparrow \text{ PRED}) = \text{'JOHN'} \rangle \xrightarrow{\nu} [\textit{john}]$   
 $[j : \uparrow_{\sigma}] \in \uparrow_{\sigma\iota}$   
 $((\in \uparrow_{\sigma\iota}) \text{ DF})$
- b.  $\langle \{N\}, (\uparrow \text{ PRED}) = \text{'ROSA'} \rangle \xrightarrow{\nu} [\textit{rosa}]$   
 $[r : \uparrow_{\sigma}] \in \uparrow_{\sigma\iota}$   
 $((\in \uparrow_{\sigma\iota}) \text{ DF})$
- c.  $\langle \{\{\sqrt{\quad}, \text{v}\}\}, (\uparrow \text{ PRED}) = \text{'MARRY'} \rangle \xrightarrow{\nu} [\textit{marry}]$   
 $[marry : (\uparrow_{\sigma} \text{ ARG2}) \multimap (\uparrow_{\sigma} \text{ ARG1}) \multimap \uparrow_{\sigma}] \in \uparrow_{\sigma\iota}$   
 $((\in \uparrow_{\sigma\iota}) \text{ DF})$
- d.  $\langle \{I\}, (\uparrow \text{ TENSE}) = \text{PAST} \rangle \xrightarrow{\nu} [\textit{-ed}]$   
 $[\lambda P. \textit{past}(P) : \uparrow_{\sigma} \multimap \uparrow_{\sigma}] \in \uparrow_{\sigma\iota}$   
 $((\in \uparrow_{\sigma\iota}) \text{ DF})$

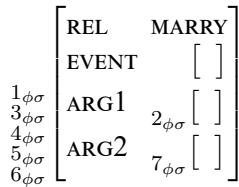
(21) C-structure:



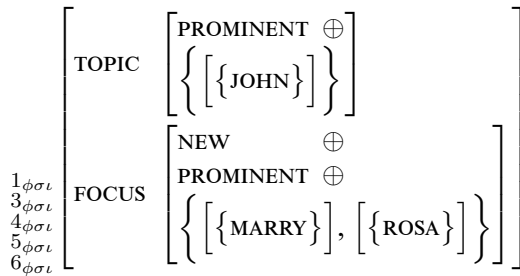
(22) F-structure:



(23) S-structure:



(24) I-structure:



In sum, in  $L_RFG$  c-structure nodes can also specify features in information structure. These features must be appropriately expressed by vocabulary items, just like other c-structural features. Thus, not only can certain *positions* be specified as associated with particular aspects of information structure, so can vocabulary items themselves, which govern which VIs can play which i-structure roles. This forms the heart of our analyses, which we turn to next. We start with null subjects, where an analysis of Spanish serves to illustrate the approach.

#### 4 Null subjects

Here are some typical examples of ‘*pro*-drop’, as demonstrated in two distantly related Indo-European languages, Spanish and Persian, and an unrelated language, Turkish:

(25) Spanish:

- a. (Yo) duerm-o.  
(PRO.1SG) sleep-1SG.PRES  
‘I sleep.’
- b. (Tu) duerm-e-s.  
(PRO.2SG) sleep-2SG.PRES  
‘You sleep.’
- c. (Ella) duerm-e.  
(PRO.3SG.FEM) sleep-3SG.PRES  
‘She sleeps.’

(26) Persian:

- a. (Man) u-rā dār-am.  
(PRO.1SG) PRO.3SG-OM have-1SG.PRES  
‘I have it.’
- b. (To) u-rā dār-i  
(PRO.2SG) PRO.3SG-OM have-2SG.PRES  
‘You[SG] have it.’
- c. (U) u-rā dār-ad  
(PRO.3SG) PRO.3SG-OM have-3SG.PRES  
‘She/he/it has it.’

(27) Turkish:

- a. (Ben) uyu-du-m.  
(PRO.1SG) sleep-PAST-1SG  
‘I slept.’
- b. (Sen) uyu-du-n.  
(PRO.2SG) sleep-PAST-2SG  
‘You[SG] slept.’
- c. (O) uyu-du.  
(PRO.3SG) sleep-PAST.3SG  
‘He/she/it slept.’

To our knowledge, this alternation is treated across frameworks as a fundamental instance of grammatical optionality: both alternants are grammatical and the use of one versus the other is not conditioned by the grammar. Moreover, the term *pro*-drop itself is possibly biasing: it presupposes that the baseline situation is the one where the pronoun occurs and that what needs to be explained is how and why it can be ‘dropped’. The data do not support this position, since the putative *pro*-dropped form is in fact the less restricted variant. In other words, the *pro*-drop metaphor is not insightful about the basic facts of discourse in so-called ‘*pro*-drop’ languages.

We propose to turn the tables: in such languages, the overt pronoun requires extra (i-structural) conditions to hold, unlike the underspecified pronominal agreement.<sup>6</sup> While an overt pronoun may be used shortly after introduction of a new discourse referent, subsequent reference to the same individual in discourse tends to leave out the overt pronoun, in neutral contexts:

<sup>6</sup>Öztürk (2002) makes a similar point specifically with regard to Turkish in a derivationalist approach.

- (28) Juan le               envió               una carta a **Anna**.  
 Juan PRO.3SG.DAT send.3SG.PAST a.FEM letter to Anna.

**Ella**               la               recibió               ayer.  
 PRO.3SG.FEM PRO.3SG.FEM receive.3SG.PAST yesterday.

Ya la               **tiene**.  
 still the.FEM have.3SG.PRES

‘Juan sent Anna a letter. She received it yesterday. She still has it.’ (Spanish)

Givón (1980) has pointed this out in the functionalist literature. Subsequent reference to individuals tends to get ‘smaller’, as above: *proper name* > *independent pronoun* > *pronominal agreement*.

#### 4.1 Analysis: Spanish null subjects

The relevant part of the Spanish syntacticon is shown in (29):

- (29) a. D               (↑ PRED) = ‘PRO’  
                           (↑ PARTICIPANT) = ⊕  
                           (↑ SPEAKER) = ⊕  
                           ((GF ↑)<sub>σ<sub>ℓ</sub></sub> PROMINENT) = ⊕
- b. D               (↑ PRED) = ‘PRO’  
                           (↑ PARTICIPANT) = ⊕  
                           ((GF ↑)<sub>σ<sub>ℓ</sub></sub> PROMINENT) = ⊕
- c. D               (↑ PRED) = ‘PRO’  
                           (↑ FEMININE) = ⊕  
                           ((GF ↑)<sub>σ<sub>ℓ</sub></sub> PROMINENT) = ⊕
- d. D               (↑ PRED) = ‘PRO’  
                           ((GF ↑)<sub>σ<sub>ℓ</sub></sub> PROMINENT) = ⊕
- e. Agr            (↑ SUBJ PARTICIPANT) = ⊕  
                           (↑ SUBJ SPEAKER) = ⊕  
                           ((↑ SUBJ PRED) = ‘PRO’)
- f. Agr            (↑ SUBJ PARTICIPANT) = ⊕  
                           ((↑ SUBJ PRED) = ‘PRO’)
- g. Agr            ((↑ SUBJ PRED) = ‘PRO’)

We assume the same IP rule for Spanish as in (8) above. Thus, the SpecIP position is optionally marked with @TOPIC.

We assume the following VIs for overt singular first and second person pronouns:

- (30) a. ⟨ {D},           (↑ PRED) = ‘PRO’               ⟩  $\xrightarrow{\nu}$  *yo*  
                           (↑ PARTICIPANT) = ⊕  
                           (↑ SPEAKER) = ⊕  
                           @PROMINENT(*speaker* : ↑<sub>σ</sub>)
- b. ⟨ {D},           (↑ PRED) = ‘PRO’               ⟩  $\xrightarrow{\nu}$  *tu*  
                           (↑ PARTICIPANT) = ⊕  
                           @PROMINENT(*addressee* : ↑<sub>σ</sub>)

These VIs use the @PROMINENT macro:

$$(31) \quad \text{PROMINENT}(X) := ((\text{GF } \uparrow)_{\sigma\iota} \text{ DF PROMINENT}) = \oplus \\ [X] \in \uparrow_{\sigma\iota} \\ ((\in \uparrow_{\sigma\iota}) \text{ DF})$$

Note that in (30) we explicitly add the  $(\uparrow \text{ PRED}) = \text{'PRO'}$  even to first and second person pronouns, as above.<sup>7</sup>

We now add the third person singular feminine pronoun *ella*:

$$(32) \quad \langle \{D\}, \quad (\uparrow \text{ PRED}) = \text{'PRO'} \quad \rangle \xrightarrow{\nu} \textit{ella} \\ (\uparrow \text{ FEMININE}) = \oplus \\ @\text{PROMINENT}(\lambda y.y \times y : (\uparrow_{\sigma} \text{ ANTECEDENT}) \multimap \uparrow_{\sigma} \otimes \uparrow_{\sigma})$$

The overt/strong pronouns are marked as belonging to an i-structure role that is marked  $[\text{PROMINENT } \oplus]$ .<sup>8</sup> The two i-structure roles that are compatible with this are TOPIC and FOCUS. Therefore, overt subject pronouns express either a topic or focus. They can occur in SpecIP when @TOPIC is present but not otherwise, since the contents of a VI must be more general than the c-structural information they express. Thus, an overt subject pronoun is licensed only if it is a topic or a focus.

We round out the independent pronouns with the VI for *él*:

$$(33) \quad \langle \{D\}, \quad (\uparrow \text{ PRED}) = \text{'PRO'} \quad \rangle \xrightarrow{\nu} \textit{él} \\ @\text{PROMINENT}(\lambda y.y \times y : (\uparrow_{\sigma} \text{ ANTECEDENT}) \multimap \uparrow_{\sigma} \otimes \uparrow_{\sigma})$$

This VI analyzes *él* as the gender-unmarked (i.e., masculine, given how Spanish gender resolution works) default pronoun. Thus, *él* is the elsewhere case for third person pronouns: it is the only way of expressing gender in the c-structure if FEMININE is not part of the input.

Now let us turn to the agreement marking/incorporated pronominals:<sup>9</sup>

$$(34) \quad \text{a. } \langle \{\text{Agr}\}, (\uparrow \text{ SUBJ PARTICIPANT}) = \oplus \quad \rangle \xrightarrow{\nu} \textit{-o} \\ (\uparrow \text{ SUBJ SPEAKER}) = \oplus \\ \left( \begin{array}{l} (\uparrow \text{ SUBJ PRED}) = \text{'PRO'} \\ [\textit{speaker} : \uparrow_{\sigma}] \in \uparrow_{\sigma\iota} \\ ((\in \uparrow_{\sigma\iota}) \text{ DF}) \end{array} \right) \\ \text{b. } \langle \{\text{Agr}\}, (\uparrow \text{ SUBJ PARTICIPANT}) = \oplus \quad \rangle \xrightarrow{\nu} \textit{-s} \\ \left( \begin{array}{l} (\uparrow \text{ SUBJ PRED}) = \text{'PRO'} \\ [\textit{addressee} : \uparrow_{\sigma}] \in \uparrow_{\sigma\iota} \\ ((\in \uparrow_{\sigma\iota}) \text{ DF}) \end{array} \right)$$

The combination of the features PARTICIPANT and SPEAKER pin down the first person singular (we assume singular number is the unmarked case). The feature PARTICIPANT in the absence of SPEAKER pins down second person singular. As in LFG, this agreement marking is sufficient to define the subject as a pronominal, and can do so optionally. In its pronominal guise, each agreement suffix is also associated with the appropriate Glue term. Most importantly with respect to information structure, the incorporated

<sup>7</sup>We could make the theoretical assumption that the feature PARTICIPANT, which picks out first and second persons only, entails that the item is expressing a pronominal, and thus mention of  $[\text{PRED 'PRO'}]$  is somehow redundant. However, we leave this possibility for future work.

<sup>8</sup>In the case of the third person singular strong pronouns, we need to specifically associate prominence with subjecthood, since they can occur in non-prominent, non-subject positions, such as objects of prepositions, e.g. *para ella/él* ‘for her/him’. This is unnecessary for the participant pronouns, because these forms can only serve as subjects, since there are forms reserved for non-subject uses (*mi* and *ti*).

<sup>9</sup>The VI for first person in (34) is simplified for presentation. The first person singular agreement marker also *spans* (Merchant 2015, Haugen & Siddiqi 2016, Svenonius 2016, Asudeh & Siddiqi 2022, Asudeh, Bögel & Siddiqi 2023) the theme vowel, which we are not discussing here. See Oltra-Massuet & Arregi (2005) and Fábregas (2022) for discussions of Spanish theme vowels in realizational morphology and Maiden (1992, 2018) for more general discussion of Romance verb morphology.

pronouns are completely underspecified for i-structural content and are thus compatible with any role. These VIs thus serve as the default elsewhere case when their inputs specify no i-structural information.

The third person singular is treated as follows:<sup>10</sup>

$$(35) \quad \langle \{Agr\}, \left( \begin{array}{c} (\uparrow \text{SUBJ PRED}) = \text{'PRO'} \\ [\lambda y.y \times y : (\uparrow_{\sigma} \text{ANTECEDENT}) \multimap \uparrow_{\sigma} \otimes \uparrow_{\sigma}] \in \uparrow_{\sigma\iota} \\ ((\in \uparrow_{\sigma\iota}) \text{DF}) \end{array} \right) \rangle \xrightarrow{\nu} -e$$

In sum, in the D-series (independent pronouns), *él* is the elsewhere case for third person pronouns: it is the only way of expressing gender in the c-structure if FEMININE is not part of the input. In the Agr-series (incorporated pronouns), the third person singular agreement is the elsewhere case. But it is only the strong D-series that is sensitive to i-structural content in the input: they express [PROMINENT  $\oplus$ ] and are therefore appropriate only as TOPIC or FOCUS. Thus, it is (literally) the *overt* pronouns that are i-structurally marked, not the incorporated pronouns. Nothing is being ‘dropped’ freely.

## 5 The Ojibwe inverse

In our original analysis of the Ojibwe inverse (Melchin et al. 2020: 280–283), we treated *-igw* as a general inverse marker with a uniform analysis, following Lochbihler (2012) and Oxford (2019), among others. However, according to more recent work by Oxford (2023, 2024: 83–104), *-igw* only performs this inverse function when the object is a participant (first or second person); see example (36). When both arguments are third person, Oxford (2024) argues that *-igw* is a traditional passive morpheme and that the so-called ‘obviative’ marks a demoted subject; see example (37).<sup>11</sup> According to Valentine (2001), *-igw* is also a ‘lexical passive’ marker. Valentine (2001: 690–91), and Algonquianist tradition in general, treats morphemes such as *-isi* in (38b) as derivational elements, which sit outside lexical passive *-igw*; this is taken to mean that this *-igw* must also be a derivational morpheme, rather than inflection for voice, because otherwise there would be an illicit instance of an inflectional morpheme closer to the root (by hypothesis, this *-igw*) than a derivational morpheme (e.g., *-isi*). Valentine (2001: 690) also notes that the meanings of lexical passives can be unpredictable, which again speaks to them not being composed of entirely regular parts.<sup>12</sup>

- (36) wa:bamigoya:ng  
wa:pam -iko -ya:nk  
see.TA -INV -1.PL.EXCL  
‘THIRD sees us.’ / ‘We are seen by THIRD.’ (Ojibwe (Algonquian): Will Oxford, p.c.)

- (37) wa:pamikowa:t  
wa:pam -iko -wa:-t  
see.TA -INV -PL-3  
‘OBV sees them.’ / ‘They are seen by OBV.’  
(Oxford 2024: 117, (27b), based on Nichols 1980: 316, 321)

- (38) a. išinaw-  
iši -naw  
thus -see.TA  
‘see someone a certain way’

<sup>10</sup> Again, the third person singular marker always spans the theme vowel and has the form of the theme vowel. For simplicity, we once again disregard complexities raised by theme vowels; see footnote 9.

<sup>11</sup> Note that *-iko* is an allomorph of *-igw*.

<sup>12</sup> Ojibwe glosses follow Oxford (2024: xix–xx), which in turn uses glossing from traditional Algonquian grammars; AI: animate intransitive; INV: inverse; PASS: passive; PL: plural; TA: transitive animate.

- b. išina:kosi-  
[iši -naw] -ikw -isi  
[thus -see.TA] -PASS -AI  
'have a certain appearance'

(Oxford 2024: 168, (48), based on Nichols & Nyholm 1995: 71)

We propose here that these are not three distinct morphemes *-igw* (a lexical passive marker, an inverse marker, and a passive marker), but are instead all instances of a single affix that consistently marks promotion of the object, as in (41), where this commonality is captured by the @INVERSE macro, shown in (42).

$$(39) \quad \text{Voice} \quad (\uparrow \text{VOICE}) = \{ \text{ACTIVE} \mid \text{INVERSE} \mid \text{PASSIVE} \mid \dots \}$$

$$(40) \quad \text{Passive} \quad (\uparrow \text{VOICE}) = \text{PASSIVE}$$

In the following, the expression @PROMINENT( $\uparrow \text{SUBJ}$ ) $_{\sigma_L}$  states, “My subject’s information structure is in the set of an information-structure discourse function that is marked prominent.” This means that the meaning constructor of the subject must be in a TOPIC or FOCUS role at information structure; i.e. the subject must be a topic or focus. The expression finds the VI in question by finding the position of exponence that maps to the VI.<sup>13</sup> Thus, the non-passive version of the inverse in the left-hand side of the disjunction in (41) only applies in the condition where the subject is a topic or focus.<sup>14</sup>

$$(41) \quad \langle \{ \text{Voice} \mid \text{Passive} \}, \quad \begin{array}{c} @\text{INVERSE} \\ \left\{ \begin{array}{l} \langle \langle \uparrow \text{VOICE} \rangle \neq \text{PASSIVE} \rangle \\ \langle \langle \uparrow \text{OBJ PARTICIPANT} \rangle \rangle \\ \langle \langle @\text{PROMINENT}(\uparrow \text{SUBJ})_{\sigma_L} \rangle \rangle \end{array} \right\} \mid \begin{array}{l} \langle \langle \uparrow \text{VOICE} \rangle =_c \text{PASSIVE} \rangle \\ \langle \langle \neg(\uparrow \text{SUBJ PARTICIPANT}) \rangle \rangle \\ \langle \langle \neg(\uparrow \text{OBJ PARTICIPANT}) \rangle \rangle \end{array} \right\} \rangle \xrightarrow{\nu} -igw$$

$$(42) \quad \text{INVERSE} := ((\uparrow \text{VOICE}) = \text{PASSIVE}) \\ (\uparrow \text{SUBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG2}) \\ (\uparrow \text{OBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG1})$$

According to (42), inverse is passive-like, since it optionally expresses [VOICE PASSIVE]. However, from a typological perspective, a true passive only involves promotion of an underlying object to surface subject, with it left up for grabs whether and how the underlying subject surfaces. In other words, inverse makes the underlying object the surface subject and makes the underlying subject the surface object. Passive only necessarily does the former (Kroeger 2004: 54–55). Ojibwe’s inverse, according to this analysis, counts as a kind of ‘weak’ passive, because of the optional exponence of [VOICE PASSIVE].

Here is the full set of Ojibwe Voice VIs, updating the analysis in Melchin et al. (2020: 281, Table 5) and adjusting its notation to current L<sub>R</sub>FG practice (see, e.g., Asudeh, Bögel & Siddiqi 2023).

$$(43) \quad \begin{array}{ll} \text{a.} & \langle \{ \text{Voice} \}, \quad @\text{DIRECT} \rangle \xrightarrow{\nu} -in \\ & \quad \langle \langle @\text{ADDRESSEE}(\uparrow \text{OBJ}) \rangle \rangle \\ \text{b.} & \langle \{ \text{Voice} \}, \quad @\text{DIRECT} \rangle \xrightarrow{\nu} -i \\ & \quad \langle \langle @\text{PARTICIPANT}(\uparrow \text{OBJ}) \rangle \rangle \\ \text{c.} & \langle \{ \text{Voice} \}, \quad @\text{DIRECT} \rangle \xrightarrow{\nu} -aa \\ & \quad \langle \langle @\text{ANIMATE}(\uparrow \text{OBJ}) \rangle \rangle \end{array}$$

<sup>13</sup>In the case of spanning, it is assumed that all positions of exponence map to the same VI, so it doesn’t matter which one is chosen from the set returned by  $\phi^{-1}$ ; again see Asudeh & Siddiqi (2026: ch.3) for further details.

<sup>14</sup>We use the notation  $\langle \dots \rangle$  to highlight instances of *morphological conditioning* (Asudeh, Bjorkman, et al. 2024), which restrict the context of occurrence of a vocabulary item but are not instances of features for exponence. These are all constraining statements (LFG’s constraining equations, existentials, negative existentials, etc.). Morphological conditioning statements are ignored by **MostInformative**<sub>f</sub> in calculating blocking based on f-structural information (Dowle & Asudeh 2025).

- d.  $\langle \{ \text{Voice} | \text{Passive} \}, \quad @\text{INVERSE} \quad \rangle \xrightarrow{\nu} -igw$   
 $\left\{ \begin{array}{l} \langle \langle \uparrow \text{VOICE} \rangle \neq \text{PASSIVE} \rangle \quad | \quad \langle \langle \uparrow \text{VOICE} \rangle =_c \text{PASSIVE} \rangle \\ \langle \langle \uparrow \text{OBJ PARTICIPANT} \rangle \rangle \quad | \quad \langle \langle \neg(\uparrow \text{SUBJ PARTICIPANT}) \rangle \rangle \\ \langle \langle @\text{PROMINENT}(\uparrow \text{SUBJ})_{\sigma_i} \rangle \rangle \quad | \quad \langle \langle \neg(\uparrow \text{OBJ PARTICIPANT}) \rangle \rangle \end{array} \right\}$
- e.  $\langle \{ \text{Voice} \}, \quad @\text{SHORT-PASSIVE} \quad \rangle \xrightarrow{\nu} -igoo$   
 $\langle \langle @\text{PARTICIPANT}(\uparrow \text{SUBJ}) \rangle \rangle$
- f.  $\langle \{ \text{Voice} \}, \quad @\text{DIRECT} \quad \rangle \xrightarrow{\nu} -idizo$   
 $@\text{REFLEXIVE}$

The macros  $@\text{ADDRESSEE}$ ,  $@\text{PARTICIPANT}$ , and  $@\text{ANIMATE}$  add the relevant features to their argument GF; for further details, see Melchin et al. (2020).

Here are the other macros used in (43). Note that the  $@\text{INVERSE}$  macro from (42) has been slightly revised to use the  $@\text{MAP}$  macro (Findlay 2016), which is how  $@\text{DIRECT}$  and  $@\text{INVERSE}$  are stated in Melchin et al. (2020). The  $@\text{INVERSE}$  macro in (44b) works exactly like the one in (42): it optionally expresses [VOICE PASSIVE], and inverts the regular mapping of SUBJ and OBJ, such that SUBJ instead maps to ARG2 and OBJ to ARG1.

- (44) a.  $\text{DIRECT} := (\uparrow \text{VOICE}) = \text{ACTIVE}$  Active voice expressed,  
 $@\text{MAP}(\text{SUBJ}, \text{ARG1})$  direct mapping of SUBJ and OBJ  
 $@\text{MAP}(\text{OBJ}, \text{ARG2})$  to ARG1 and ARG2 respectively
- b.  $\text{INVERSE} := ((\uparrow \text{VOICE}) = \text{PASSIVE})$  Passive voice optionally expressed,  
 $@\text{MAP}(\text{SUBJ}, \text{ARG2})$  inverse mapping of SUBJ and OBJ  
 $@\text{MAP}(\text{OBJ}, \text{ARG1})$  to ARG2 and ARG1 respectively
- c.  $\text{SHORT-PASSIVE} := (\uparrow \text{VOICE}) = \text{PASSIVE}$  Agent/ARG1 existentially closed  
 $@\text{SUPPRESS}(\text{ARG1})$   
 $@\text{CLOSE}(\text{ARG1})$
- d.  $\text{REFLEXIVE} := @\text{SUPPRESS}(\text{ARG2})$  Patient/ARG2 reflexively bound by  
 $@\text{BIND}(\text{ARG1}, \text{ARG2})$  Agent/ARG1

The  $@\text{DIRECT}$  macro expresses active voice and maps SUBJ to ARG1 and OBJ to ARG2. This contrasts with the  $@\text{INVERSE}$  macro, which optionally expresses passive voice and maps SUBJ to ARG2 and OBJ to ARG1. It should be clear enough what the other macros do:  $@\text{SUPPRESS}$  states that its argument has no mapping from an f-structure grammatical function,  $@\text{CLOSE}$  existentially closes its argument's corresponding variable in the meaning language, and  $@\text{BIND}$  states that its first argument binds its second argument. We leave the formal details of these macros aside here, since they are not particularly relevant to our main points about the inverse.

## 6 Conclusion

In this paper, we have shown how information structure can condition exponence in a realizational approach to morphology, such as  $L_R\text{FG}$ . Indeed,  $L_R\text{FG}$  was designed with this capacity in mind, since its architecture is closely related to LFG and information structure has long been a productive area of investigation in LFG. Our theory of information structure is a development of the theory of Butt & King (1996, 1997) and the extension by Dalrymple & Nikolaeva (2011). We have shown that this theory provides a new perspective on so-called *pro*-drop in which it is the overt, strong pronoun that is the i-structurally marked option, rather than the incorporated pronoun (agreement), which is the unmarked option. We further showed that i-structural exponence can yield a simple account of the role of the inverse marker *-igw* in Ojibwe grammar, which has been quite analytically challenging across frameworks.

## Acknowledgements

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# Generating second position clitics in Gothic

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## 1 Introduction

Wackernagel's seminal work on second position clitics (Wackernagel 1892, Wackernagel et al. 2020) introduced a group of prosodically weak elements (clitics) which frequently occur after the 'first word' in a sentence. These clitics are found in numerous languages across several language families and show a lot of variation with respect to what the 'second position' entails: depending on the language, they can, e.g., occur following the first prosodic word, the first syntactic phrase, or (as will be proposed below for Gothic) the first low-level prosodic boundary. This variation in languages and positions led to many fruitful discussions on language architecture, in particular with respect to the interface between syntax and prosody (a.o., King 1994, 1996, Franks & King 2000, Spencer & Luís 2012, Anderson 2005, Halpern & Zwicky 1996).

The present paper discusses a second position clitic in Gothic, the question particle =*u*.<sup>1</sup> This (en)clitic optionally marks yes/no- and wh-questions and only occurs as a clitic; that is, it has no non-clitic, prosodically strong counterpart. The clitic requires a preceding prosodic host, but is very flexible with regard to the word category of that host. In a corpus study, Miller (2019) notes that the clitic usually encliticizes to the first word of a clause, most often verbs as shown in example (1), where the clitic is placed after the modal verb.

- (1) maguts=**u** driggkan stikl þanei ik driggka  
can.2DU-Q drink.INF cup that I drink  
'can you two drink the cup that I drink ... ?' (Mark 10:38; Miller 2019: 463, his (306))

The clitic can also follow other word categories, for example adverbs or prepositions as shown in (2), where the question particle 'interrupts' the prepositional phrase by being placed between the preposition and the pronoun.

- (2) ab=**u** þus silbin þu þata qipis  
of-Q 2SG.DAT self 2SG.NOM that.ACC say.2SG  
'do you say this of yourself (on your own account) ... ?'  
(John 18:34; Eythórsson 1995: 112, his (74a))

The clitic can also be placed after prefixes as in example (3), where it acts as a mesoclitic at the morpheme boundary between the prefix and the following verb stem.<sup>2</sup>

<sup>1</sup>Gothic features another second position particle: the conjunction particle -*uh* is in complementary distribution to the question particle and shows identical behaviour except for indirect questions. For the analysis provided here, -*uh* is ignored to avoid confusion.

<sup>2</sup>Mesoclitics are clitics that are placed at morpheme boundaries between a stem and its affixes; see, e.g., Vigário (2003) or Spencer & Luís (2012) for an overview on the discussion of mesoclitics in European Portuguese.

- (3) bi=**u**-gitai      galaubein    ana    airpai  
 PREFIX-Q-find    faith.ACC    on    earth.DAT  
 ‘shall he find faith on the earth?’ (Luke 18:8; Eythórsson 1995: 122, his (1d))

Most previous research analysed the question particle with a focus on the syntactic component; Ferraresi (2005) and Eythórsson (1995), for example, suggest that the verb syntactically moves to the position preceding the clitic. However, these approaches cannot explain the full set of possibilities as shown in examples (1)–(3), as verb movement to the position between, e.g., a prefix and the following verb is difficult to justify. More recently, Walkden & Bögel (to appear) proposed a less syntactocentric analysis, where the ultimate linear position is determined by prosodic constraints, specifically *prosodic inversion*, which moves a clitic stranded in the initial position of an intonational phrase to a prosodically more suitable location by inverting the clitic with the following material (Halpern 1995). This analysis implies a more powerful prosodic component, which contributes rules and constraints to the string independently of syntax, and consequently also allows for a mismatch between the syntactic and the prosodic linear string.

This paper roughly follows the assumptions made in Walkden & Bögel (to appear) with a more specific focus on a particular framework, namely Lexical-Functional Grammar (LFG; Kaplan & Bresnan 1982). It proposes a strictly modular analysis which enables each module, syntax and prosody, to operate based on module-specific rules and constraints, and to exchange information only via the interface. The paper is structured as follows: after a general discussion about the proposed analysis of the question particle and the implications for language architecture in Section 2, Section 3 shows how the clitic can be analysed at the syntax-prosody interface in LFG. Section 4 demonstrates how the theoretical assumptions can be computationally implemented, thus providing a general blueprint for the generation of second position clitics at the interface between syntax and prosody.

## 2 Setting the stage: modularity and prosodic inversion

Previous research mainly analysed the Gothic question particle =*u* with respect to the syntactic component and applied syntactically-driven movement to generate the correct linear order. Eythórsson (1995: 49), for example, assumes the clitic to be base-generated in C and the verb to move to the position preceding the clitic in order to provide an adequate host. Similarly, Ferraresi (2005: 43) assumes that the clitic originates in [Foc] (following Rizzi’s (1997) model of a more fine-grained CP). In order to fulfill the requirement of a host, any element is then in principle able to syntactically move to the positions preceding the clitic.<sup>3</sup>

The accounts based on syntactic movement are problematic in that it is difficult to explain examples where the clitic interrupts a prepositional phrase as in (2) or occurs in form of a mesoclitic between the prefix *bi-* and the following stem at a word-internal morpheme boundary as in (3). It is often unclear why a particular element would occur in a specific syntactic position just to satisfy the requirements of the question particle for a host. However, the different placements of the particle =*u* can be explained with a less syntactocentric view of grammar. Under this view, all modules contain module-specific vocabulary, rules and constraints (Fodor 1983, Bock & Levelt 1994, Levelt 1999) which can ‘overrule’ syntactic structure where necessary. This allows for the prosodic component to, e.g., shift prosodic boundaries for rhythmical reasons as is the case with the prosodic rephrasing of some function words in West Germanic languages: these function words are syntactically associated with the following material, but are prosodically phrased with the previous material to support the predominant trochaic foot structure found in this language family (see, e.g., Wheeldon & Lahiri 1997, Lahiri & Plank 2010).

The modular architecture used in this paper assumes that all modules are aligned in a specific way mediating between the abstract notions of FORM and MEANING (e.g. Jackendoff 2002, Kaplan 1995, Asudeh

<sup>3</sup>See Walkden & Bögel (to appear) for further references and a detailed discussion of previous approaches.

2006).<sup>4</sup> The output of each module provides input to the next module, with which it communicates via the respective interfaces. This view not only suggests a particular order of the modules, but also implies a ‘direction’, commonly referred to as either *comprehension* (or *parsing* in computational terms), where the order of the modules allows the listener to go from form to meaning, or *production* (*generation* in computational terms) where the speaker produces an utterance going from meaning to form.

During the production of prosodically driven second position clitics like the Gothic question particle =*u*, the system first determines the syntactic structure, before prosodic constraints lead to a change in the linear syntactic order of the string. This poses a challenge to the past assumption of syntactic structure representing linear order (besides hierarchical structure) (e.g., Asudeh et al. 2013), and prompts the assumption of a ‘prosodic’ string which represents the linear order of an utterance. Figure 1 shows a (simplified) representation of the assumed architecture, where each module is assigned independent power and is thus able to alter the string accordingly (see Section 3 for a more detailed description).

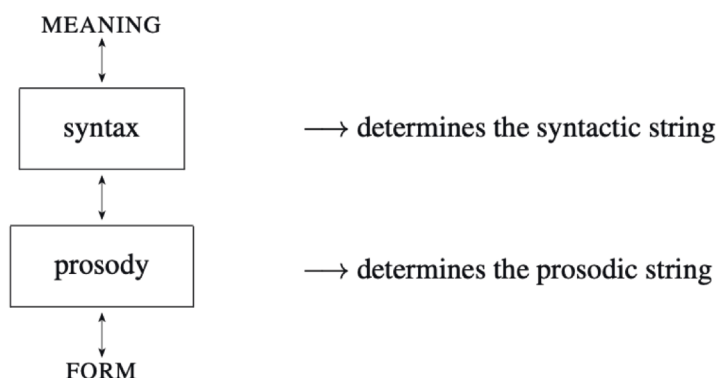


Figure 1: (Simplified) representation of the syntax-prosody interface between form and meaning

A particularly interesting mechanism for the data at hand is *prosodic inversion* (Halpern 1995) which builds on an insight made by Zwicky (1977: 18) that “the most common location [(of the clitics)] is probably at the beginning of the sentence [...] instead [(they)] are moved into ‘second position’ following some accented unit”. Halpern (1995) further formalizes this distinction between the two positions of the clitic proposed by Zwicky. He assumes that second position clitics are enclitics which are syntactically placed in the sentence-initial position. In prosodic terms, this position corresponds to the first position in the intonational phrase. However, this would not be a prosodically well-formed sentence, because the enclitic requires a preceding prosodic host which is prevented by the presence of the intonational phrase boundary blocking any merging of the enclitic with previous prosodic material.

The prosodic module then aims to ‘repair’ the structure, either by strengthening the clitic to its full form (see Bögel 2021 for an example with Swabian pronouns) or by applying prosodic inversion which simply inverts the enclitic with the following prosodic unit, thus ensuring an adequate host. Prosodic inversion is schematically represented in Figure 2.

While it is relatively straightforward that the clitic is placed after the first prosodic word (corresponding to the verb: (*maguts*)<sub>ω</sub>) in example (1), examples (2) and (3) are more difficult to explain. In an unmarked construction, Gothic prepositions and verbal prefixes are unstressed and thus cannot form prosodic words by themselves. The main stress of the construction falls on the first syllable of the following noun/verb, and prepositions and prefixes are likely part of the following prosodic domain. However, it is reasonable to assume that while the preposition and the prefix both are part of the following prosodic domain, they are not as tightly associated. Evidence for this comes from work on historical manuscripts and current production experiments.

<sup>4</sup>Note that this pipeline structure assumed in this paper is not a fundamental requirement for a modular architecture or constraint-based grammars in general (see, e.g., Kuhn 2007).

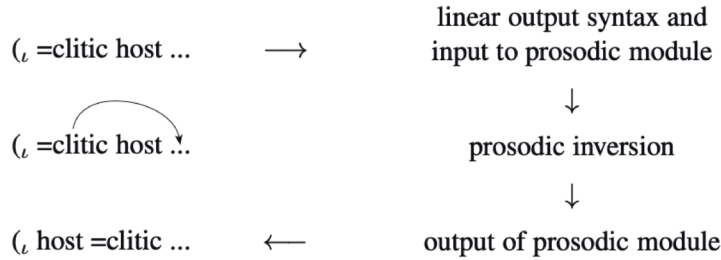


Figure 2: Prosodic inversion at the syntax-prosody interface

Streitberg (1920) notes that prefixes in Gothic and other Germanic languages in the early Middle Ages were not yet as tightly attached as it is the case with prefixes in modern Germanic languages. This assumption is supported by historical manuscripts from a number of Germanic languages, where prefixes are occasionally detached from the following verb.<sup>5</sup>

The notion that prefixes are not completely merged with the prosodic unit of the following stem is also supported by data from the modern versions of these languages. Féry (2025: 300), for example, notes that common phonological processes like resyllabification, which are restricted to the domain of the prosodic word, usually don't occur between a prefix and the following stem. This suggests the presence of a prosodic boundary, and experimental evidence proposes that this boundary is most likely part of a recursive structure (e.g., Bögel 2024).<sup>6</sup> For the unstressed prefix and the verb in example (3) a probable prosodic structure would thus be  $(bi\ (gítai)_\omega)_\omega$ .

The placement of the clitic between the prefix and the stem also implies that the host of the clitic is not necessarily a prosodic word. However, a simple syllable, e.g., the first syllable of *maguts* is also not sufficient. Instead, the clitic seems to react to a low-level prosodic boundary to its right, albeit the nature of that boundary does not need to be specified: in example (1), this would be after the prosodic word, but in examples (2) and (3) the clitic would be placed at the inner recursive prosodic word boundary.

Besides the loose attachment between the prefix and the verb stem, Streitberg (1920: 161) also points out that both preposition and prefix receive a secondary accent if an enclitic follows. This suggests that the clitic actually provides material for the preposition/prefix to form a proper trochaic foot structure, as in  $((bi=u)_F\ (gítai)_F)_\omega$ . The clitic's presence thus enables a shift in stress patterns which possibly causes a loss of recursive structure. However, since Gothic is extinct, these considerations are speculative and cannot be based on experimental evidence from Gothic, but only on the patterns found with other members of this language family.

The following part shows how the Gothic question particle *=u* can be analysed at the syntax-prosody interface in LFG by assuming a modular language architecture with prosodic structure as an independent module, in which prosodic inversion as a 'repair mechanism' leads to the linear orders as shown in examples (1)–(3).

### 3 The Gothic question particle *=u*: An LFG analysis

Previous work in LFG pursued different approaches to the phenomenon of second position clitics: Lowe & Belyaev (2015) and Lowe (2016) provide a more syntactocentric analysis of clitics in Pashto and Ossetic, where they regulate placement via both syntactic and prosodic OT-constraints. Bögel et al. (2010) analyse Russian and Serbian/Croatian/Bosnian second position clitics. They include prosodically determined brackets within syntactic structure which are then transferred to the string in order to indicate prosodic

<sup>5</sup>See Riegger et al. (2024) for a study of the prefix *ge-* in Old English, Old High German, and Old Saxon.

<sup>6</sup>Féry (2025: 300) phrases complex German words containing derivational prefixes like the negation prefix *un-* as in *unecht* 'fake' as  $((('on)_F)_\omega\ ((\epsilon\epsilon t)_F)_\omega)_\omega$ . Experimental evidence presented in Bögel (2024) shows that the boundary following the negation prefix is much weaker than a full prosodic word boundary, which suggests a recursive structure:  $((('on)_\omega\ \epsilon\epsilon t)_\omega)_\omega$ . The recursive structure is adopted in this paper, but the presented analysis can be applied to Féry's suggestion as well.

phrasing. All of these approaches take the string as the locus between p- and c-structure with p-structure being able to ‘repair’ any violation of prosodic constraints. However, even though prosodic constraints are applied to correctly place second position clitics, modularity is not maintained as prosodic constraints are mixed with syntactic structure or syntactically motivated OT-constraints. Furthermore, the string as the mediator between syntactic and prosodic structure is also problematic in a directional view of grammar.<sup>7</sup>

Other approaches to second position clitics are more in line with the architectural assumptions sketched in Section 2. Following King (1996), Bögel & King (to appear) analyse the Bulgarian question marker *=li* by means of prosodic inversion. A similar analysis was made in Bögel (2015) for second position en(do)clitics in Pashto, and Bögel et al. (2018) provided an analysis of Vafsi second position mesoclitics. All of these approaches assume a fundamental architecture as given in Figure 1, with an independent prosodic module where module-internal rules and constraints (and in particular prosodic inversion) apply. This separation of syntactic and prosodic constraints also implies a distinction between a syntactic string and a prosodic string. The syntactic string (s-string) is generated by c-structure which originally was assumed to represent the hierarchical structure and linear order of an utterance. However, given phenomena like prosodic inversion and other prosodically determined linear order phenomena, an additional prosodic string (p-string) is assumed which represents the *actual linear order* of an utterance. While the p-string is often identical with the s-string, it might deviate from the linear order in the s-string based on prosodic constraints.<sup>8</sup>

Starting with Butt & King (1998), several proposals have been made for the syntax-prosody interface in LFG. This paper follows the approach developed in Bögel (2015) and proposes a modular, directional structure in line with the architectural assumptions made above. This is illustrated in Figure 3 which shows a more detailed version of Figure 1.

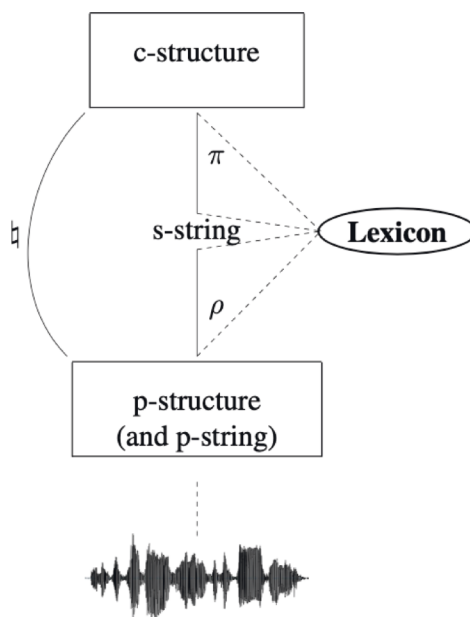


Figure 3: The syntax-prosody interface (Bögel 2015)

The s-string is the linear representation of c-structure. Two transfer processes regulate the exchange of information at the interface. The *transfer of structure* ( $\mathfrak{h}$ ) exchanges information on syntactic and prosodic grouping and on intonation, while the *transfer of vocabulary* ( $\rho$ ) associates morphosyntactic and

<sup>7</sup>As a detailed discussion would go beyond the scope of the present paper, the interested reader is referred to Bögel (2023) where these questions are thoroughly analysed.

<sup>8</sup>See Bögel (2023) for an overview on the discussion of p- and s-string in the LFG literature.

phonological information of lexical elements and projects them to their respective structures. P-structure is represented by the p-diagram (further discussed below) part of whose output is the p-string.

This paper focuses on the interface between c-structure and p-structure and how the question particle =*u* can be generated (i.e., produced) at that interface. Example (4), a shortened version of example (1), will be used for demonstration purposes.

- (4) maguts=*u* driggkan stikl  
 may.2DU-Q drink.INF cup  
 ‘can you two drink the cup?’ (Mark 10:38; Miller 2019: 463, his (306), shortened)

The following sections describe the generation/production of the second position clitic in syntax, at the interface between syntax and prosody, and in p-structure in more detail.

### 3.1 Syntactic analysis: c-structure and f-structure

The demo example in (4) shows the modal verb *maguts* ‘can’ hosting the question particle =*u* in the second position, followed by the infinitive form *driggkan* ‘drink’ and the object noun *stikl* ‘cup’. The second person dual pronoun is dropped.

As discussed above in Section 2, the question particle is assumed to be placed in sentence-initial position. Walkden & Bögel (to appear) place the clitic in Rizzi’s (1997) ForceP, where it determines sentence type. This paper adopts a more general proposal made by Lowe & Belyaev (2015), who place the Ossetic second position clitics in Spec, CP. From this initial position in the clause, the question particle =*u* contributes the clause-type information (interrogative) to f-structure. This results in the following syntactic analysis:

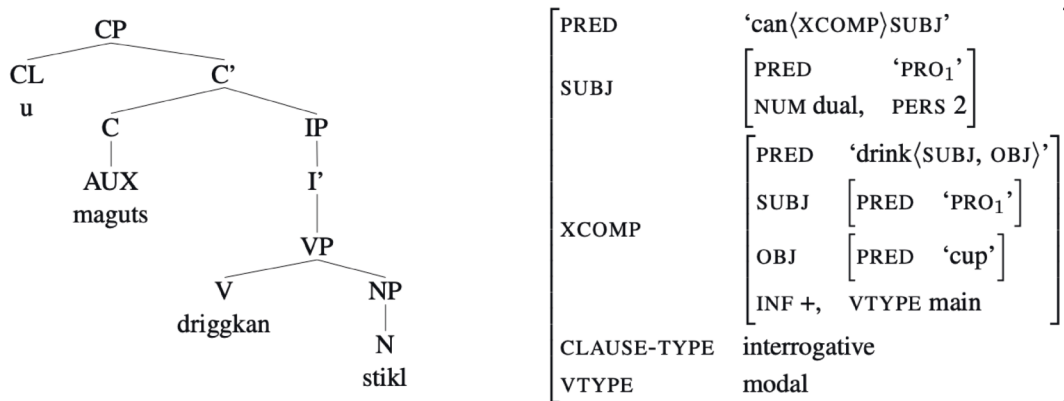


Figure 4: C-structure and f-structure for example (4)

There are no syntactic constraints that prevent the question particle from occurring in initial position. On the contrary, its function as a clause-type marker makes this the optimal position for the syntactic analysis (Rizzi 1997). Once the grammar generates the s-string from the syntactic component, the linear order is thus as shown in (5).

- (5) **s-string:** u maguts driggkan stikl

The s-string in (5) is really only an easy-to-read representation of linearly ordered morphosyntactic feature bundles. In a next step, these features are matched against the lexicon during the transfer of vocabulary.

### 3.2 At the interface: The transfer of vocabulary and the transfer of structure

During the transfer of vocabulary, the s-string is matched against the lexicon. Following Levelt et al. (1999), the lexicon is assumed to consist of several dimensions: the concept (related to semantics, not

further discussed here), the s(yntactic)-form, and the p(honological) form. The s-form contains the standard information assumed in LFG, the morphosyntactic features. The p-form contains the lexical phonological information, which includes the segments that make up the form, the number of syllables, lexical stress, and the prosodic status of the lexical item. The two entries for *maguts* ‘can’ and =*u* are shown in Table 1.

| s-form        |    |                                                               | p-form      |               |
|---------------|----|---------------------------------------------------------------|-------------|---------------|
| <i>maguts</i> | V  | (↑ PRED) = ‘maguts’ → (↑ PRED) = ‘can’<br>(↑ PERS) = 2<br>... | SEGMENTS    | /m a g u t s/ |
|               |    |                                                               | METR. FRAME | (‘σσ’)ω       |
| <i>u</i>      | CL | (↑ CLAUSE-TYPE) = interrogative                               | SEGMENTS    | /u/           |
|               |    |                                                               | METR. FRAME | =σ            |

Table 1: Lexical entries for *maguts* ‘can’ and =*u*

During production, syntactic structure analysis activates the respective s-forms in the lexicons. The corresponding p-forms become available as well and the lexical phonological information is projected to p-structure, which includes the number of syllables, the types of segments, the distribution of lexical stress, and most importantly for this paper: the prosodic status. *maguts* is a prosodic word consisting of two syllables with stress on the first syllable. In contrast, the question particle is a prosodically deficient enclitic (=σ) which requires a preceding prosodic host.

For the transfer of structure, syntactic phrasing is related to prosodic phrasing. This paper roughly follows Selkirk’s (2011) MATCH THEORY by assuming that the CP projects to an intonational phrase.<sup>9</sup> The information on phrasing is projected from c-structure by means of the following two annotations at the CP node (where PHRASING refers to prosodic phrasing domains, and  $S_{min}$  and  $S_{max}$  to the first/last syllable in this prosodic domain).

- (6) a.  $(\natural(T(*)) S_{min} \text{ PHRASING}) = {}_l($   
b.  $(\natural(T(*)) S_{max} \text{ PHRASING}) = )_l$

These annotations can be read as: for all the terminal nodes (T) belonging to the current node (\*) which in this case is the CP), associate a left intonational phrase boundary ( ${}_l$  with the syllable with the lowest index ( $S_{min}$ ), and a right intonational phrase boundary  $)_l$  with the syllable with the highest index ( $S_{max}$ ) in p-structure ( $\natural$ ). This essentially allows for the CP in c-structure to be ‘translated’ into an intonational phrase structure in p-structure.

### 3.3 Prosodic analysis: P-structure and prosodic inversion

P-structure is represented by the p-diagram, a linear representation of the utterance in syllables. Each syllable vector is associated with a number of values related to attributes like PHRASING or SEGMENTS. During comprehension, these values are derived from an actual speech signal, e.g., from duration or pitch. However, during production, as in the case at hand, the input p-diagram is based on the information from the two transfer processes. Figure 5 shows the input p-diagram associated with example (4).

The p-diagram only contains the information gathered from the transfer of structure and the transfer of vocabulary as discussed in the previous section, namely syllable structure, lexical stress, segments, and prosodic information. The intonational phrase boundaries were projected as part of the transfer of

<sup>9</sup>The syntax-prosody correspondence will be restricted to this CP- ${}_l$ -correspondence since this is the crucial boundary for the discussion of the second position clitic. Since the field on prosodic phrasing is heavily dependent on evidence from spoken language, the correct prosodic phrasing of Gothic can never be completely determined. It can be seen as certain that the CP projects to an intonational phrase. One could also assume that the nested intonational phrase projected by the IP is merged with the CP’s intonational phrase, and that the VP projects a phonological phrase, but since this is irrelevant for the current analysis, the paper refrains from including these structures.

|             |                                                                                                                                                     |                |                |                |                |                |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|
| PHRASING    | $\left( \begin{smallmatrix} \iota = \sigma & (\sigma & \sigma)_\omega & (\sigma & \sigma)_\omega & (\sigma)_\omega \end{smallmatrix} \right)_\iota$ |                |                |                |                |                |
| LEX. STRESS | –                                                                                                                                                   | x              | –              | x              | –              | x              |
| SEGMENTS    | /u/                                                                                                                                                 | /ma/           | /guts/         | /drigg/        | /kan/          | /stikl/        |
| VECTORINDEX | S <sub>1</sub>                                                                                                                                      | S <sub>2</sub> | S <sub>3</sub> | S <sub>4</sub> | S <sub>5</sub> | S <sub>6</sub> |

Figure 5: Input to p-structure for example (4)

structure as shown in (6). For this example,  $S_{min}$  thus corresponds to the very first syllable (S<sub>1</sub>) and  $S_{max}$  to the last syllable (S<sub>6</sub>) of all the terminal nodes covered by the CP - which in this case is the complete sentence.

Once the information from other modules has been collected in the p-diagram, p-structure internal rules and constraints apply; i.e., the input to p-structure as projected by c-structure and the lexicon is violable. Prosodic inversion is triggered by the constellation of an intonational phrase boundary followed by an enclitic:  $(\iota = \sigma$ . The constraint then causes the clitic to be placed after the first boundary to its right; in this case after *maguts*, which is where the clitic is placed. While *maguts* is assumed to be a prosodic word, it is not necessarily a prosodic word boundary that the clitic follows, but more generally the first low-level prosodic boundary to its right. For examples (2) and (3) this is most likely a recursive prosodic word boundary (see Section 2 for discussion). Example (7) formalizes prosodic inversion for the Gothic 2P clitic.

- (7)  $\mid_\iota = \text{cl } \sigma + \mid \dots \longrightarrow \mid_\iota \sigma + \mid = \text{cl } \dots$   
*If an enclitic (=cl) is placed following an intonational phrase boundary ( $\mid_\iota$ ), then place the clitic after the next prosodic boundary ( $\mid$ ) following at least one syllable ( $\sigma +$ )*

Figure 6 shows the output p-diagram of p-structure after prosodic inversion has applied.

|             |                                                                                                                                                     |                |                |                |                |                |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|
| PHRASING    | $\left( \begin{smallmatrix} \iota (\sigma & \sigma)_\omega & = \sigma & (\sigma & \sigma)_\omega & (\sigma)_\omega \end{smallmatrix} \right)_\iota$ |                |                |                |                |                |
| LEX. STRESS | x                                                                                                                                                   | –              | –              | x              | –              | x              |
| SEGMENTS    | /ma/                                                                                                                                                | /guts/         | /u/            | /drigg/        | /kan/          | /stikl/        |
| VECTORINDEX | S <sub>1</sub>                                                                                                                                      | S <sub>2</sub> | S <sub>3</sub> | S <sub>4</sub> | S <sub>5</sub> | S <sub>6</sub> |

Figure 6: Output of p-structure for example (4)

It is likely that the clitic is integrated into the prosodic word of *maguts*, but since this cannot be verified, the structure is left as it is. As a result of the prosodic adjustments, the p-diagram now offers the final linear p-string, shown in (8), which corresponds to the linear order of the string given in example (4).

- (8) **p-string:** ma.guts u drigg.kan stikl (orthographically: maguts=u driggkan stikl)

The final p-structure output concludes the generation of second-position clitics at the interface between syntax and prosody. The approach is strictly modular in that the two modules are clearly separated: each module is expressed in module-specific vocabulary and each is subject to its own rules and constraints. It is only at the interface that the two modules touch and ‘translate’ the terms that are relevant for the other module. The approach furthermore allows for linear order to differ between syntax and prosody and for prosodic constraints to determine placement. Under this approach, the placement of the clitic after a preposition or a prefix is thus no longer an impossible syntactic puzzle, but a mere consequence of the prosodic module placing the clitic in an adequate position. The following Figure 7 shows the complete production/generation of example (4).

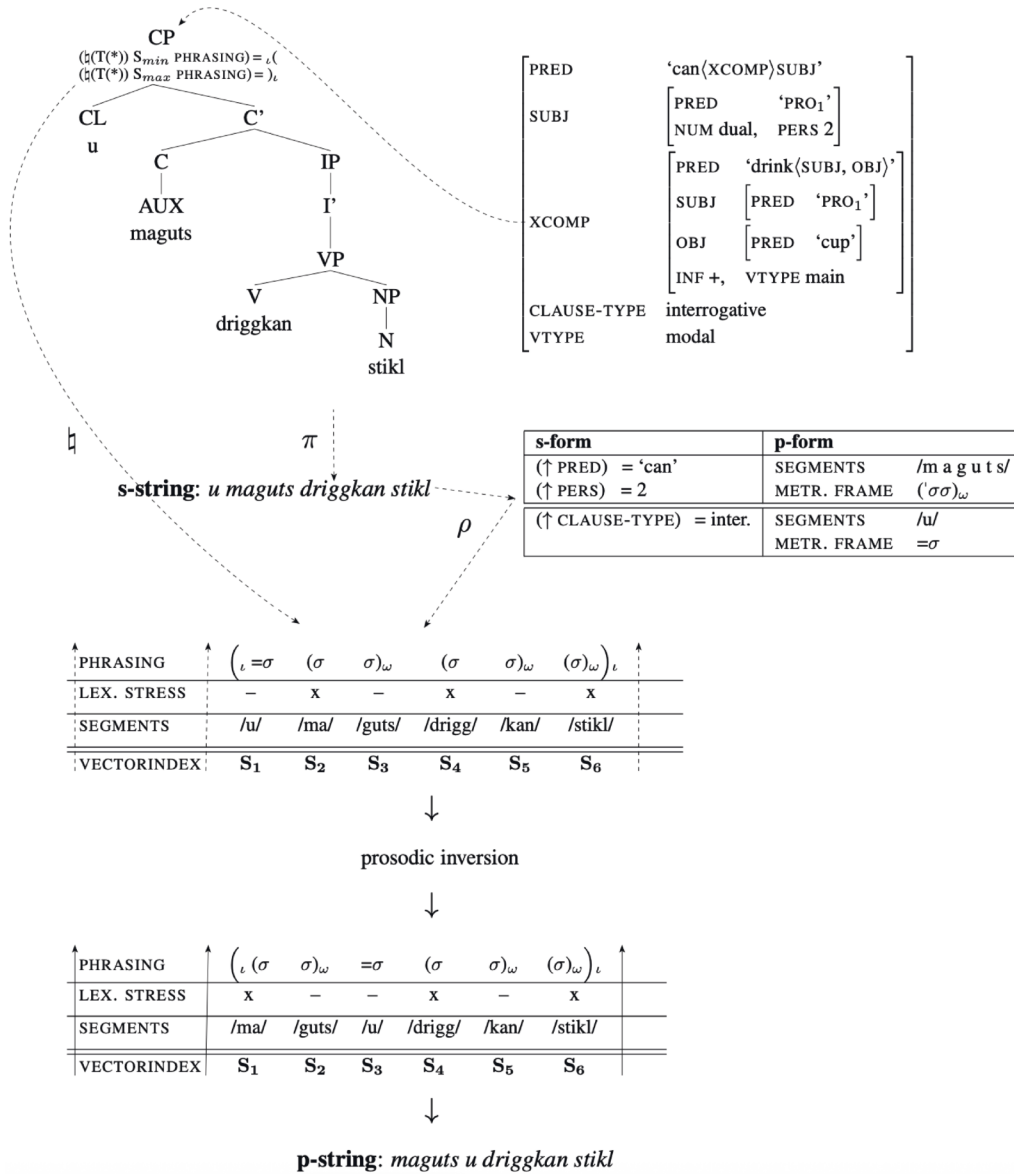


Figure 7: Complete analysis of example (4) at the syntax-prosody interface during production

The next stage in the generation process would be the interface of p-structure and the phonetic component, where the abstract categories from Figure 6 are acoustically realised. This goes beyond the current paper (Gothic is, after all, an extinct language), but the following section describes a first computational implementation of second position clitics at the syntax-prosody interface following the theoretical analysis above.

#### 4 A computational implementation at the syntax-prosody interface

In the last few years, several computational implementations have been accomplished following the approach to the syntax-prosody interface as described in Bögel (2015). This included German case ambiguities (Bögel & Zhao 2025), Urdu polar *kya* and Urdu alternative questions (Butt et al. 2024). However, all of these implementations are concerned with comprehension/parsing; that is, they go from form to meaning – from a given speech signal to a prosodic disambiguation of syntactic structure (Bögel & Zhao 2025) or semantic structure (Butt et al. 2024). These implementations are extensions to

the traditional grammar writing via the grammar development platform XLE (Crouch et al. 2011) and the ParGram project, where grammar writers have developed parallel grammars for many languages for decades (e.g., Butt et al. 1999, 2002, Sulger et al. 2013, Forst & King 2023).<sup>10</sup> The present paper is the first implementation of a production process at the syntax-prosody interface. The program is written in Perl, with interfaces to XLE for the syntactic generation, and to the finite state software XFST (Beesley & Karttunen 2003) for access to the lexical information.<sup>11</sup>

#### 4.1 Syntactic generation with a Gothic XLE-grammar

Production starts with a packed f-chart representation of the target s-string *u maguts driggkan stikl?* in prolog. A Gothic toy-grammar in XLE is used as a generator which takes the packed structure as input and generates the s-string. Figure 8 shows the c- and f-structure for example (4).

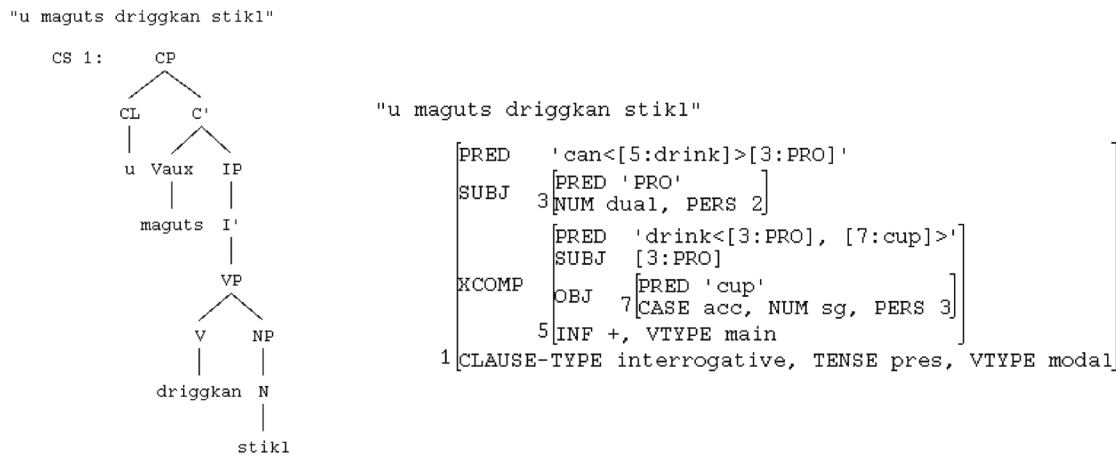


Figure 8: C- and f-structure for example (4) as generated by the Gothic XLE grammar

Two output representations are generated for the interface: the s-string and a bracketed representation of c-structure.

#### 4.2 Implementing the transfer processes at the interface

At the interface to p-structure, two transfer processes are applied: the transfer of vocabulary and the transfer of structure (see Section 3.2). During the transfer of vocabulary, s-forms are matched against the lexicon to retrieve their p-form information on, e.g., segments, syllable structure and prosodic status. The lexicon is implemented as a finite-state network in XFST (Beesley & Karttunen 2003). Example (9) shows the lexical entries for the prosodic word *maguts* and the clitic =*u*, where the upper side (to the left of the colon) denotes the s-form<sup>12</sup> and the lower side (to the right of the colon) the p-form.

- (9) a. maguts:ma.guts+pw+2  
b. u:u+=cl+1

The different types of information in the p-form are separated by "+". Encoded are the segments of each lexical element (here simply letters and not an IPA representation), including the syllable break

<sup>10</sup>Many of these grammars can be found and explored on the xle-web iness website: <https://clarino.uib.no/iness/xle-web>.

<sup>11</sup>A zip-file of the complete implementation is available on <https://github.com/ticle2/Generating-second-position-clitics-in-Gothic>.

<sup>12</sup>Note that the s-form is reduced to the orthographic representation, but can be assumed to consist of a bundle of morphosyntactic features.

represented by a dot as in *ma.guts*. This is followed by the prosodic structure of each lexical element in isolation: [pw] for the prosodic word status of *maguts* and [=cl] for the enclitic *=u*. The digits in the final position show the number of syllables that each individual lexical item consists of. During the transfer of vocabulary, the s-string is then tokenized and each item is matched against the lexicon. The p-form information is retrieved and transferred to the p-diagram syllable by syllable.

The second transfer process is the transfer of structure, which matches syntactic phrase information to prosodic phrase information. For the transfer of structure, the algorithm uses a bracketed representation of c-structure generated by the grammar. The fragment shown in example (10) illustrates the format.

- (10) (CP:25  
       (CL:2 u:1)  
       (C':24  
       (Vaux:4 maguts:3)  
       ...

The theoretical approach discussed above follows Selkirk (2011)'s MATCH THEORY. Only the relation between CP and the intonational phrase ( $\iota$  /  $i$ ) was implemented, since this is the relevant structure for the automatic generation of second position clitics by means of prosodic inversion. As can be seen in Figure 8 and the corresponding bracketed structure in (10), the CP spans the complete sentence. As a result, the transfer of structure adds left ( $\iota$  and right  $i$ ) intonational phrase boundaries to the p-diagram, spanning all syllables. Once the two transfer processes at the interface have added the respective information, the p-diagram in Figure 9 is generated as input to p-structure.

|          |       |            |            |            |            |                |
|----------|-------|------------|------------|------------|------------|----------------|
| Phrasing | i(=cl | ( $\sigma$ | $\sigma$ ) | ( $\sigma$ | $\sigma$ ) | ( $\sigma$ ))i |
| Segments | u     | ma         | guts       | drigg      | kan        | stikl          |
| V-index  | V1    | V2         | V3         | V4         | V5         | V6             |

Figure 9: Input to p-structure: The p-diagram as generated by the transfer of vocabulary and the transfer of structure.

After the completion of the transfer processes at the interface between c- and p-structure, p-structure internal rules and constraints apply to the input structure shown in Figure 9. One of these constraints is prosodic inversion which applies to an enclitic which is stranded without a prosodic host. As Figure 9 shows, this is the case for the clitic in the initial position: it is placed right after an intonational phrase boundary. P-structure then applies prosodic inversion as a repair mechanism which places the clitic after the next prosodic boundary – *maguts* in this example (see Section 3.3 for discussion). Figure 10 shows the automatically generated p-diagram after prosodic inversion was applied. The resulting p-diagram places the clitic *=u* in the correct linear position with an appropriate prosodic host preceding it, reflecting the correct linear order of example (4).

|          |              |            |     |            |            |                |
|----------|--------------|------------|-----|------------|------------|----------------|
| Phrasing | i(( $\sigma$ | $\sigma$ ) | =cl | ( $\sigma$ | $\sigma$ ) | ( $\sigma$ ))i |
| Segments | ma           | guts       | u   | drigg      | kan        | stikl          |
| V-index  | V1           | V2         | V3  | V4         | V5         | V6             |

Figure 10: Output from p-structure: The p-diagram after prosodic inversion.

## 5 Conclusion

This paper discussed the Gothic question particle *=u*, a prosodically determined second position clitic at the interface between syntax and prosody. The paper took a modular approach to language architecture which enables each module, syntax and prosody, to operate based on module-specific rules and constraints, and to exchange information only via the interface. This approach also allows for different linear orders

of the syntactic and the prosodic string, which resolves a long-standing problem to explain the clitic's linear position by means of syntactic movement alone. Instead, it is prosodic structure which places the clitic in its ultimate position via prosodic inversion (and in disregard of syntactic constituency). The paper showed how the clitic can be generated at the syntax-prosody interface in LFG and provided a first-ever computational implementation of such a generation process from c- to p-structure.

## Acknowledgements

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# These kind of noun phrases

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## 1 Introduction

Most nouns in English bear number features which must match the requirements of the determiner and verb:

- (1) a. **This/\*These dog is/\*are** friendly.
- b. **These/\*This dogs are/\*is** friendly.

Surprisingly, the unmarked, apparently morphologically singular nouns *sort/kind/type* can appear with either a singular determiner and a singular verb, or a plural determiner and a plural verb. Naturally occurring examples of the apparent agreement mismatch examples in (2c) and (3d) are provided in (4).<sup>1</sup> In fact, we analyse the forms *sort/kind/type* not as singular but as underspecified for number, as we discuss in Section 4; however, we follow the existing literature in referring to examples like (2c) and (3d) as involving agreement mismatch.

- (2) **sort/kind/type** of NOUN:
  - a. This/That kind of dog is friendly.
  - b. These/Those kinds of dogs are friendly.
  - c. **These/Those kind of dogs are** friendly.
- (3) NOUN of this **sort/kind/type**:
  - a. A dog of this/that kind is friendly.
  - b. Dogs of this/that kind are friendly.
  - c. Dogs of these/those kinds are friendly.
  - d. **Dogs of these/those kind are** friendly.
- (4) a. In Ireland, **these kind of dogs are** seen as commercial entities and are not seen as pets. (NOW)
- b. This included the use of three detection dogs specially trained to detect the odour of electric ants – believed to be the only specialist **dogs of these kind** in the world. (Google)

In all variants, the **sort/kind/type** noun and the category-denoting noun can be modified:

- (5) ‘**sort/kind/type** of NOUN’ with agreement mismatch, modified **sort/kind/type** noun:
  - a. If fielded, **these new type of SRBMs** would allow North Korea to strike specific targets within South Korea with a much higher degree of accuracy (than older variants). (NOW)
  - b. It was **those subtle type of racist statements** that were made back then. (NOW)
- (6) ‘**sort/kind/type** of NOUN’ with agreement mismatch, modified NOUN:
  - a. That should be a safe harbor for them against **those type of frivolous lawsuits**. (NOW)

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<sup>1</sup> Attested examples are annotated with their source: the NOW corpus (Davies 2016–), the iWeb corpus (Davies 2018), the Sketch Engine corpus (Kilgariff et al. 2004), or, for examples found via a Google search, a link to the URL.

- b. People have been suspecting that **these kind of extreme explosions** could be the birth of black holes or neutron stars, but this is a final piece of evidence that I think really settles the case,” says research scientist Dheeraj “DJ” Pasham. (NOW)
- (7) ‘NOUN of these **sort/kind/type**’ with agreement mismatch, modified **sort/kind/type** noun:
  - a. The prisoner was not put on the witness stand, the case being **one of those peculiar kind** in which it is not considered best for the defendant to testify. (Google)
  - b. **The formation mechanism of snow crystals of these unusual type** will be explained by the outcrop of dislocations with a screw component on the 0001 and 1010 faces as described below. (Google)
- (8) ‘NOUN of these **sort/kind/type**’ with agreement mismatch, modified NOUN:
  - a. A wizard who had the Daro of Luck in his possession found that **lucky charms of these sort** were a good idea. (Sketch Engine)
  - b. **Notable examples of these kind** include the leprechaun Hornswoggle, El Torito and other various dwarfed versions of other various wrestlers. (Sketch Engine)

The *of* phrase may also be elided:

- (9) ‘these **sort/kind/type**’ with agreement mismatch:
  - a. Another reason is that the melon they were planting is a thin-rind variety and **these kind** are actually nicknamed the ‘exploding melon’ because they tend to split. (NOW)
  - b. “Electrical burns can be very serious as the heart can be stopped by the electric current,” says Ms Macaulay. “Often **these type** can cause entry and exit burns with serious tissue damage between the two points.” (NOW)

In the following, we examine previous work on these constructions, and propose a syntactic and compositional semantic analysis in an LFG+Glue setting (Dalrymple et al. 1993, 2019, Asudeh 2022). We use the following cover terms:<sup>2</sup>

- (10)
  - a. DET<sub>K</sub> KIND (of (DET<sub>N</sub>) NOUN)
  - b. this kind/sort/type of (a) dog
  - c. these kinds/sorts/types of dogs
  - d. these kind/sort/type of dogs
- (11)
  - a. (DET<sub>N</sub>) NOUN of DET<sub>K</sub> KIND
  - b. a dog of this kind/sort/type
  - c. dogs of this kind/sort/type
  - d. dogs of these kinds/sorts/types
  - e. dogs of these kind/sort/type

## 2 Previous work

Stenton (2024) provides a detailed and lucid overview of the treatment of the agreement mismatch variant in (10d) in prescriptive and descriptive grammars and usage guides for English. There is not much discussion of the agreement mismatch variant in (11e) in the syntactic literature, and it does not appear frequently in standard corpora, though examples of it are easy to find on the web.

<sup>2</sup>As shown in the variant in (10b), the indefinite determiner *a/an* can appear before NOUN: *this kind of a dog*. Though we will not provide an explicit analysis of the variant with *a/an* here, we speculate that one way to account for this possibility is to assume that indefinites denote properties (Van Geenhoven 1998, Chung & Ladusaw 2004, and references cited there), following similar suggestions by Wilkinson (1991, 1995), and to allow any phrase of the proper semantic type as the complement of KIND, so that *dog* and *a dog* (but not, for example, *that dog* or *every dog*) are equally good as complements of KIND in this construction.

Wilkinson (1991, 1995) and Zamparelli (1998), building on work by Carlson (1977), provide compositional semantic analyses of the constructions in (10) and (11), capturing the semantic relation between *this kind of dog* and *a dog of this kind*. This work notes the existence of the number mismatch cases in (10d) (Carlson 1977: 211; Wilkinson 1995: 386; Zamparelli 1998: 292), but without providing an explicit syntactic analysis. We return to a discussion of this work in Section 5.

There is a substantial body of work on the historical development and synchronic relations of the larger family of related **sort/kind/type** constructions of the general form in (10) (Denison 2002, 2005, 2011, Keizer 2007, Davidse et al. 2008, Brems 2011, Zámečník & Denison 2018). Denison (2002) proposes the three-way distinction in (12), and explores the historical development of these subtypes and relations between them.

(12) Subtypes of the construction in (10) according to Denison (2002):

- a. BINOMIAL: **this type of material**
- b. QUALIFYING: **a sort of holiday** (the noun *type* does not appear in this construction)
- c. POSTDETERMINER: **these sort of skills** (the agreement mismatch cases in (10d))

In subsequent work (Denison 2005, 2011, Zámečník & Denison 2018), Denison refines this classification and explores a larger set of related patterns with **sort/kind/type**, including what Denison (2002) calls the ‘semi-suffix’ variant and what Denison (2005) calls the ‘sort of thing’ variant and the ‘adverbial’ variant.

(13) Additional **sort/kind/type** patterns:

- a. SEMI-SUFFIX (Denison 2002): This indicated to us not only that **quick relation type missions** are feasible, but also that the results are more than satisfactory.
- b. SORT OF THING (Denison 2005): if he had visitors he used to send her out of the room **type of thing**
- c. ADVERBIAL (Denison 2005): **I kind of admire** what he is doing.

Although the historical development of these variants and the synchronic relations between them is an interesting and important area of research, our aim here is to provide a synchronic analysis of the constructions of the forms given in (10) and (11), and we will not explore the historical development of these variants or their relation to other constructions with **sort/kind/type**. We will, however, return to a claim that is often made in this work (Denison 2002, 2005, 2011, Keizer 2007, Davidse et al. 2008, Brems 2011, Zámečník & Denison 2018), as well as in some reference grammars as discussed by Stenton (2024), that the differences among these constructions, and in particular the mismatch case in (10d), are best analysed in terms of special phrase structure configurations. For example, Denison (2002, 2005) proposes that **KIND** is the head noun with a PP complement in the binomial variant (12a), while **NOUN** is the head noun with ‘**KIND of**’ as a premodifier constituent in the postdeterminer variant (12c).

(14) Phrase structure of the construction in (10) according to Denison (2002, 2005):

- a. BINOMIAL: right-branching structure in which **KIND** ‘functions as a noun’  
[[this]<sub>D</sub> NP[[**kind**]<sub>N</sub> [[of]<sub>P</sub> [assault]]]]
- b. QUALIFYING: the string ‘sort/kind of’ forms a unit which qualifies **NOUN**; **KIND** is not a noun, ‘of’ is not a preposition  
[[a]<sub>D</sub> NP[A-Qual[**kind-of**] [**emptiness**]<sub>N</sub>]]
- c. POSTDETERMINER, with agreement mismatch: similar bracketing to qualifying construction, but different labels, with uncertainty about the category of the **KIND** noun and ‘of’  
[[those]<sub>D</sub> NP[PostD[**sort-of**] [**creatures**]<sub>N</sub>]]

Wilkinson (1991, 1995) also presents arguments for a phrasal ambiguity, not on the basis of agreement mismatch, but on the basis of ambiguity of reference of the phrase: according to her analysis, **KIND** is the head in generic readings, while **NOUN** is the head in existential readings.

(15) Wilkinson (1995: 386):

- a. GENERIC READING/reference to a kind of animal:  
[This [kind of animal]] is common.
- b. EXISTENTIAL READING/reference to an individual animal:  
[[This kind] of animal] is sitting on my lawn.

In fact, this semantic distinction can be accounted for without assuming a phrase structure ambiguity. Carlson (1977: 28), citing similar examples, observes that an example like *this kind of dog* ‘also has ‘generic’ uses alongside its existential uses’; for Carlson, the possibility of an existential use has to do with properties of the predicate and how it combines with its argument. Most recent work appeals to some version of Chierchia’s (1998) Derived Kind Predication rule, which applies freely to allow predication over instances of a kind  $k$  when required by a predicate  $P$ , thus allowing existential readings.

(16) Derived Kind Predication (Chierchia 1998):

If  $P$  applies to objects and  $k$  denotes a kind, then<sup>3</sup>

$$P(k) = \exists x. [\cup k(x) \wedge P(x)]$$

Thus, the existence of existential readings does not provide evidence for syntactic ambiguity of *this kind of dog*, or evidence that *dog* is the syntactic head. More generally, we do not believe that a special constituent structure configuration is motivated for these variants, since the special semantic and pragmatic properties of these constructions are not signalled by special phrasal properties such as unusual word order, and do not display evidence of nonstandard phrasal constituency.

### 3 Agreement in the English noun phrase

We adopt the standard LFG/HPSG distinction between CONCORD and INDEX features (Wechsler & Zlatić 2003, King & Dalrymple 2004, Hristov 2012, 2021, and references cited there): roughly, CONCORD features encode DP-internal number, and INDEX features are visible external to the DP. Number has a dual role, in that nominal phrases have both CONCORD NUM and INDEX NUM; this enables an analysis of coordinated nouns like *man and woman* as having distributive singular CONCORD NUM requiring a singular determiner, and nondistributive plural INDEX NUM for the coordinate phrase requiring plural verb agreement: *This/\*These man and woman are/\*is happy* (King & Dalrymple 2004).

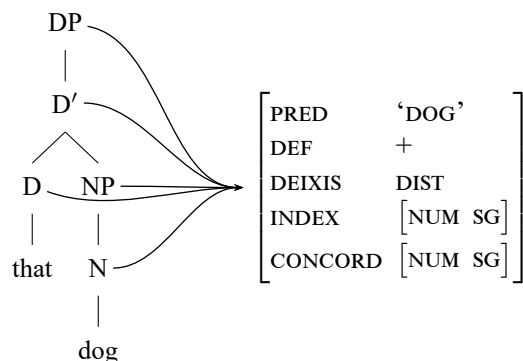
In the f-structures that we display, we include CONCORD and INDEX number features, while leaving out features encoding CASE, PERSON, GENDER, and other nominal features that are not relevant for the current discussion. As proposed by Dalrymple et al. (2019: Chapter 2), we assume that English demonstrative determiners such as *that* and *those* are definite, contributing the feature DEF with value +, and also specify proximal or distal deixis via the feature DEIXIS with values PROX and DIST; they are also specified for CONCORD NUM. We assume the lexical entries in (17), which produce the c-structure and f-structure in (18) for the DP *that dog*. In the c-structure, we omit non-branching  $X'$  nodes.

- (17) a. *dog*                    ( $\uparrow$  PRED) = ‘DOG’  
                                  ( $\uparrow$  CONCORD NUM) = SG  
                                  ( $\uparrow$  INDEX NUM) = SG
- b. *dogs*                    ( $\uparrow$  PRED) = ‘DOG’  
                                  ( $\uparrow$  CONCORD NUM) = PL  
                                  ( $\uparrow$  INDEX NUM) = PL

<sup>3</sup>In (16), ‘ $\cup$ ’ is the predication operator mapping the kind  $k$  into the property of being a  $k$ . For further discussion of existential readings for **sort/kind/type** phrases, see McNally (1997), Scontras (2017), Schoenfeld (2022), and references cited there.

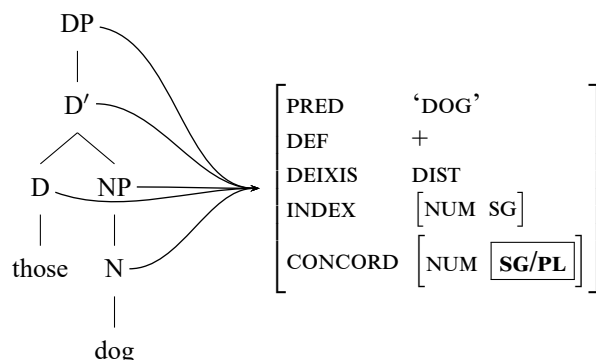
- c. *that*           (↑ DEF) = +  
                       (↑ DEIXIS) = DIST  
                       (↑ CONCORD NUM) = SG
- d. *those*           (↑ DEF) = +  
                       (↑ DEIXIS) = DIST  
                       (↑ CONCORD NUM) = PL

(18) C-structure and f-structure for *that dog*:



Number mismatch between the demonstrative determiner and the noun results in clashing CONCORD NUM features, a violation of the Consistency principle, as shown in (19).

(19) Ill-formed f-structure for *\*those dog*:



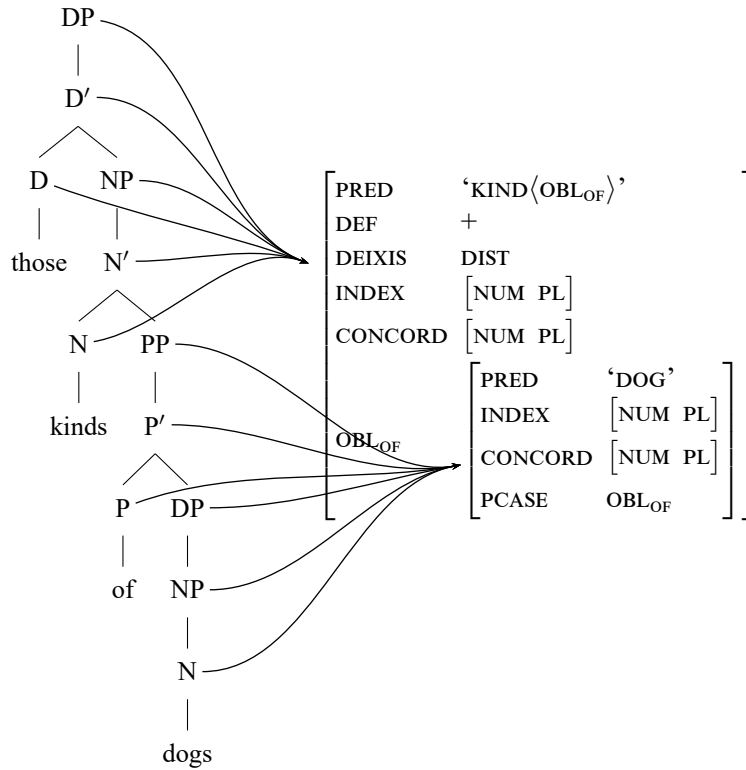
## 4 Kind/sort/type constructions: Syntax

### 4.1 Those kinds (of dogs)

In the phrase *those kinds of dogs*, *kinds* is a relational noun which subcategorizes for an oblique  $OBL_{OF}$  complement.<sup>4</sup> We assume that in the examples we discuss in this paper, and perhaps in general, *of* does not introduce its own PRED, but acts more like a casemarker: this is in line with Chisarik & Payne's (2001) acknowledgement of 'the longstanding idea that the preposition *of* in these [MD: possessor] constructions has no semantic value and serves merely to create a syntactically oblique PP complement for the head noun'.

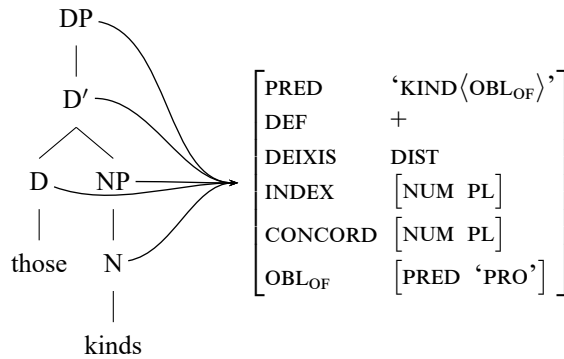
<sup>4</sup>Chisarik & Payne (2001) call this grammatical function  $NCOMP$ . See Börjars & Lowe (2023) for discussion of grammatical functions within the nominal phrase, and Vincent (2021) for a discussion of *of* from a historical perspective.

(20) C-structure and f-structure for *those kinds (are friendly)*:



As usual with relational nouns in English, the OBL<sub>OF</sub> complement can be elided if its reference is clear in context.

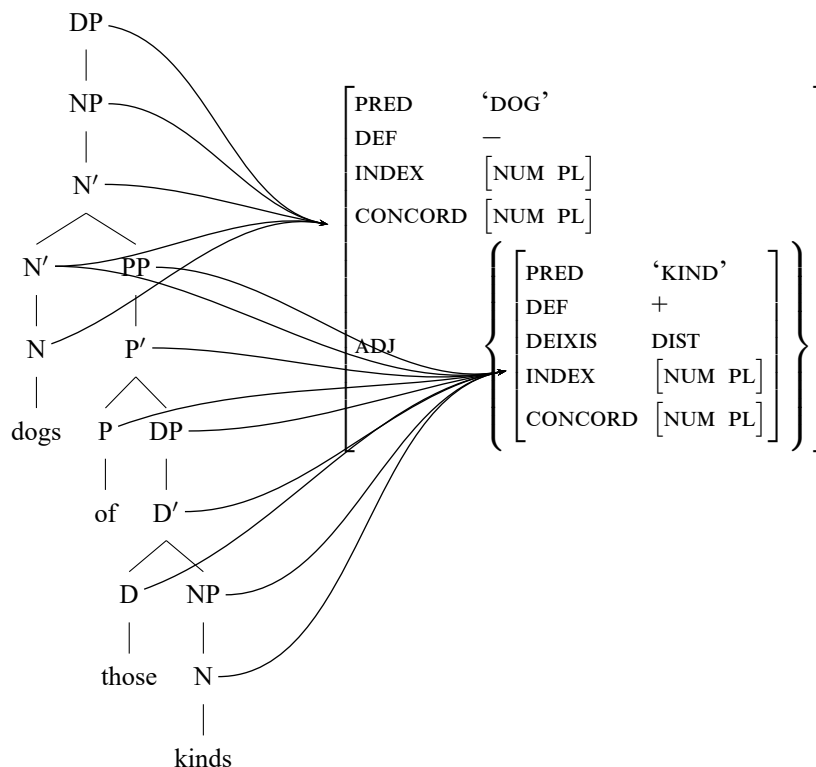
(21) C-structure and f-structure for *those kinds (are friendly)*:



## 4.2 Dogs of those kinds

In the phrase *dogs of those kinds*, the phrase *of those kinds* is an adjunct, not subcategorized by *dog*. In this case, *kinds* does not require an OBL<sub>OF</sub> argument at f-structure. Our LFG+Glue semantic analysis captures the semantics of this construction and the role of the *of*-phrase, as we show in Section 5.

(22) C-structure and f-structure for *dogs of those kinds (are friendly)*:



### 4.3 Constituent structure

The c-structure in (20) for *those kinds of dogs* is as for other relational nouns: the complement PP is a sister to the head N *kinds*. The c-structure for *dogs of those kinds* is given in (22): here, *dogs* is not a relational noun, and the PP modifier *of those kinds* is adjoined at the N' level, in the same way as other modifiers are adjoined. The particular details of the c-structures given here are not crucial; the important point is that there is no evidence that the c-structure properties of phrases like *these kinds of dogs* or *dogs of this kind* are in any way exceptional. The *OBL<sub>OF</sub>* phrase in *these kinds of dogs* appears in the c-structure configuration appropriate for complements of relational nouns, and the *of*-phrase in *dogs of these kinds* appears in the c-structure configuration appropriate for PP adjuncts. There are no special word order requirements, nor syntactic evidence for unusual phrasal constituents, that would motivate postulation of a special c-structure for these examples.

As noted above, some analyses posit a variety of constituent structures for the related family of **sort/kind/type** constructions in (10), where the different constituent structures are intended to correlate with (and possibly to encode) semantic and/or pragmatic differences among the construction types. For example, it has been proposed that in some examples of the form *this kind of NOUN*, the material before NOUN can be analysed as a complex determiner.

Maekawa (2015) presents several arguments against this view. First, he notes that an adjective can appear before the KIND noun, which is problematic for the view that 'DET<sub>K</sub> KIND of' is an uninterruptible determiner-like constituent:

(23) Maekawa (2015: 139):

- a. those **steady-state** type of organizations
- b. those **weird** sort of criticisms

Second, as also noted by Denison (2002) and Keizer (2007), the fact that the *of*-phrase can be elided provides evidence against the constituenthood of the 'KIND of' sequence, and evidence for constituenthood of the 'of-NOUN' sequence:

- (24) Maekawa (2015: 140):
- a. They won't last long, mate, **these type** never do.
  - b. But **these kind** are good for us.

Maekawa's own analysis addresses only the variant 'DET<sub>K</sub> KIND (of NOUN)', and assumes two different structures depending on whether DET<sub>K</sub> agrees with KIND. Both structures are right-branching on his analysis. In the first structure (*this kind of NOUN/these kinds of NOUN*), DET<sub>K</sub> agrees with the KIND noun, and KIND is the head; in the non-agreeing variant (*these kind of NOUN*), KIND is a functor selecting NOUN, and NOUN is the head. This is similar to Wilkinson's (1991, 1995) analysis, briefly described in Section 2, but while Wilkinson's aim is to capture a semantic difference between generic and existential readings, Maekawa's aim is to account for the syntactic agreement mismatch between DET<sub>K</sub> and KIND by positing an analysis in which DET<sub>K</sub> specifies NOUN rather than KIND.

Maekawa's analysis is problematic in several respects. First, there are no syntactic patterns other than agreement mismatch that motivate structural or categorical syntactic differences between the agreeing and non-agreeing variants, so a more parsimonious analysis of the range of possible phrase structures is to be preferred. Second, it is not easy to see how the analysis can be extended to agreement mismatch cases of the form 'NOUN of these/those KIND', since the analysis depends on treating the plural determiner *these/those* as combining directly with NOUN. Third, as we will see in Section 4.4.2, there are attested examples in which DET<sub>K</sub> agrees neither with KIND nor with NOUN, so the inventory of agreement possibilities may be broader than Maekawa assumes. Finally, the semantic difference between generic and existential readings that motivates Wilkinson's analysis does not line up with the syntactic difference between agreeing and non-agreeing variants, as we might expect; existential and generic readings are available for both variants, and so the semantic motivation for this syntactic difference is missing.

- (25) Agreeing variants (Carlson 1977: 28):
- a. **This kind of animal** is common. (generic)
  - b. **This kind of animal** is sitting on my lawn. (existential)
- (26) Mismatch variants:
- a. **These type of mirages** are rare in the United Kingdom, but happen occasionally in the Arctic. (generic: NOW)
  - b. My granddaughter found **these type of mushrooms** growing on a downed tree nearby. (existential: iWeb)

More generally, analyses that propose different phrase structures for the different variants do so on the basis of criteria that are not relevant at c-structure from an LFG perspective. If there are no c-structure differences that distinguish these constructions, their semantic or pragmatic properties are better analysed at other levels of representation.

#### 4.4 Number matches and mismatches

Keizer (2007) and Brems (2011) provide corpus examples of all possible combinations of number features in the 'KIND of NOUN' variant:

- (27) KIND of NOUN: (Keizer 2007: 160)
- a. Singular KIND, singular NOUN  
In museums and exhibitions you often see **one kind of knife** called the scribe's knife...
  - b. Singular KIND, plural NOUN  
And these are of course **the sort of questions** that Dick doesn't really want answered
  - c. Plural KIND, singular NOUN  
And those are **the types of artefact** that actually appear in this reduced data set

- d. Plural KIND, plural NOUN

But those are **the sorts of prices** that we are looking at just to do, the panel work

The situation is more complicated when we also consider determiner (CONCORD) and verb (INDEX) agreement.

#### 4.4.1 Patterns with plural *kinds/sorts/types*

The plural nouns *kinds/sorts/types* are like other English plural nouns in bearing plural CONCORD and INDEX features, and hence requiring plural determiners and plural verb agreement.

- (28) *Kinds/sorts/types*: plural CONCORD, plural INDEX

- a. Singular DET<sub>K</sub> disallowed (CONCORD clash)  
     \***this kinds** of dog(s)  
     \*dog(s) of **this kinds**
- b. Singular verb agreement disallowed (INDEX clash)  
     \***These kinds** of dog(s) **is**...

Plural *kinds/sorts/types* can appear with either a singular or a plural NOUN in both the ‘*these/those kinds/sorts/types* of NOUN’ pattern and the ‘NOUN of *these/those kinds/sorts/types*’ pattern, though the pattern in (30a) is rare.

- (29) *these/those kinds/sorts/types* of NOUN:

- a. Singular NOUN  
     **These types of dog** were probably mixed with the Schnauzer to create the Schnauzer (Miniature). (Sketch Engine)
- b. Plural NOUN  
     **These kinds of dogs** usually only require an occasional bath and brush. (Google)

- (30) NOUN of *these/those kinds/sorts/types*:

- a. Singular NOUN  
     And there is the problem of the Barbary Pirates and the Minoans! Have you any idea of the support required to sustain **a civilization of those sorts**? (Sketch Engine)
- b. Plural NOUN  
     **Dogs of these types** were mainly used to guard and herd livestock, guard homes, and kill rats in barns. (Sketch Engine)

Examples like (30a) might be expected to be unacceptable for semantic reasons. **Sort/kind/type** nouns are generally analysed as partitioning the individuals referred to by NOUN into non-overlapping groups constituting different sorts or kinds of NOUN, with the requirement that an individual cannot belong to more than one group: this is the disjointness condition of Carlson (1977: 213). Thus, an example like *?a dog of these kinds* is hard to interpret because an individual dog, even a mixed breed dog, cannot count as more than one kind of dog. However, Schoenfeld (2022) argues against a general version of Carlson’s disjointness condition on the basis of examples like (31), where a single individual instantiates two different kinds of performer.

- (31) In my opinion, there are two kinds of performers: concert performers and club performers. ... I’d have to say I’m **both kinds of artist**... (Schoenfeld 2022: 99)

In light of these observations, the pattern in (30a) may be best characterized as grammatically well formed but rare, hard to contextualize, or dependent on the particular semantics of NOUN.

#### 4.4.2 Patterns with singular/unmarked *kind/sort/type*

We now examine patterns with singular/unmarked *kind/sort/type*. In the pattern ‘NOUN of DET<sub>K</sub> *kind/sort/type*’, verb agreement is with NOUN, the head of the noun phrase. All of the possible combinations are attested, though the pattern in (32b) is rare.

(32) NOUN of DET<sub>K</sub> *kind/sort/type*:

- a. Singular NOUN, singular DET<sub>K</sub>  
**A dog of this type was** exhibited at the first Italian dog show in Milan in 1881. (Sketch Engine)
- b. Singular NOUN, plural DET<sub>K</sub>  
 Soon after, in the 1984 Galletué con Fisco case (RDJ, T 81, N° 2), the Chilean Supreme Court was faced with **a problem of these kind**, granting an indemnity to the owner of a forest of araucarias – an endangered native species – who claimed that environmental regulation prohibiting the cutting of these trees has deprived its land of its economic usability. (Sketch Engine)
- c. Plural NOUN, singular DET<sub>K</sub>  
**Dogs of this type were** hard-working aides on Spanish farms, at mines and in fishing villages, where they filled many roles, including herding, retrieving, rat patrol and protection. (Sketch Engine)
- d. Plural NOUN, plural DET<sub>K</sub>  
**The simplest structures of these kind are** toroidal knots. (Sketch Engine)

The status of example (32b) requires a detour into the question of the semantic number of constructions with singular/unmarked *sort/kind/type*, in light of the rarity of examples like (30a) (*a civilization of those sorts*, with singular NOUN and plural DET<sub>K</sub>/KIND). Huddleston & Pullum (2002: 352–353) claim that examples like *these kind of dogs*, with singular/unmarked *kind*, refer to a single kind, despite the plural determiner. If we assume that the singular/unmarked noun *kind* enforces singular semantic reference, we have an explanation for the fact that plural determiners like *few* and *many* are not allowed with unmarked KIND nouns, since these determiners enforce plural reference, and this would create a clash if singular reference is enforced by unmarked *kind*.

- (33) a. \*many/few/several kind of dogs  
 b. \*dogs of many/few/several kind

However, it would leave unexplained the relative rarity of examples like (32b), since this example would then have the same semantic status as acceptable examples such as *a problem of this kind*. But there is an independent problem with Huddleston & Pullum’s (2002) claim. As pointed out by Denison (2002), Brems (2011), Keizer (2007), Zámečník & Denison (2018), and others, examples with *all* are also found in the mismatch construction, though in these cases reference is not to a single kind, sort, or type.

(34) Zámečník & Denison (2018):

- a. and there were **all kind of things** came out
- b. We used to break **all kind of speed limits** getting out of the door
- c. he used to expect **all sort of reports** to be presented

Corpus examples of the pattern in (34) are rare except with the noun *manner* (for example, *all manner of things*). I also do not have very clear intuitions about whether *these kind* in examples like *a problem of these kind* refers to one kind or to an indeterminate number of kinds, and since it is difficult to investigate these issues by inspection of corpus examples, I will leave this issue, and the rarity of examples like *a problem of these kind*, for future research.

The  $DET_K$  *kind/sort/type* of NOUN pattern also raises complex issues: we must consider INDEX agreement between *kind/sort/type* and the verb as well as possibilities for  $DET_K$  and NOUN. When  $DET_K$  and NOUN match in number, verb agreement must also match:<sup>5</sup>

(35) *these/those kind/sort/type* of NOUN:

- a. Singular  $DET_K$ , singular NOUN, singular verb  
**This type of dog is(/\*are)** prone to ear infections and weight problems so extra care must be taken to ensure a healthy dog. (Sketch Engine)
- b. Plural  $DET_K$ , plural NOUN, plural verb  
**These type of dogs are(/\*is)** known for being highly intelligent and loyal companions. (Sketch Engine)

Examples can be found in which  $DET_K$  and NOUN do not match in number, but to me these do not sound completely well formed, and these patterns tend not to be found in edited texts.

(36) Singular  $DET_K$ , plural NOUN:

- a. It is possible that the movie was an attempt to popularise **this kind of trucks**. (Sketch Engine)
- b. People with cognitive disabilities or persons which are not familiar with a specific language would benefit from **this kind of solutions** too. (Sketch Engine)

(37) Plural  $DET_K$ , singular NOUN:

- a. Unfortunately, Africa is not the place for **these type of dog**. (Sketch Engine)
- b. In general, the optical glass that forms the image in these telescopes is of sufficient quality to give acceptable images, but the wobbly mounts and the inferior eyepieces supplied with **these type of telescope** is ALWAYS the thing that does them in. (Sketch Engine)

Corpus searches revealed a striking avoidance of examples with these mixed patterns requiring verb agreement: both singular and plural verb agreement are found, but my own intuitions are that neither singular nor plural agreement sounds completely acceptable.

(38) Singular  $DET_K$ , plural NOUN, variable verb agreement:

- a. However, as demonstrated in this paper, **this kind of models is** prone to overfitting. (Sketch Engine)
- b. When **this kind of sequences are** executed by fMBT during a test run, log entries are grouped under names of AAL/Python code blocks. (Sketch Engine)

(39) Plural  $DET_K$ , singular NOUN, variable verb agreement:

- a. Also, choosing an electric toothbrush with soft bristles can do the trick and **these type of brush is** also gentle on your gums and teeth. (Sketch Engine)
- b. Do not bother trying to apply heat, since **these type of bolt are** meant to be heated so will expand at the same rate as the nut or faster. (Sketch Engine)

We conclude that at least a weak condition governs agreement relations in the  $DET_K$  *kind/sort/type* of NOUN pattern, which rules out the unacceptable variants in (35): if the CONCORD value of  $DET_K$  matches the INDEX value of NOUN, then the INDEX value of *kind/sort/type* must also match. My own intuition is that a stronger condition is warranted, namely that the CONCORD and INDEX values of *kind/sort/type* and the INDEX value of NOUN must all match; this would disallow the patterns in examples (36)–(37), which do not seem well formed to me. There may be individual and dialectal variation in acceptability of these patterns, for which additional corpus work and acceptability judgement experiments are needed.

<sup>5</sup>I report my own judgements for examples (35)–(39), checked with corpus searches, but these judgements should be confirmed in future work with acceptability judgement experiments. Thanks to Adam Przepiórkowski for discussion of these patterns.

## 4.5 Lexical entries for *kind* and *kinds*

Number mismatches are found only with singular/unmarked *sort/kind/type* nouns: examples with singular/unmarked *sort/kind/type* nouns with plural determiners and plural verb agreement are attested (*These<sub>PL</sub> kinds<sub>SG</sub> of dogs are<sub>PL</sub> friendly*), but examples with plural *sorts/kinds/types* nouns and singular determiners and singular verb agreement are not found (*\*This<sub>SG</sub> kinds<sub>PL</sub> of dog is<sub>SG</sub> friendly*). In fact, all of the unexpected attested agreement patterns involve morphologically unmarked *sort/kind/type*. Accordingly, it is only the morphologically unmarked version which must be lexically specified to allow these unusual agreement patterns, and we treat this as an idiosyncratic lexical property of these forms. The plural forms *sorts/kinds/types* show unexceptional agreement properties, requiring plural determiners and plural verb agreement, and resemble other English plural nouns in this respect.

### 4.5.1 Plural *kinds*

For the plural noun *kinds* (and similarly for *sorts* and *types*) we propose the following syntactic lexical entry, to be fleshed out with a semantic analysis in Section 5. Like other plural nouns in English, *kinds* has plural CONCORD NUM and INDEX NUM, and like many other relational nouns, it subcategorizes for an OBL<sub>OF</sub> complement, which can be elided given the appropriate context.

- (40) *kinds*            { (↑ PRED) = ‘KIND⟨OBL<sub>OF</sub>⟩’  
                           ((↑ OBL<sub>OF</sub> PRED) = ‘PRO’)  
                           | (↑ PRED) = ‘KIND’ }  
                           (↑ CONCORD NUM) = PL  
                           (↑ INDEX NUM) = PL

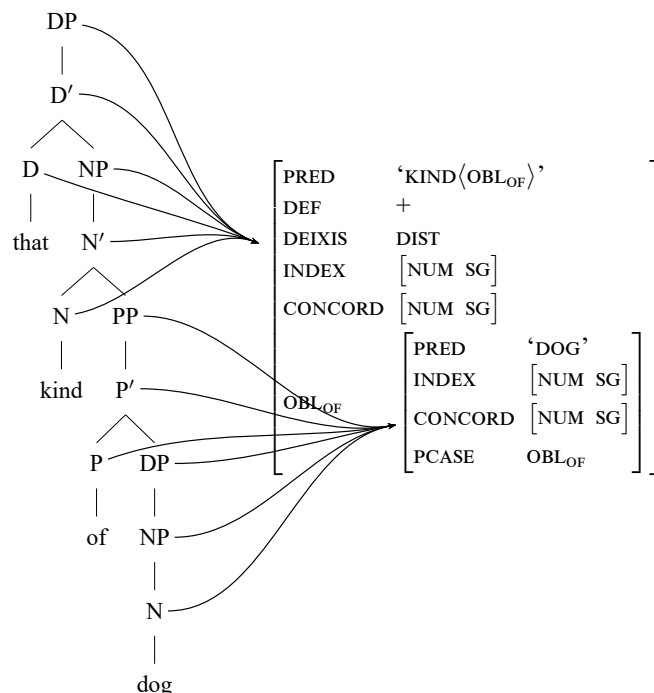
According to this lexical entry:

- *kinds* requires an oblique OBL<sub>OF</sub> argument, as in examples like *Those kinds of dogs are friendly*;
- the OBL<sub>OF</sub> argument may be elided, and is then realized at f-structure with PRED ‘PRO’, as in examples like *Those kinds are friendly*; OR
- it appears without a complement, as in examples like *Dogs of those kinds are friendly*. In Section 5, we will see additional semantic requirements governing the distribution of this variant.
- In all of its uses, *kinds* has plural CONCORD NUM and INDEX NUM.
- There are no constraints on the CONCORD NUM or INDEX NUM of the OBL<sub>OF</sub> complement: both singular and plural complements are possible (Section 4.4.1).

### 4.5.2 Unmarked *kind*

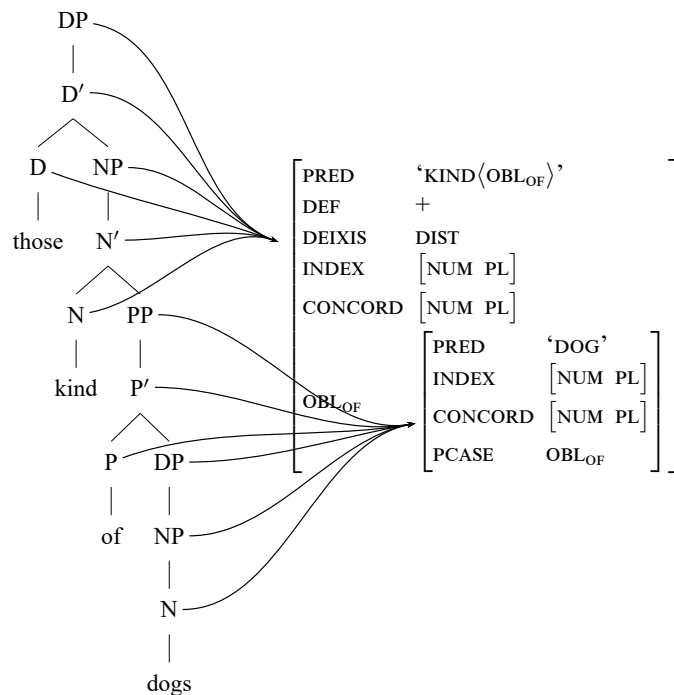
The c-structure and f-structure for *that kind of dog (is friendly)* are given in (41). Here, the CONCORD NUM and INDEX NUM for both *kind* and *dog* are singular.

- (41) C-structure and f-structure for *that kind of dog (is friendly)*:



We propose that the c-structure and f-structure for *those kind (of dogs) (are friendly)* are exactly the same as for the version with plural *kinds*, with plural CONCORD NUM and INDEX NUM.<sup>6</sup>

- (42) C-structure and f-structure for *those kind of dogs (are friendly)*, same as (20) except for the terminal node *kind* in the c-structure tree:



<sup>6</sup>This does not entail that such phrases are semantically plural: the existence of *pluralia tantum* nouns such as *binoculars* makes it clear that mismatches between syntactic and semantic number are possible. However, as discussed in Section 4.4, the issue of the semantic number of phrases like *those kind of dogs* is tricky, and I will not make claims about the semantic number of phrases with singular/unmarked *kind*.

Similarly, except for the form of the head noun *kind* in the c-structure tree, the c-structure and f-structure for *those kind are friendly* is as in (21), and the c-structure and f-structure for *dogs of those kind (are friendly)* is as in (22).

These patterns follow from the lexical entry in (43) for *kind*. The lexical entry for *kinds* in (40) is repeated in (44) for comparison. The crucial differences between (43) and (44) are in the specification of CONCORD NUM and INDEX NUM. While the entry for *kinds* in (44) specifies plural CONCORD NUM and INDEX NUM, the entry for *kind* in (43) specifies that if the CONCORD value of the matrix f-structure matches the INDEX value of the OBL<sub>OF</sub> argument, then the INDEX value of the matrix f-structure must also match, as discussed in Section 4.4.2.

- (43) *kind*            { (↑ PRED) = 'KIND<OBL<sub>OF</sub>>'  
                          { (↑ OBL<sub>OF</sub> PRED) = 'PRO'  
                          | [(↑ CONCORD NUM) = (↑ OBL<sub>OF</sub> INDEX NUM)]  
                              ⇒ [(↑ CONCORD NUM) = (↑ INDEX NUM)] }  
                          | (↑ PRED) = 'KIND' }
- (44) *kinds*            { (↑ PRED) = 'KIND<OBL<sub>OF</sub>>'  
                          ((↑ OBL<sub>OF</sub> PRED) = 'PRO')  
                          | (↑ PRED) = 'KIND' }  
                          (↑ CONCORD NUM) = PL  
                          (↑ INDEX NUM) = PL

According to the lexical entry in (43) for *kind*:

- *kind* requires an oblique OBL<sub>OF</sub> argument, as in examples like *That kind of dog is friendly* or *Those kind of dogs are friendly*;
- the OBL<sub>OF</sub> argument may be elided, and is then realized at f-structure with PRED 'PRO', as in examples like *That kind is friendly* or *Those kind are friendly*; or
- if the OBL<sub>OF</sub> argument is not elided, then if the CONCORD value of the matrix f-structure matches the INDEX value of the OBL<sub>OF</sub> argument, then the INDEX value of the matrix f-structure must also match; OR
- it appears without a complement, as in examples like *Dogs of that kind are friendly* or *Dogs of those kind are friendly*. As with plural *kinds*, semantic requirements ensure that this version of *kind* appears only in the construction 'NOUN of DET<sub>K</sub> KIND', as we show in Section 5.

This analysis accounts for the syntactic patterns we have seen by means of a special lexical entry for morphologically unmarked *sort/kind/type* nouns. No special phrase structure rules or other idiosyncratic syntactic specifications are required. The fact that only a particular small set of lexical items have grammaticalised in this way, and that the syntactic properties of these constructions can be captured purely through lexical specifications associated with unmarked *kind/sort/type*, fits well with the substantial literature on the historical development of the various types of **sort/kind/type** constructions (Denison 2002, 2005, 2011, Keizer 2007, Davidse et al. 2008, Brems 2011, Zámečník & Denison 2018). Further work is needed to reveal to what degree purely lexical specifications can account for the semantic and pragmatic properties of the full range of **sort/kind/type** constructions that are attested.<sup>7</sup>

<sup>7</sup>It is clear that at least some patterns with *sort/kind/type* cannot be treated purely by additional lexical specification to the entries for *sort/kind/type* that we have proposed: for example, the adverbial pattern (*You're being **kind of** melodramatic*) does not conform to the phrasal syntax of the examples we have discussed. See Kay (1997) for discussion of adverbial *sort of/kind of* and an analysis in a lexicalist framework.

## 5 Kind/sort/type constructions: Semantic composition

There has been an enormous amount of work on the semantics of kind-denoting constructions (Carlson 1977, Carlson & Pelletier 1995, Chierchia 1998, among many others) which we will not attempt to summarize here. The analysis that we present in this section addresses compositional semantic issues in the analysis of the ‘KIND (of NOUN)’ and ‘NOUN of DET<sub>K</sub> KIND’ constructions and the relation between them. These issues were first raised by Wilkinson (1991, 1995), building on Carlson (1977), and explored in subsequent work by Zamparelli (1998). Later work (McNally 1997, Sutton & Filip 2018, Scontras 2017, Schoenfeld 2022, among others) proposes refinements and alternatives to Carlson’s compositional semantic analysis of the ‘KIND of NOUN’ construction, but these works do not discuss the ‘NOUN of DET<sub>K</sub> KIND’ construction or its relation to the ‘KIND of NOUN’ construction. Since the basic assumptions in these works about how the ‘KIND of NOUN’ meaning is composed are compatible with the analysis to be presented in the following, and our focus here is on issues of semantic composition rather than the details of semantic representation, we do not discuss these analyses further.

We take *kind/kinds* as representative of the nouns which can participate in the ‘KIND of NOUN’/‘NOUN of DET<sub>K</sub> KIND’ constructions. We adopt the semantics for *kind/kinds* in (45a), a simplified version (ignoring intensionality) of the semantics that Wilkinson (1995) adopts, which is in turn a simplification of the analysis presented in Carlson’s (1977) foundational work. For clarity, we have spelled out Carlson’s *R* relation as *Realize*. With Carlson and Wilkinson, we assume that *of* does not make a semantic contribution in the ‘KIND of NOUN’ construction.

- (45) a.  $\text{kind} = \lambda Q_{\langle e, t \rangle} . \lambda x_k . [\forall z_e . \Box [ \text{Realize}(z_e, x_k) \rightarrow Q(z_e) ]]$   
 b.  $\text{dog} = \lambda z_e . \text{dog}(z_e)$   
 c.  $\text{kind of dog} = \lambda x_k . [\forall z_e . \Box [ \text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e) ]]$

According to (45a), *kind* requires an argument  $Q$ , which is a property of  $e$ -type individuals:<sup>8</sup> in an example like *kind of dog*,  $Q$  is the property of being a dog. When *kind* combines with its argument  $Q$ , it produces a property of individuals  $x$  of type  $k$  (for kind), requiring that any individual  $z$  which realizes the kind  $x$  is a  $Q$ ; if  $Q$  is the property of being a dog, all of the individuals realizing the kind  $x$  are required to be dogs, meaning that  $x$  is a kind of dog. This meaning can then combine with a determiner such as *this* in *this kind of dog*, or *every* in *every kind of dog*, in the usual way. By virtue of its  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$  type, the meaning constructor for *kind* resembles meaning constructors for noun modifiers: as observed by Carlson (1977: 209), *kind* behaves ‘something like an adjective’ in this respect, though it has the syntax of a noun.

In our discussion, we will retain the use of  $\forall$  in translation of the lexical meaning of *kind* for ease of comparison to previous work. Elsewhere, for simplicity, we treat *every*, *that*, and *a* as generalized quantifiers. Other views of the semantics of determiners such as *a* and *that* could be adopted, and would not affect the main claims of the analysis.

### 5.1 Meaning constructors

We assume familiarity with LFG+Glue (see Dalrymple et al. 2019 and Asudeh 2022, 2023 for overviews). Three different meaning constructors may be contributed by *kind/kinds*: MEANING CONSTRUCTOR 1 contributes the meaning of *kind/kinds* in examples of the form *This kind of dog is friendly*; MEANING CONSTRUCTOR 2 combines with MEANING CONSTRUCTOR 1 to contribute the meaning of the OBL<sub>OF</sub> complement when it is elided, as in examples like *This kind is friendly*; and MEANING CONSTRUCTOR 3 contributes the meaning of *kind/kinds* in examples like *Dogs of this kind are friendly*. We provide definitions for each of these meaning constructors in the following sections.

<sup>8</sup>Carlson (1977) distinguishes three subtypes of  $e$ : kinds, objects, and stages. To aid in readability of the formulas we present, we use  $k$  for kinds, but otherwise we do not distinguish between different subtypes of  $e$ .

- (46) *kind*       $\{ (\uparrow \text{PRED}) = \text{'KIND'} \langle \text{OBL}_{\text{OF}} \rangle \}$   
                   **MEANING CONSTRUCTOR 1**  
                    $\{ (\uparrow \text{OBL}_{\text{OF}} \text{PRED}) = \text{'PRO'} \}$   
                   **MEANING CONSTRUCTOR 2**  
                    $| [(\uparrow \text{CONCORD NUM}) = (\uparrow \text{OBL}_{\text{OF}} \text{INDEX NUM})] \Rightarrow [(\uparrow \text{CONCORD NUM}) = (\uparrow \text{INDEX NUM})] \}$   
                    $| (\uparrow \text{PRED}) = \text{'KIND'}$   
                   **MEANING CONSTRUCTOR 3 }**
- (47) *kinds*       $\{ (\uparrow \text{PRED}) = \text{'KIND'} \langle \text{OBL}_{\text{OF}} \rangle \}$   
                   **MEANING CONSTRUCTOR 1**  
                    $((\uparrow \text{OBL}_{\text{OF}} \text{PRED}) = \text{'PRO'})$   
                   **MEANING CONSTRUCTOR 2)**  
                    $| (\uparrow \text{PRED}) = \text{'KIND'}$   
                   **MEANING CONSTRUCTOR 3 }**  
                    $(\uparrow \text{CONCORD NUM}) = \text{PL}$   
                    $(\uparrow \text{INDEX NUM}) = \text{PL}$

As Zamparelli (1998: 260) notes, other forms such as *variety/varieties* also display the alternations in (48a)–(48b). Such forms would have similar lexical entries to the entry for *kinds*, and their compositional semantics would also be the same. They differ syntactically, however: unlike unmarked *kind*, the unmarked form *variety* is specified for singular number, and does not allow agreement mismatch, as shown in (48c).

- (48) a. this variety of dog/these varieties of dogs  
       b. dogs of these varieties  
       c. \*these variety of dogs/\*dogs of these variety

## 5.2 MEANING CONSTRUCTOR 1: *kind of dog*

Adopting the meaning in (45a) for *kind*, we propose that MEANING CONSTRUCTOR 1 is as in (49): this meaning constructor consumes the  $\langle e, t \rangle$ -type meaning of its  $\text{OBL}_{\text{OF}}$  argument and produces a  $\langle k, t \rangle$ -type meaning for the phrase headed by *kind*.

- (49) MEANING CONSTRUCTOR 1:  
 $\lambda Q_{\langle e, t \rangle} . \lambda x_k . [\forall z_e . \Box [\text{Realize}(z_e, x_k) \rightarrow Q(z_e)]] :$   
 $[((\uparrow \text{OBL}_{\text{OF}})_\sigma \text{VAR}) \multimap ((\uparrow \text{OBL}_{\text{OF}})_\sigma \text{RESTR})] \multimap [(\uparrow_\sigma \text{VAR}) \multimap (\uparrow_\sigma \text{RESTR})]$

In examples like *a kind of dog* or *kinds of dogs*,  $Q$  is provided by the  $\text{OBL}_{\text{OF}}$  phrase *of dog(s)*; we assume that *of* makes no semantic contribution, and so the meaning contributed by the  $\text{OBL}_{\text{OF}}$  phrase is just the meaning of *dog(s)*. Assuming the standard meaning constructor for *dog* in (50), we have the proof in (53) for *kind of dog*, using the labels  $k$  and  $d$  from the skeletal f-structure in (51) (see Section 4 for a more complete c-structure and f-structure for these examples).

- (50) Meaning constructor for *dog(s)*:  
 $\lambda x_e . \text{dog}(x_e) : (\uparrow_\sigma \text{VAR}) \multimap (\uparrow_\sigma \text{RESTR})$
- (51) Abbreviated f-structure for *kind of dog*:  
 $k : \left[ \begin{array}{l} \text{PRED} \quad \text{'KIND'} \langle \text{OBL}_{\text{OF}} \rangle \\ \text{OBL}_{\text{OF}} \quad d : \left[ \begin{array}{l} \text{PRED} \quad \text{'DOG'} \\ \text{PCASE} \quad \text{OBL}_{\text{OF}} \end{array} \right] \end{array} \right]$
- (52) Instantiated meaning constructors for *kind* and *dog*:  
   a.  $\text{KIND} = \lambda Q . \lambda x_k . [\forall z_e . \Box [\text{Realize}(z_e, x_k) \rightarrow Q(z_e)]] :$   
        $[(d_\sigma \text{VAR}) \multimap (d_\sigma \text{RESTR})] \multimap [(k_\sigma \text{VAR}) \multimap (k_\sigma \text{RESTR})]$   
   b.  $\text{DOG} = \lambda x_e . \text{dog}(x_e) : (d_\sigma \text{VAR}) \multimap (d_\sigma \text{RESTR})$

(53) Proof of the meaning of *kind of dog*:

$$\frac{\lambda Q.\lambda x_k.\lambda z_e.\Box[Realize(z_e, x_k) \rightarrow Q(z_e)] : \quad \lambda x_e.dog(x_e) : (d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})}{\lambda x_k.\lambda z_e.\Box[Realize(z_e, x_k) \rightarrow dog(z_e)] : (k_\sigma \text{ VAR}) \multimap (k_\sigma \text{ RESTR})}$$

### 5.3 MEANING CONSTRUCTOR 2: *kind* with elided OBL<sub>OF</sub>

It is also possible for the OBL<sub>OF</sub> complement of *kind* to be elided, as in an example like *This kind is friendly*. In that case, MEANING CONSTRUCTOR 2 combines with MEANING CONSTRUCTOR 1 to supply the missing resource. Here we do not provide a detailed treatment of the meaning of the elided complement or its anaphoric requirements, requiring only that it satisfy the requirement  $\lambda x_e.entity(x_e)$ : for an analysis of the compositional semantics of relational nouns and a discussion of elided OBL<sub>OF</sub> complements in a Glue setting, see Asudeh (2005).

(54) MEANING CONSTRUCTOR 2 =

$$\lambda x_e.entity(x_e) : ((\uparrow\text{OBL}_{\text{OF}})_\sigma \text{ VAR}) \multimap ((\uparrow\text{OBL}_{\text{OF}})_\sigma \text{ RESTR})$$

(55) Abbreviated f-structure for *kind* with elided OBL<sub>OF</sub> complement:

$$k : \left[ \begin{array}{l} \text{PRED} \quad \text{'KIND' } \langle \text{OBL}_{\text{OF}} \rangle \\ \text{OBL}_{\text{OF}} \quad p : \left[ \begin{array}{l} \text{PRED} \quad \text{'PRO'} \\ \text{PCASE} \quad \text{OBL}_{\text{OF}} \end{array} \right] \end{array} \right]$$

The proof of the meaning of *kind* with elided complement in (57) is obtained from the instantiated meaning constructors in (56). It is isomorphic to the proof of the meaning of *kind of dog* in (53).

(56) Instantiated meaning constructors:

a. MEANING CONSTRUCTOR 1 =

$$\lambda Q.\lambda x_k.\lambda z_e.\Box[Realize(z_e, x_k) \rightarrow Q(z_e)] : \quad [(p_\sigma \text{ VAR}) \multimap (p_\sigma \text{ RESTR})] \multimap [(k_\sigma \text{ VAR}) \multimap (k_\sigma \text{ RESTR})]$$

b. MEANING CONSTRUCTOR 2 =

$$\lambda x_e.entity(x_e) : (p_\sigma \text{ VAR}) \multimap (p_\sigma \text{ RESTR})$$

(57) Proof of the meaning of *kind* with elided complement:

$$\frac{\lambda Q.\lambda x_k.\lambda z_e.\Box[Realize(z_e, x_k) \rightarrow Q(z_e)] : \quad \lambda x_e.entity(x_e) : (p_\sigma \text{ VAR}) \multimap (p_\sigma \text{ RESTR})}{\lambda x_k.\lambda z_e.\Box[Realize(z_e, x_k) \rightarrow entity(z_e)] : (k_\sigma \text{ VAR}) \multimap (k_\sigma \text{ RESTR})}$$

We cannot use MEANING CONSTRUCTOR 2 in the derivation of the meaning of an example like *This kind of dog appeared*, since in this example, the meaning of the OBL<sub>OF</sub> complement is provided by the overt phrase *of dog*, and the contribution of MEANING CONSTRUCTOR 2 would go unused, rendering the derivation semantically incoherent. Crucially, we also cannot use this version of *kind* in the derivation of the meaning of examples like *dog of this kind*; for such examples, we must use MEANING CONSTRUCTOR 3, which integrates the meaning of the ‘DET<sub>K</sub> KIND’ constituent with the rest of the noun phrase to ensure semantic coherence. Recall that we assume that *of* as a marker of nominal dependents does not make a semantic contribution. Therefore, for adjuncts marked with *of*, it is the object of *of* which must perform the task of integrating its meaning with the rest of the clause. Otherwise, the semantic contribution of the *of* adjunct is not consumed, and remains at the end of the derivation, rendering the derivation semantically incoherent. In the current setting, if we used MEANING CONSTRUCTOR 1 and MEANING CONSTRUCTOR 2 as the meaning contribution of *kind* in the semantic derivation for an example like *A dog of this kind appeared*, we would end up with a meaning paraphrasable as *A dog appeared*, with the meaning of *this kind* remaining unintegrated and unused. In the next section, we will see how semantic composition proceeds for examples of the form ‘NOUN of DET<sub>K</sub> KIND’.

#### 5.4 MEANING CONSTRUCTOR 3: *dog of that kind*

Carlson (1977) discusses only examples of the form ‘KIND of NOUN’, and a major aim of Wilkinson’s (1991, 1995) and Zamparelli’s (1998) work is to extend Carlson’s analysis to the alternant ‘NOUN of DET<sub>K</sub> KIND’. We propose the meaning in (58) for *dog of that kind*.

$$(58) \quad \text{dog of that kind} = \\ \lambda y_e. \text{that}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)], \\ \lambda x_k. \text{Realize}(y_e, x_k)])$$

This is a property that holds of individuals  $y$  of type  $e$  if:

- there is a kind  $x$  such that every individual  $z$  that realizes  $x$  is a dog; and
- $y$  also realizes  $x$  (meaning that  $y$  is also a dog).

This is in fact very close to the meaning that Carlson (1977: 234) proposes for *such dog* in noun phrases like *every such dog* or *such a dog*, and also similar to Wilkinson’s proposal for *dog of that kind*. For a *dog of that kind*, we have:

$$(59) \quad \text{a dog of that kind} = \\ \lambda S. a(\lambda y_e. \text{that}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)], \\ \lambda x_k. \text{Realize}(y_e, x_k)]), \\ \lambda y_e. S(y_e))$$

As noted by Wilkinson (1991, 1995) and Zamparelli (1998), it is possible for the *kind* phrase to combine with various quantifiers in this construction, and to vary in its scope. For a *dog of every kind*, the wide scope reading is the only sensible reading, since it is not possible for an individual dog to be a realization of every kind of dog:

$$(60) \quad \text{a dog of every kind} = \\ \lambda S. \text{every}(\lambda x_k. \forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)], \\ \lambda x_k. a(\lambda y_e. \text{Realize}(y_e, x_k), \\ \lambda y_e. S(y_e)))$$

Thus, our meaning constructors must be able to derive both scopings.

We propose that MEANING CONSTRUCTOR 3 in fact consists of two separate meaning constructors which we will call KIND1 and KIND2.

$$(61) \quad \begin{array}{ll} \text{a.} & \text{KIND1} = \\ & \lambda Q. \lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow Q(z_e)]] : \\ & [((\text{ADJ} \in \uparrow)_\sigma \text{VAR}) \multimap ((\text{ADJ} \in \uparrow)_\sigma \text{RESTR})] \multimap [(\uparrow_\sigma \text{VAR}) \multimap (\uparrow_\sigma \text{RESTR})] \\ \text{b.} & \text{KIND2} = \\ & \lambda x_k. \lambda y_e. \text{Realize}(y_e, x_k) : \\ & \uparrow_\sigma \multimap ((\text{ADJ} \in \uparrow)_\sigma \text{VAR}) \multimap ((\text{ADJ} \in \uparrow)_\sigma \text{RESTR}) \end{array}$$

The scope ambiguity that distinguishes (59) and (60) is due to the different ways in which these two meaning constructors can combine. The left-hand/meaning side of KIND1 is the same as MEANING CONSTRUCTOR 1: when applied to its argument  $Q$ , it requires that all individuals realizing the kind  $x_k$  are  $Q$ s. The right-hand/glue side of KIND1 requires this meaning to be assembled in a different way from MEANING CONSTRUCTOR 1, however: as is typical for adjuncts, this version of *kind* ‘looks upward’, to the f-structure within which it is an adjunct, to find and consume its argument  $Q$ , and produces a modified meaning which depends on  $Q$ . Unlike a typical adjunct, however, KIND1 associates the modified meaning not with the main f-structure, but with the subordinate adjunct. The meaning constructor KIND2 specifies that the kind  $x$  identified by KIND1 realizes the individual  $y$ , and associates this relation with

the subordinate adjunct and the contribution of the head noun. The full set of premises and proof for *A dog of that kind barked* are given in Figure 1, and for *A dog of every kind barked* are given in Figure 2. Notably, the premise labeled DOG and the premise labeled KIND2 each produce a meaning associated with the resource  $(d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})$ , and the premise labeled A/EVERY and the premise labeled KIND1 are each required to consume that resource. The different scope possibilities for these two sentences arise when the premises are combined in different orders, as can be seen by inspection of the proofs.

Independent evidence for this analysis is provided by Zamparelli's (1998) observation that the  $\text{DET}_K$  KIND constituent in the 'NOUN of  $\text{DET}_K$  KIND' construction cannot be replaced by a pronoun, as shown in (62a). This is because, as discussed in Section 5.3, the semantic contribution of the 'of  $\text{DET}_K$  KIND' phrase must be managed by the KIND noun: this is accomplished by meaning constructors KIND1 and KIND2, contributed by the **kind/sort/type** noun. Crucially, replacing KIND with a pronoun means that KIND1 and KIND2 are not contributed, and so the *of*-phrase cannot be semantically integrated. Example (62b) shows that this is not a general fact about pronominalization of **kind/sort/type** expressions, but a fact about the KIND complement in the 'NOUN of  $\text{DET}_K$  KIND' construction.

(62) Zamparelli (1998: 265–266):

- a. \*As for that kind, **an animal of it** was first described by Darwin. (**it** = that kind)
- b. As for this kind of animal, **a description of it** was first done by Darwin. (**it** = that kind of animal)

## 5.5 Comparison with Wilkinson and Zamparelli

Wilkinson (1991, 1995) does not discuss examples like *This kind is friendly*, in which the complement of *kind* is elided. She makes two proposals for the compositional semantics of non-elliptical **kind/sort/type** constructions. According to her first proposal, there is an alternative version of *kind*, shown in (63a), which does not take a complement. This is the version that is relevant in her analysis of 'NOUN of  $\text{DET}_K$  KIND'; it is a simple, nonrelational predicate that refers to kinds in general. This analysis also requires *of* in *a dog of that kind* to have the semantics of predication: in (63),  $\pi$  is the predication operator, usually written as ' $\cup$ ' (Chierchia 1998: see footnote 3) or 'pred' (Partee 1986). This has the result that *a dog of that kind* in (63b) means *a dog that has the property of being that kind*. Zamparelli (1998) points out that this analysis incorrectly conflates a kind with an instance of the kind. He also notes that it is not clear what determines whether *of* is semantically contentful (as is required in the 'NOUN of  $\text{DET}_K$  KIND' construction on Wilkinson's analysis) or semantically empty (as is required in the 'KIND of NOUN' construction).

(63) Meaning of *a dog of that kind*, Wilkinson's (1991, 1995) proposal 1:

- a. Alternative meaning of *kind* =  $\lambda x_k. \text{kind}(x_k)$
- b. Meaning of *a dog of that kind* =  
 $\lambda P. \exists z_e. [\text{dog}(z_e) \wedge \pi(\iota y. \text{kind}(x_k) \wedge y = x_k)(z_e) \wedge P(z_e)]$
- c. Meaning of *a dog of every kind* =  
 $\lambda P. \forall x_k. \text{kind}(x_k) \rightarrow \exists y_e. [\text{dog}(y_e) \wedge \pi(x_k, y_e) \wedge P(y_e)]$

In an example like *a dog of every kind* in (63c), *kind* is universally quantified, not limited to kinds of dogs: thus, on Wilkinson's analysis, *A dog of every kind arrived* means that for every possible kind (of dog, cat, car, building, ...), a dog of that kind arrived. This is problematic, as noted by both Wilkinson and Zamparelli. Zamparelli (1998: 264) shows that pragmatic accommodation does not seem to be a good solution to this problem, since general strategies for suspending pragmatic accommodation do not have the expected effect: in *A dog of literally every kind appeared*, reference is still only to kinds of dogs. We agree with Zamparelli (1998: 266) that 'a kind is always a kind of something', and that the meaning in (63) is not appropriate for *kind*. These shortcomings motivate Wilkinson's second proposal for examples like *dog of that kind*, which adopts the same representation of the meaning of *kind* as in *this kind of dog*, repeated from (45a):

$$b : \left[ \begin{array}{c} \text{PRED 'BARK'} \\ \text{PRED 'DOG'} \\ \text{DEF} - \\ \text{SUBJ } d : \left[ \begin{array}{c} \text{ADJ} \left\{ k : \left[ \begin{array}{c} \text{DEF} + \\ \text{DEIXIS DIST} \\ \text{PRED 'KIND'} \\ \text{PCASE OBL.OF} \end{array} \right] \right\} \end{array} \right] \end{array} \right]$$

Premises:

A  $\lambda R. \lambda S. a(\lambda y_e. R(y_e), \lambda y_e. S(y_e)) : [(d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})] \multimap [VS. [d_\sigma \multimap S] \multimap S]$

DOG  $\lambda x_e. \text{dog}(x_e) : (d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})$

THAT  $\lambda R. \lambda S. \text{that}(\lambda x_k. R(x_k), \lambda x_k. S(x_k)) : [(k_\sigma \text{ VAR}) \multimap (k_\sigma \text{ RESTR})] \multimap [VS. [k_\sigma \multimap S] \multimap S]$

KIND1  $\lambda Q. \lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow Q(z_e)]] : [(d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})] \multimap [(k_\sigma \text{ VAR}) \multimap (k_\sigma \text{ RESTR})]$

KIND2  $\lambda x_k. \lambda y_e. \text{Realize}(y_e, x_k) : k_\sigma \multimap (d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})$

BARK  $\lambda x_e. \text{bark}(x_e) : d_\sigma \multimap b_\sigma$

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="border-bottom: 1px solid black; padding-bottom: 5px;"> <p style="text-align: center;">THAT</p> <math display="block">\frac{\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : (k_\sigma \text{ VAR}) \multimap (k_\sigma \text{ RESTR})}{\lambda S. \text{that}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : \lambda x_k. S(x_k)) : VS. ((k_\sigma \multimap S) \multimap S)}</math> </div> <div style="border-bottom: 1px solid black; padding-bottom: 5px;"> <p style="text-align: center;">KIND1</p> <math display="block">\frac{\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : \lambda x_k. \text{Realize}(X_2, x_k)) : (d_\sigma \text{ RESTR})}{\text{that}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : \lambda x_k. \text{Realize}(X_2, x_k)) : VS. (d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})} \rightarrow I_2</math> </div> <div style="border-bottom: 1px solid black; padding-bottom: 5px;"> <p style="text-align: center;">A</p> <math display="block">\frac{\lambda S. a(\lambda y_e. \text{that}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : \lambda x_k. \text{Realize}(y_e, x_k)), S(x_k)) : VS. (d_\sigma \multimap S) \multimap S}{a(\lambda y_e. \text{that}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : \lambda x_k. \text{Realize}(y_e, x_k)), \lambda y_e. \text{bark}(y_e)) : b}</math> </div> | <div style="border-bottom: 1px solid black; padding-bottom: 5px;"> <p style="text-align: center;">KIND2</p> <math display="block">\frac{\lambda y_e. \text{Realize}(y_e, X_1) : (d_\sigma \text{ VAR}) \multimap (d_\sigma \text{ RESTR})}{\text{Realize}(X_2, X_1) : (d_\sigma \text{ RESTR})} \frac{[X_2 : (d_\sigma \text{ VAR})]_2}{\rightarrow I_1}</math> </div> <p style="text-align: center;">BARK</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Figure 1: F-structure, premises, and proof for *A dog of that kind barked*

$$\begin{array}{c}
\left[ \begin{array}{c} \text{PRED 'BARK'} \\ \text{DEF} - \\ \text{SUBJ } d : \left[ \begin{array}{c} \text{PRED 'DOG'} \\ \text{SPEC [PRED 'EVERY']} \\ \text{ADJ } \left\{ \begin{array}{c} k : \left[ \begin{array}{c} \text{PRED 'KIND'} \\ \text{PCASE OBL-OF} \end{array} \right] \end{array} \right\} \end{array} \right] \end{array} \right] \\
a :
\end{array}
\end{array}$$
  

$$\begin{array}{ll}
\text{Premises:} & \text{A} \quad \lambda R. \lambda S. a(\lambda y_e. R(y_e), \lambda y_e. S(y_e)) : [(d_\sigma \text{ VAR} \multimap (d_\sigma \text{ RESTR})) \multimap [\forall S. [d_\sigma \multimap S] \multimap S]] \\
& \text{DOG} \quad \lambda x_e. \text{dog}(x_e) : (d_\sigma \text{ VAR} \multimap (d_\sigma \text{ RESTR})) \\
& \text{EVERY} \quad \lambda R. \lambda S. \text{every}(\lambda x_k. R(x_k), \lambda x_k. S(x_k)) : [(k_\sigma \text{ VAR} \multimap (k_\sigma \text{ RESTR})) \multimap [\forall S. [k_\sigma \multimap S] \multimap S]] \\
& \text{KIND1} \quad \lambda Q. \lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow Q(z_e)]] : [(d_\sigma \text{ VAR} \multimap (d_\sigma \text{ RESTR})) \multimap [(k_\sigma \text{ VAR} \multimap (k_\sigma \text{ RESTR}))]] \\
& \text{KIND2} \quad \lambda x_k. \lambda y_e. \text{Realize}(y_e, x_k) : k_\sigma \multimap (d_\sigma \text{ VAR} \multimap (d_\sigma \text{ RESTR})) \\
& \text{BARK} \quad \lambda x_e. \text{bark}(x_e) : d_\sigma \multimap b_\sigma
\end{array}$$
  

$$\begin{array}{c}
\text{EVERY} \quad \frac{\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]] : ((k_\sigma \text{ VAR} \multimap (k_\sigma \text{ RESTR}))}{\lambda S. \text{every}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]]], \lambda x_k. S(x_k)) : \forall S. ((k_\sigma \multimap S) \multimap S)} \quad \text{KIND1} \quad \text{DOG} \\
\frac{\lambda S. \text{every}(\lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)]]], \lambda x_k. a(\lambda y_e. \text{Realize}(y_e, x_k), \lambda y_e. \text{bark}(y_e)) : b}{\lambda S. a(\lambda y_e. \text{Realize}(y_e, X_1), \lambda y_e. S(y_e)) : \forall S. ((d_\sigma \multimap S) \multimap S)} \quad \text{KIND2} \quad \frac{[X_1 : k_\sigma]_1}{\lambda y_e. \text{Realize}(y_e, X_1) \multimap (d_\sigma \text{ RESTR})} \quad \text{A} \\
\frac{\lambda S. a(\lambda y_e. \text{Realize}(y_e, X_1), \lambda y_e. S(y_e)) : \forall S. ((d_\sigma \multimap S) \multimap S)}{a(\lambda y_e. \text{Realize}(y_e, X_1), \lambda y_e. \text{bark}(y_e)) : b} \quad \text{BARK} \\
\frac{\lambda X_1. a(\lambda y_e. \text{Realize}(y_e, X_1), \lambda y_e. \text{bark}(y_e)) : (k_\sigma \multimap b)}{\lambda X_1. a(\lambda y_e. \text{Realize}(y_e, x_k), \lambda y_e. \text{bark}(y_e)) : b} \rightarrow t_1
\end{array}$$

Figure 2: F-structure, premises, and proof for *A dog of every kind barked*

$$(64) \quad \text{kind} = \lambda Q_{\langle e, t \rangle}. \lambda x_k. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow Q(z_e)]]$$

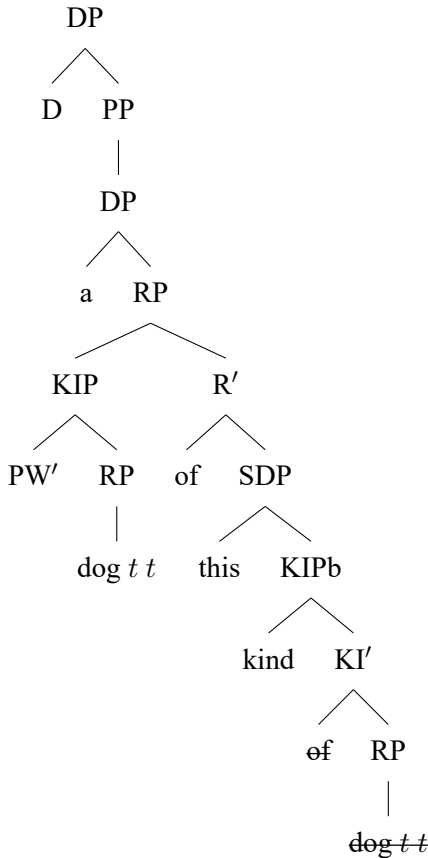
For an example like *a dog of this kind*, Wilkinson proposes that function composition allows this meaning to combine first with the determiner *this*, and then (eventually) with *dog*. This produces the following meaning:

$$(65) \quad \text{Meaning of } a \text{ dog of that kind, Wilkinson's (1991, 1995) proposal 2:} \\ \lambda Q. \exists v. [\pi(\iota y. [\forall z_e. \Box [\text{Realize}(z_e, x_k) \rightarrow \text{dog}(z_e)] \wedge y = x_k])(v) \wedge Q(v)]$$

However, as Wilkinson points out, it still does not allow for a compositional analysis of examples like *a dog of every kind*, in which *every* takes wide scope.

Zamparelli (1998) does not provide an explicit representation of the meaning of an example like *a dog of this kind*; instead, he provides the syntactic structure in (66) which, he says, is associated with the appropriate meaning. As in our analysis, the crucial aspect of this structure is that *dog* is semantically an argument of *kind*: this is accomplished by movement and deletion of structures conforming to his theory of the structure of the DP, together with certain ‘backup strategies’ for adjustment of types. As noted above, constructions like *this kind of dog* and *a dog of this kind* do not seem to have special syntactic properties that must be captured by special syntactic representations, and we prefer a solution that locates the special properties of these constructions in lexical specifications and the compositional semantics, not the syntax.

(66) Syntactic structure of *a dog of this kind* according to Zamparelli (1998):



## 6 Conclusion

We have examined two constructions involving **kind/sort/type**: the ‘DET<sub>K</sub> KIND (of NOUN)’ construction and the ‘NOUN of DET<sub>K</sub> KIND’ construction. On the syntactic side, we have found that there is no justification for positing special syntactic structure for these examples to handle the number mismatch

cases: these are due to grammaticalization of unmarked *kind/sort/type*, with loss of intrinsic number features. On the semantic side, a modifier like ‘of DET<sub>K</sub> KIND’ ‘reaches up’ in the syntactic structure to retrieve the semantics of the head, like other modifiers; it then manages the contribution of the head and its integration into the meaning of the rest of the sentence in such a way as to produce an ambiguity which would be hard to achieve outside of a glue setting. Much work remains to be done, including exploring connections to the syntax and semantics of other constructions with *of*, such as pseudopartitives and *of*-possessives.

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This paper builds on the work that Tracy King and I have done together on features and agreement in the noun phrase, including King & Dalrymple (2004), Dalrymple, King & Sadler (2009), and Dalrymple & King (2019). I am grateful to Miriam and Tracy for their hard work for the LFG community, and I look forward to many more years of fruitful collaboration. I also thank Dag Haug and Gianluca Giorgolo for providing the provers that were used to check the proofs in Figures 1 and 2, and Bozhil Hristov, Adam Przepiórkowski, and Nigel Vincent for very helpful comments on earlier versions.

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# From space to the grammar of affectedness: Semantics, syntax, and pragmatics of Kodhi DAT marking

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## 1 Introduction

This paper discusses the intricacies of the syntax-semantics interface of dative (DAT) marking within the broader index-based case-series system (NOM/ACC/DAT/GEN) in Kodhi (ISO 639-3: kod), an Austronesian language of the Sumba-Hawu subgroup within the higher-level subgroup Bima-Lembata. Kodhi is spoken by roughly 100,000 people on the southwestern tip of Sumba Island in Eastern Indonesia (see Figure 1 below). Dative (DAT) marking is of central typological and theoretical interest. Typologically, it is a primary means of the cross-linguistic expression of the participant roles recipient (R) or beneficiary while also often expressing a wide range of grammatical and semantic relations, extending to a variety of other participant roles, including goals, and even non-canonical subjects. The term ‘dative’ itself is historically rooted in the Latin *dare* ‘to give’, “meant to reflect a participant who is a recipient, either of an object or of a more abstract entity” (Butt 2006: 14). This link between morphological case and perceived semantic function, as Butt shows, shaped how case categories have been understood since antiquity, with traditional case names encoding semantic assumptions about event participants. The diversity in the realization and function of dative marking – sometimes as a prepositional phrase, sometimes as a morphological case (including inflected pronominal index clitics as discussed in Kodhi in this paper) – makes it a crucial parameter for comparative grammar and typology (Blake 2001: 101–104; Malchukov et al. 2010).

Theoretically, dative marking is a focal point for debates about argument structure, case assignment, and the mapping between syntax and semantics. Modern ‘Localist’ theories, which Butt (2006: 14–15) traces to Gruber (1965), explicitly posit that spatial notions are fundamental to human conceptualization of events and therefore also to the participants in events. Participants are marked explicitly by case in order to identify their particular roles, for example, a dative marks a recipient. Furthermore, other theories such as Role and Reference Grammar (RRG) and Optimality Theory (as discussed by Butt 2006: ch. 8) highlight that the assignment of dative often interacts with hierarchies of semantic roles, prominence, and markedness, and can serve as a default for third, non-core arguments in many languages (Butt 2006: 208–210). This complex interface of semantic roles and grammatical relations in dative marking is, as we demonstrate in this paper, also seen in Kodhi. These theoretical perspectives underscore that dative marking not only reflects cross-linguistic patterns of argument realisation but also illuminates the interplay between morphology, syntax, and event semantics, making it a key phenomenon for both descriptive typology and theoretical models of grammar.

In this section, we provide fresh data on pronominal DAT marking in Kodhi, highlighting its intriguing DAT-marking patterns (e.g., double DAT marking with T (theme) also marked by DAT and the role of DAT in encoding epistemic modality) while also pointing out its typological commonalities (e.g., its

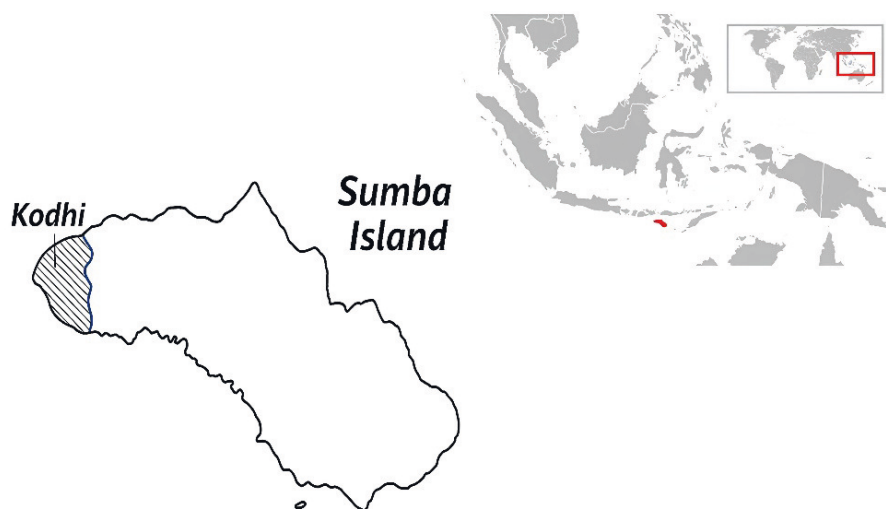


Figure 1: Kodhi in western Sumba, Indonesia.<sup>1</sup>

prototypical function of encoding R).<sup>2</sup> We offer an LFG (Lexical-Functional Grammar)-based analysis to capture the intricacies of DAT marking in Kodhi, demonstrating how LFG’s modular and parallel architecture (e.g., explicit integration of phrase structure rules and argument structure linking) can capture the distributional complexities of the pronominal DAT marking but also other pronominal indexes in Kodhi. We incorporate insights from Localist and cognitive frameworks (Gruber 1965, Jackendoff 1990, Lakoff & Johnson 1980, Lakoff 1987), showing that the mapping of spatial schemas onto more abstract domains (such as transfer and possession) provides a conceptual basis for the grammaticalization of DAT. Thus, the DAT marker in Kodhi can be seen as a linguistic reflex of the more general conceptual metaphor: “POSSESSION/TRANSFER IS MOTION TO LOCATION” (Lakoff & Johnson 1980: 32–38). By situating the analysis within cognitive-based typological and theoretical studies of case marking – or, in our term for the Kodhi system, pronominal index-based case-series marking<sup>3</sup> – and affectedness (cf. Andrews 1996, Hole et al. 2006), this paper contributes to our understanding of Austronesian morphosyntax and enriches broader discussions on the interplay of syntax, semantics, and morphology.

This paper is structured as follows. Section 2 provides an overview of Kodhi morphosyntax, outlining basic clausal structures related to transitivity and grammatical relations, and sets the stage for the discussion of DAT marking and related issues. Section 3 presents the LFG analysis, incorporating localist theoretical insights into the argument mapping and index-based case-series assignment. This is followed by a discussion of the discourse-information interface in Section 4. Conclusions and final remarks are presented in Section 5.

<sup>1</sup>© Gunkarta / CC-BY-SA-3.0 Wikimedia Commons, insert map of Indonesia

<sup>2</sup>Following common typological practice (among others, Comrie 1978, Dixon 1979, Croft 2002, Haspelmath 2007), we use A for the most agent-like argument of a transitive predicate, P for the prototypical patient-like argument in monotransitives, and R (‘recipient’) and T (‘theme’) for the two non-subject arguments of ditransitives (e.g. give-type predicates). These labels are descriptive role labels used for cross-linguistic comparison; they do not by themselves determine grammatical-function status (e.g. OBJ1/OBJ2), which is handled separately in the LFG linking analysis.

<sup>3</sup>We use the term ‘case-series’ to describe the Kodhi case system in order to avoid Indo-European NP-case assumptions (e.g. that a grammatical function/relation has a unique case value). We want to underline that, while pronominal indexes and their case-series values in Kodhi play a role in encoding grammatical relations, they also contribute to discourse-pragmatic meanings such as mirativity (Section 2.2.3) and to definiteness- and affectedness-related construals (Section 4). In this system, a single grammatical relation may therefore bear more than one case-series value.

|          | Free pronoun | Bound pronominal |         |          |          |
|----------|--------------|------------------|---------|----------|----------|
|          |              | NOM              | ACC     | DAT      | GEN      |
| 1SG      | yayo         | ku=              | =gha    | =ngga    | =nggu    |
| 2SG      | yoyyo        | Ø=               | =ghu    | =nggu    | =mu      |
| 3SG      | dhiyo        | na=              | =ya     | =ni~=nya | =na~=nya |
| 1PL.INCL | yicca        | ta=              | =nda    | =nda     | =nda     |
| 1PL.EXCL | yamma        | ma=              | =ghamma | =nggamma | =ma      |
| 2PL      | yemmi        | mi=              | =ghummi | =nggummi | =mi      |
| 3PL      | dhiyo        | a=               | =hi     | =ndi     | =dha     |

Table 1: Kodhi pronominal paradigm

## 2 Kodhi morphosyntax

### 2.1 Kodhi in the Austronesian typology: a brief overview

Typologically, Kodhi is an SVO language. Unlike its northern Flores neighbouring languages such as Manggarai and Rongga (Arka 2007, Arka & Wouk 2014), which are highly isolating, Kodhi shows agglutinating morphology,<sup>4</sup> although not as rich as its distant Indonesian-type relatives such as Balinese. Notably, Kodhi has almost completely lost its verbal voice morphology. Hence, unlike Indonesian-type languages, Kodhi lacks voice marking (e.g., the homorganic nasal prefixes in Balinese: Arka 2003b) and related voice alternations.<sup>5</sup> Kodhi has evolved to become a fully-fledged head-marking language (Ghanggo Ate 2020). The full sets of Kodhi pronominal index clitics are given in Table 1.

A brief clarification on clitic ‘positioning’ is in order. The labels in Table 1 (NOM, ACC, DAT, GEN) refer to clitic series and their syntactic/distributional functions, not to fixed morphological positions within a verb. In Kodhi, the same argument function may be indexed by different series depending on predicate type; for instance, intransitive S may appear as a NOM proclitic with dynamic predicates, but as an ACC enclitic with stative/non-verbal predicates (cf. the examples in (10)–(12) below). This distribution also supports treating these bound pronouns as clitics,<sup>6</sup> since they are not confined to lexical verbal stems and may attach to non-verbal predicate hosts (e.g. as in (12) and (26)) or to a preverbal auxiliary (as in (42a)).

In the context of Austronesian typology, Kodhi aligns with indexing-type languages (cf. Arka & Yeh 2023), relying on a clitic-based indexing system to express grammatical relations. This is a feature of Austronesian languages of Eastern Indonesia.

### 2.2 Basic clausal syntax and grammatical relations

In this subsection, we first discuss prototypical transitivity, alignment, and word order in Kodhi (Section 2.2.1). We then examine pronominal index marking across different valence structures, focusing on ditransitive predicates (Section 2.2.2), followed by the complexities of split intransitivity (Section 2.2.3).

<sup>4</sup>Typologically, Kodhi is an agglutinative language, with clearly segmentable morphemes that encode distinct grammatical and semantic functions. Its morphological system includes both derivational affixes (e.g., *pa-~ha-* for causatives, *pa-* for multiplicative verbalizer, *ha-* for separative, and the pluractional prefix *h-* for certain plural deictic and existential verbs) and the inflectional infix <y>, which functions as a personal definite article that marks third-person reference.

<sup>5</sup>Remnants of a homorganic nasal are observed in a few verbal pairs, appearing both with and without differences in meaning. For example: *puloko* vs. *mbuloko* ‘to break’ vs. ‘to be(come) broken’, and *ponggo* vs. *monggo* ‘to cut’ (in free alternation).

<sup>6</sup>While analysed as clitics, these bound pronominals appear to have become morphologized to a certain degree, acquiring affixal properties. For example, they may trigger phonological processes such as vowel lengthening and stress shifts, and they also undergo vowel harmony and palatalization, reflecting a high degree of prosodic and morphological integration (Ghanggo Ate forthcoming).

## 2.2.1 Transitivity, alignment, and linear order

Following Haspelmath's typological approach to argument indexing (Haspelmath 2013) and to the division of labour between indexing and flagging (Haspelmath 2019), we treat Kodhi as employing a coindexing system: bound person forms (e.g. *na*= in (1)–(2)) – henceforth *pronominal indexes*, or simply *indexes* – that identify a participant on the predicate can cooccur with an overt co-referential NP/pronoun (*conominal* in Haspelmath's terms). This perspective is particularly useful for Kodhi – and for many Austronesian languages including Sigulai (Akoli et al. 2025) and Mentawai (Keith & Arka 2025) – because bound person forms are widespread and may appear with, or without, an overt nominal. Typologically, this is a very common strategy cross-linguistically (often called *cross-referencing*), and it provides a neutral comparative vocabulary for describing systems where bound person forms do not behave like canonical grammatical 'agreement markers' in familiar Indo-European-type paradigms.

We emphasise *indexing* rather than *agreement* because the Kodhi system goes beyond simple feature matching: it includes double/triple indexing patterns and constructional uses in which particular coindexing configurations contribute additional meaning – e.g. mirativity effects (see Section 2.2.3, examples (16)–(17)) and systematic contrasts in affectedness reflected in ACC vs. DAT selection (see Section 3, examples (36)–(37)). In short, the coindexing system in Kodhi not only tracks reference but also participates in the grammar of event construal.<sup>7</sup>

The prototypical clausal syntax in Kodhi, as indicated by the coindexing patterns of transitive arguments (A vs. P) and the sole intransitive argument (S), broadly follows a nominative-accusative alignment. Key examples illustrating the alignment are presented in (1)–(3), where the same clitic form *na*= '3SG' is used for the agentive S ((1)) and transitive A ((2)–(3)). This is in contrast with '3SG' appearing in distinct forms (e.g. *=ya* in (2)) when it appears as P/OBJ. However, note that transitive structures require different object markings depending on their verb class, which are related to the affectedness involved. An affected object (OBJ) is marked with ACC ((2)) while a stimulus non-affected object (OBJ) is marked with DAT (3).<sup>8</sup> Thus, we notice a split in the OBJ marking (i.e., differential OBJ marking), a phenomenon that we will explore in greater depth in the subsequent discussions.<sup>9</sup>

- (1) Nandendek.  
*na*=ndende=ka  
 3SG.NOM=stand=PFV  
 'He has stood.' [S:*na*=]<sub>NOM</sub>
- (2) ([Ariwenya Ismasmulan]) nagharuya.  
*ariweyyo*=na Ismasmulan *na*=gharru=*ya*  
 [wife=3SG.GEN PN]<sub>i</sub> [3SG.NOM]<sub>i</sub>=pull=3SG.ACC  
 'Ismasmulan's wife pulled it.' [A: *na*=]<sub>NOM</sub> vs. [P: *=ya*]<sub>ACC</sub>

<sup>7</sup>We also adopt Haspelmath's recommendation of using the term '(pronominal) indexing' to prioritise the basic contrast bound vs. free (rather than committing to a universal affix/clitic/word trichotomy), since affix-clitic diagnostics often fail to generalise well across languages. Accordingly, we speak of pronominal indexes (bound forms) and conominals (free NPs/pronouns) and model their relationship as optional coindexing/cross-indexing. This analysis is fully compatible with an LFG 'agreement' treatment (cf. Bresnan & Mchombo 1987 analysis of Chichewa, among others), in the sense that the index and the co-referential nominal must be referentially compatible.

<sup>8</sup>We avoid the terms 'direct object' and 'indirect object' by using OBJ, or OBJ1 and OBJ2, in discussing two objects, because Kodhi does not instantiate a single stable ditransitive alignment (cf. Dryer 1986, Haspelmath 2007). The term 'indirect object' is appropriate only for an indirective system in which R is coded differently from T/P. As discussed in Section 2.2.2, Kodhi instead shows mixed object-coding behaviour across ACC, DAT, and GEN series, with different constructions yielding different patterns. For this reason, the DAT-marked argument in (3) is simply called OBJ but it may also be referred to as 'indirect object' informally in the limited sense that it is marked in the same way as R.

<sup>9</sup>Glosses follow the Leipzig glossing conventions, with the addition of the following: AUG=augmentative, CNJ=conjunction; EMP=emphatic; INTR=intransitive; MOD=modal; MOT=motion; NTR=neutral; PN=proper name; SUB=subordinate.

- (3) ([A laghina]) nambanini.  
 a laghi=na na=mbani=ni  
 [DEF.SG husband=3SG.GEN]<sub>i</sub> [3SG.NOM]<sub>i</sub>=be.angry=3SG.DAT  
 ‘Her husband is angry at **her**.’ [A: na=]<sub>NOM</sub> vs. [P: =ni]<sub>DAT</sub>

For now, we set aside additional complexities (particularly ditransitives, discussed in Section 2.2.2), and present in (4) a core clause template that brings together three basic properties of Kodhi clause structure:

- (i) coding of core arguments by pronominal indexes and their case series (NOM vs ACC/DAT),
- (ii) the option of co-occurring free conominals (coindexing), and
- (iii) the default linear order of these elements.

In terms of grammatical alignment/coding, what is relevant here is that S/A roles are typically indexed by the NOM series, while P roles are indexed by the ACC or DAT series; (4) simply indicates where these indexes occur relative to the predicate and how they relate to SUBJ and OBJ functions.

The coindexing system in Kodhi is shown in (4) by the optional free NPs in parentheses and the coindexing indices (*i/j*). This reflects the possibility that pronominal indexes may be accompanied by co-referential free NPs, which are typically motivated by discourse or semantics; for instance to provide additional referential specificity or to mark pragmatic prominence, such as (new/contrastive) TOPIC (e.g., ‘*Ismasmulan’s wife*’ in (2)). However, as we show later, an argument can also appear as a bare, non-indexed NP, typically when it is indefinite/unspecific or generic, as further discussed in Section 4.

- (4) Kodhi core clause template (coding, coindexing, and word order)

|                              |       |                                                |                                            |                                                    |                             |
|------------------------------|-------|------------------------------------------------|--------------------------------------------|----------------------------------------------------|-----------------------------|
| [(NP <sub>i</sub> )<br>TOPIC | (AUX) | [CL= <sub>i</sub><br>[S/A: NOM] <sub>SBJ</sub> | VERB<br>=CL <sub>i</sub> ] <sub>V(P)</sub> | (NP <sub>j</sub> *)<br>[P: ACC/DAT] <sub>OBJ</sub> | ]CORE-CLAUSE<br>ARG/ADJUNCT |
|------------------------------|-------|------------------------------------------------|--------------------------------------------|----------------------------------------------------|-----------------------------|

The template in (4) also illustrates Kodhi’s default SVO order and the placement of core pronominal indexes relative to the verb. This order generally holds, even when free coindexing NPs are present: that is, the SBJ and OBJ free coindexing NPs typically appear preverbally and postverbally respectively. Since coindexing NPs in Kodhi are optional alongside indexing clitics, they show greater positional flexibility than the bound indexes; in this sense they behave more like adjunct-like elements in linear placement, even though they are co-referential with core grammatical functions.

Word order variation is particularly evident in pragmatically marked structures, which involve an extended sentence structure with salient elements fronted to the sentence-initial, left-peripheral position. This fronted element may serve as a contrastive TOPIC or frame setter (Krifka & Musan 2012, Krifka 2008, Arka & Sedeng 2018). Consider example (5), where a free NP (*wawi* ‘pig’) – coindexing the OBJ (which is typically postverbal) – appears before the free pronoun subject *bhana*, serving as a pronominal copy for the framesetter *Njyomi*. The fronted OBJ can be analysed as bearing a contrastive (secondary) TOPIC.

- (5) Njyomi, a wawi eme bhana nja [nakahiya]<sub>V(P)</sub>,  
 Nj<y>omi a wawi eme bhana nja na=kahi=ya  
 [PN<DEF.3SG >]<sub>i</sub> [DEF.SG pig]<sub>i</sub> later [SUB.3SG]<sub>i</sub> NEG [3SG.NOM]<sub>i</sub>=buy=[3SG.ACC]<sub>i</sub>  
 kumbanini.  
 ku=mbani=ni  
 1SG.NOM=be.angry=[3SG.DAT]<sub>i</sub>  
 ‘As for Njomi, (if) he doesn’t buy the pig later, I will scold him.’

### 2.2.2 Ditransitive constructions

Ditransitive clauses in Kodhi given in (6) are structurally marked by the use of multiple pronominal clitics, allowing the language to distinguish between two object arguments – typically R (i.e., a recipient/beneficiary or goal) and T (i.e., a theme or transferred entity), in addition to the subject argument (A). The basic structural template for a ditransitive construction may involve the stacking of R and T enclitics, as seen in Pattern 1 in (6). However, we also have Patterns 2 and 3 when the verb only hosts one object clitic, either DAT or GEN.

#### (6) Ditransitive Clause Construction:

|           | [CL=     | [VERB =CL                  | =CL] <sub>V(P)</sub>   | (NP and/or PP) ] <sub>S</sub> |
|-----------|----------|----------------------------|------------------------|-------------------------------|
| Pattern 1 | [A: NOM] | [R: DAT/GEN ] <sub>j</sub> | [T: DAT ] <sub>j</sub> | T ] <sub>j</sub>              |
| Pattern 2 | [A: NOM] | [R: DAT/GEN ] <sub>j</sub> |                        | T R ] <sub>j</sub>            |
| Pattern 3 | [A: NOM] | [T: ACC ] <sub>j</sub>     |                        | T ] <sub>j</sub> R            |
|           | SBJ      | OBJ1                       | OBJ2                   |                               |

Of particular interest in the patterns shown in (6) is how the formal make-up of pronominal indexes (i.e., their case-series shapes) and the way they co-occur (or fail to occur) in a single predicate reveal the principles that constrain clitic stacking vs. non-stacking in Kodhi. These patterns allow Kodhi to encode not only semantic roles – such as T(heme) and R(ecipient) – but also participant relationships, i.e., the *inferred relation between those participants within the event*, such as whether the transfer event entails or implicates that R becomes (or is intended to become) the possessor of T. This contrast is visible in the Pattern 1 alternations: in (7a), where R is marked by GEN, the recipient is construed as the intended possessor/beneficiary of T, whereas in (7b), where R is marked by DAT, this possessor inference does not arise. The GEN pattern – encoding R not only as receiver but also as (intended) possessor of *ndingi* ‘money’ (hence benefiting from the event) – has been noted and well documented for Oceanic languages (e.g. Lau/Mala and Toqabaqita), which Lichtenberk (2002) characterises as the ‘possessive-benefactive connection’.

#### (7) Pattern 1:

- a. Kuwonani dhiyo ndingi.  
ku=woyyo=na=ni dhiyo ndingi  
1SG.NOM=give=[3SG.GEN]<sub>j</sub>=[3SG.DAT]<sub>j</sub> [3SG]<sub>j</sub> [money]<sub>j</sub>  
‘I gave her the money.’ (She was the target owner of the money.)
- b. Kuwondini manu dhi.  
ku=woyyo=ndi=ni manu dhiyo  
1SG.NOM=give=[3PL.DAT]<sub>j</sub>=[3SG.DAT]<sub>j</sub> [chicken]<sub>j</sub> [3PL]<sub>j</sub>  
‘I gave the chicken to them.’ (They are possibly not the intended target owner of the chicken.)

One important point to note in Pattern 1 is the marking of T as DAT. This can result in DAT-case stacking, or double DAT constructions, where both object arguments are marked with DAT. Although this is cross-linguistically unusual, it is well-motivated within Kodhi grammar – a point that will be discussed further in Section 3.

In the above examples, both R and T receive clitic expressions and are also co-indexed by free NPs. In the examples in (8) and (9), however, only one argument – either R or T – is co-indexed. As seen from the free translations, there is a clear parallelism in meaning: the use of the GEN clitic on the verb indexed by the PP *tanggu=na* (*dhi*) (i.e., also with the GEN clitic) in (8a) explicitly indicates intended ownership, in contrast to DAT in (8b) or its absence in (9), where the transfer of ownership is left unspecified.



- (10) **Nanggolengok.**  
 na=nggolengo=ka  
 3SG.NOM=fall=PFV  
 ‘He fell down.’

(ii) *ACC-marked S arguments* Accusative marking for S arguments in Kodhi typically arises in at least two distinct contexts. One prominent context is found in predicates expressing aspectually static states of affairs. These include stative verbs like *hingiro* ‘(be) clean’ as in (11), or nominal predicates as in (12). The ACC clitic =*ya* ‘3SG.ACC’ is the S argument in these sentences, and an attempt to use the corresponding NOM proclitic *na=* ‘3SG.NOM’ gives rise to an ungrammatical structure. This highlights the point that NOM marking is not compatible with stative predicates.

- (11) Hingir langatakaya.  
hingiro langatakka=ya  
be.clean be.real=3SG.ACC  
'It is very clean.'

- (12) a. Ngguruya.  
ngguru=ya  
teacher=**3SG.ACC**  
'He is a teacher.'
- b. \*Nangguru.  
**na**=ngguru  
**3SG.NOM**=teacher  
Intended meaning: 'He is a teacher.'

(iii) *DAT-marked S arguments* DAT-marked S arguments occur in contexts where the sole argument (S) is prototypically a displaced entity (i.e., a theme, irrespective of its animacy) and is not physically affected in the way that a typical patient of an impact transitive verb would be. This pattern of single DAT marking for S is especially prominent with directed motion verbs such as *eme* ‘come’ as seen in (13a) with an animate S and (13b) with inanimate S. That is, this type of verb does not entail agent S, although an agentive interpretation is possible, either implied and triggered by animacy as in (13a), or explicitly constructed by double-marking of NOM-DAT as in (13c). An attempt to mark the S argument solely with NOM, as seen in (13d), is ungrammatical. Note, however, that in (13c), double marking with both DAT and NOM is grammatical, and introduces a subtle semantic difference. The S argument doubly marked with NOM in (13c) conveys specific nuances of purposeful intentionality/agentivity (e.g., deliberately coming due to invitation), which are unspecified or absent with DAT marking alone in (13a).

- (13) a. Emeni a mori dhoyyo.<sup>10</sup>  
eme=ni a mori dhoyyo  
come.NTR=[3SG.DAT]\_i [DEF.SG lord thing]\_i  
'The owner of the cattle comes (neutral w.r.t. intentionality, e.g. just passing by).'
- b. Emini a kapore.  
eme=ni a kapore  
come.NTR=[3SG.DAT]\_i [DEF.SG outbreak]\_i  
'The outbreak comes.'

<sup>10</sup>In Kodhi, *dhoyyo* functions as a broad hypernym – an umbrella term that can generically mean either ‘wealth’ (or *harta* in Indonesian) or simply ‘things’. This hypernymic quality allows *dhoyyo* to encompass a range of specific items within those categories, such as gold or various types of livestock like pigs, buffaloes, and horses when referring to wealth. Its precise interpretation is highly context-dependent; for example, in a conversation focused on animals, *dhoyyo* would be understood more specifically as referring to livestock.

- c. Naemeni a mori dhoyyo.  
**na**=eme=**ni** a mori dhoyyo  
 [3SG.NOM]\_*i*=come.NTR=[3SG.DAT]\_*i* [DEF.SG lord thing]\_*i*  
 ‘The owner of the cattle comes (with a specific intention, e.g. deliberately coming due to an invitation).’
- d. \*Naeme a mori dhoyyo.  
**na**=eme a mori dhoyyo  
 [3SG.NOM]\_*i*=come.NTR [DEF.SG lord thing]\_*i*  
 Intended meaning: ‘The owner of the cattle comes.’

The pattern of single DAT marking for S in (13a) parallels the marking of OBJ2 in ditransitive constructions discussed in the previous section, as both are semantically conditioned by the participant's thematic role as a theme, rather than as a prototypical patient. If agentive S is intended for this verb, then double NOM-DAT marking must be used, as in (13c).

(iv) *Double/triple index marking of S* Intransitive structures with double or triple index marking of S are highly constrained by semantic, lexical, or pragmatic factors, and therefore occur only in specific constructions. As seen in (13c), the addition of a clitic (e.g., NOM in addition to DAT) introduces specific semantic nuances of intentionality – such as explicit volition – compared to single index marking as in (13a). However, since intentionality is typically associated with human referents, the volitional meaning contributed by NOM marking may not be acceptable in all contexts. For instance, when S is a non-human entity, double marking with NOM may be disallowed. This is illustrated by the contrast in (14), where the plural S (‘dragonflies’) requires the plural form of the verb ‘come’.<sup>11</sup> The PL verbs, appearing with initial *h-*, require plural participants, contrasting with the neutral (NTR) verbs, which are unspecified for verbal number. For example, *hama* ‘come.PL’ vs. *ama* ‘come.NTR’, and *homo* ‘exist.PL’ vs. *omo* ‘exist.NTR’, and only (14a), the structure with DAT without NOM doubling, is acceptable.

- (14) a. Hemindika ha karinggi cana.  
 hemi=ndi=ka ha karinggi cana  
 come.PL=[3PL.DAT]\_i=PFV [DEF.PL dragonfly]\_i  
 ‘The dragonflies have come.’  
 b. \*Ahemi(ndika).  
 a=hemi=ndi=ka  
 3PL.NOM=come.PL(=3PL.DAT=PFV)  
 Intended meaning: ‘They (i.e., the dragonflies) have come.’

The middle construction in Kodhi, which expresses self-initiation/self-affect and can be translated as an emphatic ‘by oneself’, also exhibits double index marking of S, further confirming the semantic basis of pronominal index marking in this language. This is exemplified by the verb *palayo* ‘run’ with NOM-ACC S marking in (15a), in contrast to the single NOM S marking in (15b). The first sentence conveys a ‘marked’ or unexpected emphatic reflexive interpretation, whereas the second sentence expresses the default meaning, lacking this additional emphatic contrast. When S is understood as a negatively affected participant – for example, forced to flee due to a life-threatening incident – S must be marked with a single ACC clitic on the verb, as shown in (15c). The pattern observed provides clear evidence for the semantic basis of affectedness in index marking in Kodhi.

<sup>11</sup>Kodhi has a small set of deictic and existential verbs that show verbal number (cf. Durie 1986, Corbett 2000, among others).

- (15) a. Maka aplahika olla Padhdhu.  
           maka a=palayo=hi=ka olla Padhdhu  
           CNJ [3PL.NOM]\_i=run=[3PL.ACC]\_i=PFV LOC.DIST place  
           ‘They ran by themselves to Padhdhu.’  
       b. Apalayo.  
           a=palayo  
           3PL.NOM=run  
           ‘They run.’  
       c. Playaka.  
           palayo=ya=ka  
           run=3SG.ACC=PFV  
           ‘S/he ran away.’

Finally, we briefly discuss triple index marking of S in Kodhi, using a NOM-GEN-DAT combination, as exemplified in (16), which expresses mirativity – the grammatical marking of information that is unexpected, surprising, or new to the speaker (DeLancey 1997, 2012). In (16), the structure features a NOM proclitic followed by two pronominal enclitics and a final perfective (PFV) clitic. However, the mirative meaning is constructed by the last three enclitics (GEN+DAT+PFV). The PFV clitic *=ka* is critical for the mirative construction, as its presence is required to convey this meaning, while the NOM proclitic can be omitted without affecting the mirative interpretation, as seen in (17). Importantly, this mirative construction – featuring the GEN+DAT+PFV clitic combination – is restricted to intransitive structures; a different structure is used with transitive stems, not shown here due to space (see Ghanggo Ate forthcoming).

- (16) Bhu lohondika,                      nalohonanika                      wali  
 Bhu lohho=ndi=ka,                      **na**=loho=**na=ni=ka**                      wali  
 just leave=3PL.GEN=PFV [3SG.NOM]\_*i*=come.out=[3SG.GEN]\_*i*=[3SG.DAT]\_*i* =PFV source  
 ella              kopena              a              bhei langgodha,              a              minye kabholaho.  
 ella              kopena              a              bhei langgodha,              a              minye kabholaho  
 LOC.PROX husk=3SG.GEN DEF.SG AUG langgodha<sup>12</sup> [DEF.SG female beautiful]\_*i*  
 ‘They had just left; the beautiful woman surprisingly came out accidentally on her own of the  
 husk of the giant *langgodha* tuber.’ [Collected by Janet Hoskins, 1980]
- (17) Lohonanika.  
 lohho=**na=ni=ka**  
 come.out=3SG.GEN=3SG.DAT=PFV  
 ‘She came out accidentally (to the speaker’s surprise).’

The obligatory presence of PFV=*ka* to express mirativity in Kodhi highlights the complex interface of morphosyntax and discourse pragmatics involved in mirativity, which cross-linguistically often includes elements of tense-aspect-modality TAM (e.g., PFV), grammatical relations, and related verbal morphology (e.g., clitic shapes in Kodhi). Mirativity typically conveys unexpected non-intentionality and newness that triggers surprise, often realized at the moment of speaking. It is also closely linked to evidentiality and stance – that is, the source or basis of information, such as direct perception (with PFV often essential), and the speaker’s personal perspective or expectations underlying the ‘surprise’ element.<sup>13</sup> Whether

<sup>12</sup>*Langgodha* is a type of tuber that was often eaten by the Kodhi people in the past but is rarely eaten today.

<sup>13</sup>In Indonesian, one way of expressing mirative meaning is through the use of the prefix *ter-* (indicating 'accidental passive'), often found in expressions like *ternyata*, and also with the particle *kok*:

- (i) Ia ternyata penipu.  
'He is a liar, to my surprise.' (i.e., contrary to my expectation).

mirativity is a valid cross-linguistic grammatical category remains controversial (DeLancey 1997, 2012, Hill 2012).

Having presented the basic facts of Kodhi morphosyntax and shown how pronominal and TAM clitics encode grammatical relations, we have highlighted the range of clitic constructions found around predicates. These constructions not only illustrate alignment patterns – such as split-S and differential object marking – but also reflect deeper semantic and pragmatic motivations. While some features are typologically common (e.g., NOM marking for actors), others – like double-DAT marking and mirativity – are notably rare. In the next subsection, we examine the complexities of DAT marking from an LFG perspective, drawing on ‘Localist’ theories (Butt 2006: 14–15), which emphasize spatial notions, and adopting Jackendoff’s (1990) lexical conceptual structure to capture the relevant spatial configurations.

### 3 Localist theory, affectedness and DAT in Kodhi: an LFG analysis

#### 3.1 Affectedness and proto/macro-roles

Affectedness – the degree to which a participant in an event is changed or impacted by that event – has become a central concept in modern linguistics, particularly in the study of lexical conceptual structure, argument structure and grammatical relations. In particular, affectedness has been tied to event delimitation: on Tenny’s (1987) account, an ‘affected’ internal argument is one that can *measure out* and potentially delimit the event (contributing to boundedness), rather than merely participating in it. Related approaches model affectedness as a cluster of proto-properties that define gradience between agent-like and patient-like participants (Dowty 1991), and as part of broader conceptual-structural representations of event and thematic organization (Jackendoff 1990; see also Jackendoff 1991). These affectedness-based perspectives help explain a wide range of alignment and object-expression phenomena cross-linguistically, including systems with splits involving DAT/GEN and differential marking – precisely the kinds of patterns found in Kodhi and analysed in this paper.

We apply insights from affectedness-based Localist theories as discussed in Butt (2006) within the LFG framework (Bresnan et al. 2016, Dalrymple et al. 2019, Arka et al. 2021, among others), integrating compatible ideas from cognitive linguistics (Lakoff 1987, Lakoff & Johnson 1980). We adopt Jackendoff’s (1990) Lexical Conceptual Structure (LCS) to represent the local/spatial origins of case marking and to model how spatial configurations can be extended to encode non-spatial relations relevant to affectedness as seen in Kodhi. In addition, we draw on role-gradience models – Dowty’s (1991) Proto-Agent vs. Proto-Patient properties and the Actor-Undergoer hierarchy (Foley & Van Valin 1984, Van Valin 2005) – to capture the Kodhi-relevant dimensions of volition/agentivity/intentionality, including cases where the goal/recipient is also evaluated positively as a beneficiary-possessor, or not, and where speaker stance introduces a mirative ‘surprise’ component.

We represent affectedness in Kodhi by combining Dowty’s (1991) [P-A] and [P-P] or Foley & Van Valin’s (1984) A-U macroroles – implemented as binary features for Actorhood and Patienthood ([+A]/[–A] and [+P]/[–P]). This creates a four-cell space, as shown in (18), which captures role gradience while aligning with Kodhi grammatical relations and clitic/case-series marking. As represented in (18) with an alternative representation in (19), DAT and GEN (with negative feature values) occupy the same intermediate position as the middle construction (with positive values), (19)a. That is, they are classified as neither prototypically A nor P, either because they lack the relevant properties, or show a mix of certain properties of A and P – exactly the kind of ‘in-between’ affectedness that Kodhi encodes morphosyntactically.

The multiple labels in (19) are intentionally somewhat redundant: they function as a cross-framework translation of prominence rather than as independent theoretical commitments. Our analysis is implemented in the two-dimensional affectedness space in (18) – i.e., the  $[+A/-A] \times [+P/-P]$  feature grid –

- 
- (ii) Kok dia datang?  
 ‘He came, to my surprise.’ (i.e., contrary to my wish/expectation).

which captures role gradience and provides the basis for linking to Kodhi grammatical functions (GFs) and clitic/case-series. However, readers from different backgrounds often conceptualise prominence and linking through different one-dimensional hierarchies: Dowty’s Proto-Agent vs. Proto-Patient property clusters ([P-A] vs. [P-P]), RRG’s Actor vs. Undergoer macroroles (A vs. U), and typological role labels for mono- and ditransitives (A, P, R, T). The schematic in (19) therefore ‘projects’ the two-dimensional space in (18) onto a familiar linear prominence scale, making it easier to see (i) how DAT/GEN occupy an intermediate, non-prototypical region, and (ii) how the same underlying prominence relations can be stated in a way that is translatable across linking theories in LFG and beyond. In short, (19) is included for expository interoperability: it helps the reader map our feature-based implementation onto widely used terminologies without changing the core analysis. We treat the feature grid in (18) as primary; (19) is purely expository.

(18) Actorhood and Patienthood in the affectedness space in Kodhi:

|             |    | Actorhood                                                         |                                                                                      |
|-------------|----|-------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|             |    | +A                                                                | −A                                                                                   |
| Patienthood | −P | [+A, −P]<br>NOM: SBJ <sub>TR</sub> : A<br>SBJ <sub>INTR</sub> : A | [−A, −P]<br>DAT: OBJ <sub>1R</sub><br>OBJ <sub>2T</sub><br>GEN: OBJ <sub>1POSS</sub> |
|             | +P | [+A, +P]<br>MIDDLE.CONSTR <sub>REFL</sub> : SBJ <sub>A=P</sub>    | [−A, +P]<br>ACC: OBJ <sub>1P</sub><br>SUBJ INTR: P                                   |

(19) Kodhi case marking feature and [P-A]-[P-P]/A-U role hierarchy:

|                                                                                      |                   |                                                                |                                                                                        |
|--------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------|
| (a)                                                                                  | NOM<br>[+A, −P]   | DAT/GEN<br>[−A, −P]                                            | ACC<br>[−A, +P]                                                                        |
|                                                                                      |                   | MIDDLE<br>[+A, +P]                                             |                                                                                        |
| (b)                                                                                  | Proto-Agent [P-A] | Proto-Patient [P-P]                                            | (Dowty’s (1991) Proto-roles)                                                           |
| (c)                                                                                  | Actor (A)         | U (Undergoer)                                                  | (RRG, Foley & Van Valin 1984)                                                          |
|  |                   |                                                                |                                                                                        |
| (d)                                                                                  | A/S <sub>A</sub>  | R/T<br>S <sub>R</sub> :goal/poss.loc<br>S <sub>A=P</sub> :refl | Sp/P<br>(Grammatical roles as used in language typology; e.g. Comrie 1978, Dixon 1979) |

We now turn to explaining the distribution of DAT/GEN marking in Kodhi, inspired by Localist and cognitive-constructional frameworks (Gruber 1965, Lakoff 1987, Lakoff & Johnson 1980, Goldberg 1995), adopting representational insights proposed in Jackendoff (1990).

### 3.2 On the spatial conceptual basis for DAT/GEN marking in Kodhi

Jackendoff’s Lexical Conceptual Structure (LCS) provides a rich and systematic framework for representing argument structure and event semantics through two core tiers. The first is the *action tier*, which captures the dynamics of action and affectedness using the primitive AFFECT (AFF). For psychological predicates, this is replaced by the *reaction tier*, employing the primitive REACT to reflect the experiencer’s internal response. In this framework, traditional thematic roles as listed in (20) serve as shorthand labels that can be defined in terms of argument positions in the LCS. A sample of conceptual units and their corresponding traditional thematic roles is given in (21) (Arka 2003a: 125–126, adapted from Jackendoff 1991). It is now widely recognized that thematic role labels such as agent, goal, patient, and locative are not themselves semantic primitives. They are decomposable. Their hierarchy is derived

from their structural positional configurations in the LCS. For example, the agent (or [P-A]) is a ‘willful doer’ and the top-most role due to its identification as the first argument, [X], of the action tier  $AFF_{+vol}$  ([X], [ ]), which is also the causer, [X], in the thematic tier line  $CS([X], [ ])$ ; see example (24) below.<sup>14</sup>

- (20) Thematic role hierarchy: *ag > ben > rec/exp > inst > th/pt > loc* (Bresnan & Kanerva 1989)
- (21) Thematic roles defined in LCS

|      | Semantic structure                        | Traditional thematic roles                                          |
|------|-------------------------------------------|---------------------------------------------------------------------|
| (i). | Thematic tier:                            |                                                                     |
| a.   | [EVENT CS({[THING/ EVENT X]}, [EVENT Y])] | (X=Causer, causing event, Y=Patient)                                |
| b.   | [EVENT GO([THING X], [PATH Y])]           | (X=Theme)                                                           |
| c.   | [EVENT BECOME([THING X],[STATE Y])]       | (X=Theme)                                                           |
| d.   | [STATE BE([THING X],[PLACE Y])]           | (X=Theme, Y=Loc)                                                    |
| e.   | [PATH TO/FROM ([PLACE X])]                | (X=Goal/Source)                                                     |
| f.   | [PLACE PLACE-FUNCTION([THING X])]         | (X=Loc)                                                             |
| (ii) | Action tier:                              |                                                                     |
| a.   | AFF ([THING X], [THING Y])                | (X=Affector, Agent; Y=Patient for AFF-)<br>(Y=Benefactive for AFF+) |
| b.   | REACT ([THING X], [THING Y])              | (X=Experiencer, Y=Stimulus)                                         |

For example, Kodhi prototypical transitive verbs such as *gharru* ‘pull’ (example (22)) requiring a NOM subject and ACC object will have LCS consisting of the action tier with AFF in their lexical entries as shown in (22a). In contrast, psychological verbs like *mbe* ‘like’ (example (23)) differ in that they have REACT, instead of AFF. Crucially, given this conception, the stimulus [Y] is not patientive (nor affector), specified as [–A, –P] following our proposed feature-based case marking/mapping for Kodhi formulated in (18)–(19). It is therefore assigned DAT, not ACC. It is not assigned GEN, however, due to semantic constraints: *mbe* ‘like’ lacks the specific LCS possession in its thematic tier, required for the GEN marking; see (28c.iii.b) in Section 3.3.

- (22) a. *gharru* ‘pull’  
 AFF<sup>-</sup>([X], [Y])  
 [+A, -P] [-A, +P]  
 NOM ACC
- b. *mbe* ‘like’  
 REACT([X], [Y])  
 [+A, -P] [-A, -P]  
 NOM DAT

- (23) Kumbeni enetu waricoyyo.  
ku=mbe=ni enetu waricoyyo  
1SG.NOM=like=3SG.DAT DIST.MOT.SG woman  
'I like that woman.'

In Jackendoff's force-dynamic/event-structural system, a refinement using the plus/minus superscript notation may be necessary for CAUSE (CS) and AFF, depending on the analysis. The plus superscript in  $CS^+$ , for instance, encodes a positive success parameter – the exertion of force yields a successful outcome (Jackendoff 1990: 132–133). Importantly, beneficiary is expressed by the plus superscript on the action tier: Jackendoff renotates dyadic interaction so that AFF encodes opposition with a negatively affected second participant (Patient, in  $AFF^-$ ), while  $AFF^+$  encodes helping/positive affectedness, i.e. a Beneficiary, and  $AFF^0$  encodes letting/non-opposition (Jackendoff 1990: 134). We employ this refinement as needed as it lets us represent, for instance, an event that is successful ( $CS^+$ ) in the causative sense

<sup>14</sup> Agency in LCS reflects action, volition, and/or causation, rather than a single role. The critical element of volitionality is only relevant when an animate NP bears the Actor role; if the Actor is inanimate, [–vol] is required for consistency, while verbs may lexically require [+vol], [–vol], or leave volitionality unmarked (Jackendoff 1990: 129).

while also construing one participant as benefiting (AFF<sup>+</sup>) – exactly the kind of semantic packaging that becomes relevant when Kodhi DAT-marked arguments pattern as recipient/goal vs. beneficiary-possessor under stance and affectedness conditions.

We now turn to the *thematic tier* in LCS. It is composed of spatial primitives such as PATH, GO, TO, FROM, LOC, and AT. While these primitives originally describe literal spatial motion and location, Jackendoff's LCS extends them to more abstract domains, including possession, transfer, and experiencer roles. Thus, an event like 'give' – for example, *woyyo* in Kodhi (see example (7)) – is analyzed with the LCS shown in (24). This structure involves both an action (the causer/agent [X] affecting a theme [Y]) and a spatial path (the theme moving to a goal/recipient [<sub>PATH</sub> GO([Y], TO([Z]))]). The LCS representation of 'give' and other transfer verbs in Kodhi, which encodes a PATH from agent to recipient, is a clear instantiation of Lakoff's (1987) source-path-goal schema. This cognitive metaphor motivates both the syntactic realization of the DAT argument and its extension to other roles (e.g., goals and beneficiaries). In a construction grammar approach, these patterns constitute a family of *spatial transfer constructions* whose syntactic and semantic properties are shaped by the underlying metaphorical mapping (Goldberg 1995: 141–169).

The LCS of *woyyo* in Kodhi, however, includes a disjunctive specification for the nature of the resulting state: it may be explicitly specified (indicated by the primitive POSSESS, with the recipient [Z] as the first argument of POSSESS), or it may be simply left implicit (i.e., unspecified). This alternation is also reflected in the disjunction {[Y] | [Z]} on the action tier. In this way, the alternative case marking of the recipient ([Z]) as GEN in (7a) or DAT in (7b) can be captured; this is discussed further below.

Crucially, the action tier of *woyyo* ‘give’ is ‘unmarked’ with respect to the polarity of affectedness: AFF is not specified with a positive or negative superscript, as discussed above. When beneficiary-possession is involved, as in (7a), we posit  $AFF^+$ , signalling that the event of ‘giving’ is evaluated as positive; in this configuration, [Z] (the goal/recipient) is selected as the second argument on the action tier, and the thematic tier selects the POSSESS primitive. This accounts for the recipient being specified as  $[-A, -P]$ , realized as OBJ1 and marked with GEN. By contrast, when the goal ([Z]) is not construed as a beneficiary, AFF may remain unspecified, as in (24). (If desired, a negative specification  $AFF^-$  with [Z] would yield a malefactive interpretation.)<sup>15</sup>

(24) LCS of *woyyo* ‘give’:

|                                                |                             |
|------------------------------------------------|-----------------------------|
| AFF ([X], {[Y] {Z}})                           | (Action Tier)               |
| CS ([X], [ <sub>PATH</sub> GO([Y], [TO([Z]) ]) | (Thematic Tier)             |
| & { BECOME([Y], [AT/WITH ([Y], [Z]))           | (POSS, unspecified/implied) |
| BECOME([Y], [POSSESS ([Z], [Y]))}              | (POSS, specified)           |

In contrast, negative AFF<sup>-</sup> applies straightforwardly to transitive verbs whose second or internal argument bears Proto-Patient properties (i.e. [P-P]): such arguments are assigned [-A, +P], mapped onto OBJ1, and receive ACC marking. For *woyyo* ‘give’ in (24), this corresponds to selecting [Y] (the Theme) as the second argument on the action tier, and selecting the non-possessive result-state option on the thematic tier – i.e. the BECOME([Y], [AT/WITH([Y], [Z])]) disjunct rather than the POSSESS disjunct.

At this point it is crucial to distinguish two issues:

- (i) the polarity/value of affectedness, which conditions clitic series, and
- (ii) GF linking in ditransitives, where prominence relations decide whether Theme or Recipient is realised as OBJ1.

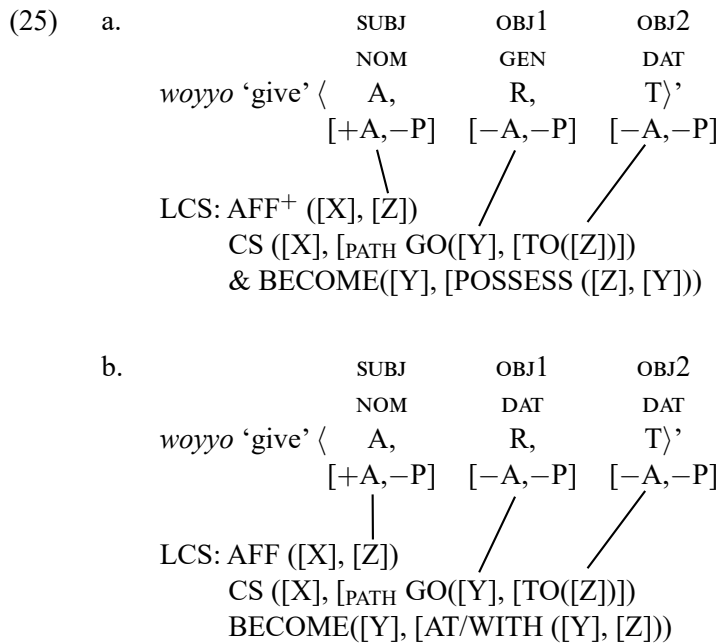
<sup>15</sup>The benefactive vs. malefactive interpretation of the DAT-marked R is therefore context dependent. Below is an example in which *wɔɣɔ* ‘give’ with a DAT-marked R receives a malefactive interpretation:

- (i) Awongganika a kabhi mboghi.  
a=woyyo=ngga=ni=ka a kabhiyo mboghi  
3PL.NOM=give=[1SG.DAT]<sub>J</sub>=[3SG.DAT]<sub>J</sub>=EMP [DEF.SG meat spoiled]<sub>J</sub>  
'They gave me spoiled meat (to my detriment).'

In other words, Proto-Patient-like affectedness does not by itself determine which non-subject maps to OBJ1 vs. OBJ2. In the ditransitive configuration where the Goal/Recipient [Z] is selected on the action tier, the theme [Y] is less prominent than [Z] and is embedded in the LCS, irrespective of whether [Z] is construed as the intended possessor. Therefore, given the general principles of prominence-based grammatical function (GF) mapping/linking (cf. Bresnan & Kanerva 1989, Arka 2024, and references therein), which will be formulated in the next subsection, the theme is mapped onto the third argument position in the ditransitive (i.e., OBJ2). It is then realised with DAT in virtue of its  $[-A, -P]$  specification.

The resulting GF mapping and marking for the verb *woyyo* ‘give’, showing the two options, is presented in (25a) and (25b) for the possessive and non-possessive options respectively. For clarity, we represent the arguments and their relative prominence in the argument structure using typological labels such as A, R, and T, while acknowledging that these may be redundant since their properties are derivable from the LCS. The mapping steps indicated by lines from LCS to argument structure and case in (25) can be described as follows:

- (i) Identify LCS positions, giving rise to semantic prominence in the following order: X=causer/affector > Z=goal/recipient > Y=theme (with optional POSSESS result-state);
- (ii) Map semantic prominence to GFs: most prominent, X → SUBJ; next most prominent, Z → OBJ1; remaining, Y → OBJ2, following (27a), (28a–b), and (29a).
- (iii) Assign case-series features by the affectedness space (18)–(19) and the LCS configuration (cf. explicit principles in (28)): X  $[+A, -P]$  → NOM; Z  $[-A, -P]$  → GEN when POSSESS is selected, otherwise DAT; Y  $[-A, -P]$  → DAT (28c.iii).



The Kodhi example in (26) provides clear evidence that possession in Kodhi is conceptually goal/location, involving a theme with the possessor understood as a location or goal. In this example, the nominal predicate ‘my name’ functions syntactically as an intransitive predicate and semantically as a non-dynamic state. However, it is conceptually complex, representing the result of a name-giving event (with an unspecified agent/causer) in which the possessor (‘1sg’, [Z] in the LCS) is the recipient or goal of the name (*Ana Lewe*), which serves as the theme ([Y]) in the LCS and syntactically as the subject (S). This name ultimately becomes her identity. Given the LCS configuration, [Y] as the theme receives a  $[-A, -P]$  specification and, like the theme in *woyyo* ‘give’, is indexed by DAT.

- (26) a. Ana Lewe ngarangguni.  
 Ana Lewe ngara=nggu=ni  
 PN name=1SG.GEN=3SG.DAT  
 ‘Ana Lewe is my name.’  
 b. *ngarangguni* ‘my name < S >’  
 [–A, –P]  
 sem-str:  
 CS ([ ], [PATH GO([‘ANA LEWE’]<sub>Y</sub>, [TO([‘1sg’]<sub>Z</sub>)])])  
 & BECOME([Y], [POSSESS ([Z], [Y])])  
 STATE & BE<sub>IDENTITY</sub> ([Y]<sub>i</sub>, [‘NAME’]<sub>i</sub>)  
 (Y: ‘ANA LEWE’=Theme)  
 (Z: ‘1sg’=Goal/Possessor)

Finally, Kodhi’s innovative use of DAT for non-canonical functions, such as expressing epistemic or mirative meaning (cf. examples (16)–(17)), illustrates the dynamic process of metaphoric extension in grammar. As Lakoff & Johnson (1980) note, spatial schemas like movement and transfer serve as foundational conceptual metaphors, often recruited for more abstract domains. In Kodhi, the mirative construction – formed by the DAT clitic, GEN clitic, and perfective evidential particle – acts as a constructional unit signalling the metaphorical ‘arrival’ of unexpected information. Crucially, this construction is specific to intransitive structures and relies on the combination of elements, rather than the DAT clitic alone, to signal the transfer of knowledge or newness to the experiencer. This pattern exemplifies how families of spatial transfer constructions (Goldberg 1995: 141–169) can be metaphorically extended to encode highly abstract meanings, with DAT and GEN clitics taking on new discourse functions within these constructional templates.

### 3.3 GF-mapping and marking principles in Kodhi

This subsection outlines the mapping and marking principles in Kodhi, which were exemplified in the previous section, but here we further illustrate these points – particularly in the broader context of the semantic-pragmatic-syntactic interface.

Salient alternative indexing and the intricacies of double or triple index marking, with/without free conominals, require some discussion on the representation of case series in f-structure. Note that, in Kodhi, morphological case-series values (NOM/ACC/DAT/GEN) are realized on pronominal indexes/clitics rather than on free nominals. Accordingly, we treat CASE as a feature contributed by the pronominal index, not by the free NP/pronoun conominal: when a GF is expressed by an index (optionally together with a coindexed conominal in c-structure), the f-structure for that GF contains a CASE specification. To capture the empirically meaningful possibility of multiple simultaneous case-series values on one argument (double/triple indexing), we take CASE to be set-valued in Kodhi, so that a single GF may have CASE={NOM, DAT}, etc. Conversely, if a GF is realized only by a bare free NP (with no pronominal index), CASE may be unspecified – a possibility motivated by indefinite/generic arguments that resist indexing. This is a deliberate extension of the standard LFG treatment of morphosyntactic features to fit Kodhi’s head-marking system and the semantic contribution of case-series, and to capture the empirical point that grammatical relation may be simply encoded by word order in this language.

Although Kodhi lacks voice alternation as seen in Indonesian-type languages such as Balinese, the principle of prominence matching – familiar from cross-linguistic GF-mapping – applies here. Within the LFG framework, GF prominence (SUBJ > OBJ1 > OBJ2 > OBL: (27a)) aligns with semantic prominence (27b), which is determined by the positional structure in the LCS (e.g., Agent/[P-A] > Patient/[P-P]). We formulate the principles of argument mapping and index-based case-series assignment for Kodhi in (28). The concise version of the principles is given in (29).

## (27) Syntactic and Semantic Prominence:

- a. GF-Prominence: SUBJ > OBJ1 > OBJ2 > OBL
- b. Semantic Prominence: [P-A]<sub>i</sub> > [P-P]<sub>j</sub> (Proto-roles)  
*ag* > *ben* > *rec/exp* > *inst* > *th/pt* > *loc* (Traditional roles)  
 AFF ([X]<sub>i</sub>, [Y]<sub>j</sub>) ... ] (LCS)  
 CS([X], [ ...Y...])

While related – and both involving prominence – GF mapping and case-series assignment in (28) are two distinct processes with different outcomes. GF mapping determines the syntactic structure and grammatical-function realisation of an argument, i.e. whether a non-agent participant (e.g. a [P-P] argument or a theme) surfaces as SUBJ or OBJ. By contrast, case-series assignment determines the realisation of the index value(s) and the corresponding pronominal clitic form(s) of that argument. Thus, a [P-P] participant may be mapped to SUBJ or OBJ (depending on the predicate's transitivity), but the same GF may receive more than one case-series value (e.g. OBJ1 marked with ACC or DAT), yielding affectedness contrasts such as those illustrated in (37).

## (28) Mapping principles and index-based case-series assignment in Kodhi: Detailed Version

Given the predicate's argument structure (and associated grammatical functions) as in (a), mapping applies as in (b), and index-based case-series assignment applies as in (c):

- a. Syntactic transitivity  
 (i) 'PRED<SUBJ>' (ii) 'PRED<SUBJ, OBJ1>' (iii) 'PRED<SUBJ, OBJ1, OBJ2>'
- b. Mapping  
 (i) By default, map the most prominent item in the semantic structure onto SUBJ.  
 (ii) Then, map the next most prominent item to the next GF according to the prominence hierarchy in (27).
- c. Index-based case-series assignment: parse the sem-str/LCS and, following the feature space in (18)/(19):  
 (i) Assign [+A/−P], NOM, to the most prominent element [X]/[Y] or [P-A]<sub>x/y</sub>, where [P-A]<sub>x/y</sub> is defined as:  
 [EVENT AFF ([X], [Y]), CS([X], [EVENT ...])] or  
 [EVENT AFF ( , [Y]), GO([Y], [PATH Z])] ]  
 (ii) a. Assign [−A/+P], ACC, to the most patient-like element [Y] or [P-P], where [P-P]<sub>y</sub> is defined as:  
 [EVENT AFF ([X], [Y]) & CS([X], [EVENT ...])],  
 or  
 b. Assign ACC to the element [Y] of non-possessive identity STATE:  
 [STATE BE<sub>IDENTITY</sub>([Y], [THING ])] ]  
 (iii) Assign [−A, −P] to an element [Z]/[Y], which is neither [P-A] nor [P-P]:  
 a. mark it DAT for [Z]/[Y] in the following LCS configuration:  
 [EVENT AFF ([X], {[Z] | [Y]}, CS ([X], [PATH GO([Y], [TO([Z])  
 & BE(COME)([Y], [ AT/WITH ([Y], [Z])])), or  
 [EVENT BE(COME)([Y], [ AT/WITH ([Y], [Z])])),  
 or  
 b. mark it GEN for [Z] in the following LCS configuration:  
 [EVENT AFF+ ([X], [Z]), CS ([X], [PATH GO([Y], [TO([Z])  
 & BECOME([Y], [POSSESS ([Z], [Y])]))]  
 or  
 [STATE POSSESS([Z] [Y]),  
 or

- c. mark it DAT for Y that is part of the non-dynamic possessive/locative STATE:  
 [STATE CS ([ ], PATH GO([Y], [TO([Z]),  
 & BECOME([Y], [POSSESS ([Z], [Y])) ]  
 or  
 [STATE BE([Y] [PLACE...])]

(29) Mapping and Index-based Case-series Assignment: Concise Version

- a. By default, the most prominent semantic role is mapped to SUBJ, with subsequent roles mapped to OBJ1, OBJ2, and so forth, following the prominence hierarchy.
- b. Index-based case-series assignment reflects the features of each argument:
  - (i) NOM ([+A, −P]) is assigned to the most prominent, typically actor-like [P-A], element.<sup>16</sup>
  - (ii) ACC ([−A, +P]) is assigned to the most patient-like element or a non-possessive theme.
  - (iii) DAT/GEN ([−A, −P]) is assigned to arguments that are neither clear actors nor patients, depending on their configuration in the LCS, such as goals/recipients or possessors.

### 3.4 LCS and lexical entries

We now illustrate these principles with additional examples, showing that the mapping and marking system in Kodhi consistently reflects both argument structure and the finer semantic distinctions captured in the LCS. However, there are intricacies associated with affectedness and event type – dynamic events (e.g., actions and motions, possibly with intentionality involved) versus non-dynamic states (e.g., possessive or non-possessive identification) and unspecified force dynamics (e.g., absence of affector, indicated by the empty [ ] as the first argument of AFF in LCS) – which influence index marking and need to be specified in lexical entries.

First, a patientive item is not necessarily assigned ACC. For example, the patientive verb *nggolengo* ‘fall’ has its subject marked by NOM, as shown in example (30a). Its lexical entry in (30b) specifies that the displaced entity Y (theme/patient) is the most prominent element in the LCS. Although negatively affected, in the absence of an affector it is assigned [+A, −P] and marked NOM accordingly, following the mapping and marking principle in (28c.i).

- (30) a. (=10))  
 Nanggolengok.  
 Na=nggolengo=ka  
 3SG.NOM=fall=PFV  
 ‘He fell down.’  
 b. *nggolengo* V (↑ PRED) = ‘FALL(SUBJ)’  

$$\left[ \begin{array}{l} \text{AFF} ( \text{ , } [Y] ) \\ \text{EVENT GO} ([Y], [\text{PATH DOWN } ] ) \end{array} \right]$$

In contrast, the motion verb *eme* ‘come’ (see the examples in (13)), while conceptually also involving a displaced entity along a path, exhibits different indexing patterns. It requires obligatory DAT indexing, with NOM as an optional marker. In our analysis, the lexical entry for this verb is shown in (31a), where the thematic tier is obligatory and the action tier is optional. For now, the action tier is included in the lexical entry but in our analysis below it is introduced to the semantic structure by general rules presented in (32), which also apply to other verbs.

The thematic tier configuration of *eme* ‘come’ dictates DAT marking, following the mapping principle in (28c.iii). The action tier, with the affector [X] identified as the theme Y (indexed by *i*), licenses NOM marking in accordance with principle (28c.i). We indicate the same indexing by *i* for [X] and [Y] in the

<sup>16</sup>This formulation (cf. 28c.i) allows the most prominent argument that is patientive, but it receives NOM marking as shown in (30).

LCS to represent the idea that the two LCS units must be distinctly marked, even though they refer to the same referent. This ensures that double indexing of the same referent/argument is reflected in the syntax. The semantics-syntax interface for the examples in (13) can be informally represented in the parallel structure in (31b).

Note that the presence or absence of the NOM marker in (31) (cf. the data in (13)) – indicated by placing *na=* ‘3SG.NOM’ and the corresponding  $AFF_{+vol}$  in brackets – is meaningful: it correlates with the presence or absence of intentionality. When NOM is absent, the sentence simply reports the coming of the owner of the cattle, with intentionality unspecified or absent. Given this alternation in indexing, which is semantically general and not confined to a single verb, we propose that Kodhi has semantically motivated lexical mapping rules that operate at the level of the semantic argument structure, LCS and determine the index-based case-series specification of grammatical functions. In this respect, the rules are comparable in spirit to lexical rules in Lexical Mapping Theory (e.g. passive-type rules: Bresnan & Kanerva 1989, 1992, among others) in that they derive morphosyntactic realization from semantic-argument structure; unlike passive, however, the Kodhi rules do not primarily suppress or demote an argument, but rather regulate how a participant is construed (intentional vs. non-intentional, self-initiated/middle) and how this is reflected in the choice and combination of case-series values on pronominal indexes. Three such rules relevant to our discussion – Intentionality, Non-intentionality, and Self-initiation/self-affect, or ‘middle’ – are formulated in (32).

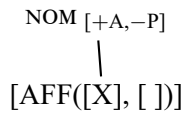
- (31) a. *eme* ‘COME<SUBJ>’  
           (  $AFF_{+vol}$  ([X]<sub>i</sub>, ))  
           EVENT GO([Y]<sub>i</sub>, [PATH TO([PLACE.OF.SPEAKER Z])])
- b. c-str:<sup>17</sup> [[(na=)eme=ni]<sub>VP</sub> [a mori dhoyyo]]<sub>IP</sub>  
           3SG.NOM=come.NTR=3SG.DAT DEF.SG lord thing
- c. a-str: ‘come<SUBJ: (NOM=) . =DAT>’  
           [+A, -P] [-A, -P]
- d. [EVENT (  $AFF_{vol}$  ([X]<sub>i</sub>, )),  
           GO([Y]<sub>i</sub>, [PATH TO([PLACE.OF.SPEAKER Z])])]  
       ‘The owner of the cattle came.’

To ease the exposition, we use different variable labels to track distinct argument positions in different semantic primitives: X denotes the *affector/actor* argument on the action tier (i.e. the first argument of  $AFF$  in (32a), whereas Y denotes the argument selected as the *affected/displaced participant* (the second argument of  $AFF$  in (32b) and the Theme of GO on the thematic tier). Importantly, the thematic tier in lexical entries such as (33a) remains constant (with GO([Y], ...)); the rules in (32) merely add an action-tier specification that may (but need not) identify an affector X. In the self-initiation/self-affect (‘middle’) configuration, both roles are structurally present, so we retain two variables (X and Y), but mark them as co-referential by coindexing (*i*). Note that we need (32c) as it is not reducible to the combination of (32a) and (32b) because it contributes a distinct constraint: X and Y must be co-referential (index *i*), i.e. the same participant simultaneously fills both affector and affectee roles. Combining (32a)–(32b) could yield double indexing, but it does not by itself impose this co-reference requirement.

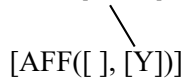
<sup>17</sup> A reviewer questions whether the appropriate level here is morphological structure rather than c-structure, implicitly assuming that bound pronouns such as *na=* and *=ni* are affixes. However, in Section 2.1 we discuss the clitic vs. affix status of these bound pronouns, arguing for their clitic status while also noting some degree of morphologicalization. We use c-structure here in the standard LFG sense of surface constituency. The verbal complex is written with ‘=’ only to make clitic boundaries transparent; nothing in the analysis depends on a commitment to clitic vs. affix status. The crucial point is that the pronominal index is the exponent of CASE-series features, whereas a coindexed conominal NP need not itself bear case morphology.

(32) Semantically motivated case marking lexical rules: Kodhi

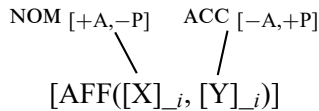
a. Intentionality:



b. ACC [-A, +P]



c. Self-initiation/self-affect, or ‘middle’:



The motion verb *palayo* ‘run’ exemplifies the application of these rules, as it can appear with NOM, ACC, or both, each yielding a different semantic nuance (see the examples in (15)). In our analysis, the verb’s lexical entry includes only a thematic tier, as shown in (33a); the action tier is introduced into the semantic structure by the general rules in (32). For brevity, only the middle and non-intentional instances are shown in (33b) and (33c).

(33) a. *palayo* ‘RUN<SUBJ>’

[EVENT GO<sub>[IN.RUNNING.MODE]]([Y], [PATH TO([PLACE Z)])]</sub>

b. Aplahika.

a=palayo=hi=ka

3PL.NOM=run=3PL.ACC=PFV

‘RUN<SUBJ:NOM<sub>[+A, -P]</sub>>, ACC<sub>[-A, +P]</sub>>’

[AFF([X]<sub>i</sub>, [Y]<sub>i</sub>)]

[EVENT GO<sub>[RUNNING]]([Y]<sub>i</sub>, [PATH TO([PLACE Z)])]</sub>

‘They ran by themselves.’ (i.e., made themselves run)

c. Playaka.

palayo=ya=ka

run=3SG.ACC=PFV

‘RUN<SUBJ:ACC<sub>[-A, +P]</sub>>’

[AFF([ ], [Y])]

[EVENT GO<sub>[RUNNING]]([Y], [PATH TO([PLACE Z)])]</sub>

‘S/he ran away.’ (i.e., fleeing)

Our LCS-based analysis effectively captures the different markings of non-verbal predicates. While all of these predicates are stative, they display different indexing patterns. Non-possessive statives, such as ‘(be) clean (x)’ (11) and ‘(be) a teacher’ (12), have their subjects marked with ACC, following (28c.iii). Possessive statives (example (26)) are conceptually conceived as spatially locative, involving a theme (the possessed) being located with the possessor. According to the LCS-based marking, the subject theme receives DAT. Likewise, all locative predicates follow the same pattern, with the subject theme indexed by DAT, as seen in (34). The lexical entries for these locative predicates are provided in (35). Note that they may also optionally receive NOM, due to the action tier introduced by lexical rule (32)a.

- (34) a. (Na)yini John.  
 (na=)yi=ni John  
 [(3SG.NOM)]<sub>i</sub>=be.here=[3SG.DAT]<sub>i</sub> [PN]<sub>i</sub>  
 ‘John is here.’  
 b. John (na)eni la dholo.  
 John na=e=ni la dholo  
 [PN]<sub>i</sub> [3SG.NOM]<sub>i</sub>=exist=3SG.DAT<sub>i</sub> LOC inside  
 ‘John is inside.’

Lexical entries for *yi* ‘be here’ and *e* ‘exist, be’:

- (35) a. *yi* ‘BE.HERE(SUBJ)’  
 b. *e* ‘BE.INSIDE(SUBJ)’

Our LCS-based analysis also captures the alternating ACC-DAT marking found with impact verbs such as *palu* ‘hit’ and *tunu* ‘burn’, where affectedness is closely linked to TAM. Specifically, the choice of marking depends on whether the event is presented as already realised or potentially realised with a high degree of likelihood (so that an impact/result is entailed) or as not yet realised (so that no impact can be inferred). In the former case, the object is marked with ACC, with the subject in NOM, as illustrated in (36a) and (37a). In the latter case, the object is marked with DAT; this option is restricted by a usage constraint associated with the illocutionary force of a threat directed at the speech-act participants (i.e. the speaker and/or addressee), as exemplified in (36b) and (37b)–(37c). In LCS terms, the ACC-marked objects in (36a) and (37a) correlate with successfully construed causation (CS<sup>+</sup>), whereas the DAT-marked objects pattern with non-successful or unrealised causation (CS<sup>-</sup>), reflecting the absence of an entailed result state at the reference time.<sup>18</sup>

- (36) a. Apaluya.  
 a=palu=ya  
 3PL.NOM=hit=3SG.ACC  
 ‘They hit him.’  
 b. Enga dhika paludhani.  
 enga dhika palu=dha=ni  
 MOD so hit=3PL.GEN =3SG.DAT  
 ‘So, they will hit **him** (and it’s a threat).’  
 (37) a. A kamumma natunuya.  
 a kamumma na=tunu=ya  
 DEF.SG grass.clipping 3SG.NOM=burn=3SG.ACC  
 ‘He burned **the grass clippings**.’ (a simple locution, not a threat).  
 b. Nakambu ati tunungga.  
 na=kambu ate tunu=ngga  
 3SG.NOM=stomach liver burn=1SG.DAT  
 ‘He wants to burn **me**.’ (the speaker is reporting a threat).

<sup>18</sup>Discussing the complexity of the illocutionary component of an utterance – together with the presence of (modal) auxiliaries such as *enga* ‘MOD’ (with P in DAT) and verbs of intention such as *mbe* ‘want’ (with P in ACC, as in (i) below) – is beyond the scope of the present paper. Moreover, illocution belongs primarily to the domain of pragmatics rather than lexical semantics; accordingly, our use of CS<sup>+</sup> in the LCS should ultimately be refined and complemented with more fine-grained pragmatic-structure constraints, an issue we do not pursue here.

- (i) Nambengo la tunuya a kamumma.  
 na=mbe-ngo layyo tunu=ya a kamumma  
 [3SG.NOM]<sub>i</sub>=want-APPL go burn=[3SG.ACC]<sub>j</sub> [DEF.SG grass.clipping]<sub>j</sub>  
 ‘He wants to burn the grass clippings (a simple locution, not a threat).’

- c. Enga tununani                      a        kamumma  
enga tunu=na=ni                  a        kamumma  
MOD burn=3SG.GEN=3SG.DAT DEF.SG grass.clipping  
'He will burn the grass clippings.' (the speaker is reporting a threat, not a simple locution)

The alternative case markings associated with these impact verbs can be analyzed in two ways in relation to their lexical entries. One analysis is to specify that the LCS of these verbs lacks the action tier, containing only the thematic tier in their lexical entries. The perfective use then introduces the impact action tier AFF([X], [Y]), licensing ACC marking according to the mapping and marking principles in (28c.i-ii). In contrast, in a future context, the impact action tier is not introduced. In this case, the most prominent, actor-like argument is assigned NOM, while the second argument, or OBJ, is assigned DAT (i.e., it is neither [+A, -P] nor [-A, +P]), following (28c.iii).

An alternative analysis is the opposite of the first: their lexical entries include the action tier,  $\text{AFF}([X], [Y])$ , which by default assigns  $\text{ACC}$  to  $\text{OBJ}$ . The  $\text{DAT}$  alternative arises from a lexical rule – an ‘Unaffected- $\text{OBJ}$ ’ rule – that suppresses the action tier, making  $\text{OBJ}$  neither  $[+A, -P]$  nor  $[-A, +P]$ , and thus assigned  $\text{DAT}$ . Either analysis works equally well, with no clear disadvantages.

#### 4 Discourse-pragmatic aspects of pronominal indexing

A full discussion of this topic is beyond the scope of this section. Instead, we just focus on the following: definiteness and contrastive focus.

An argument expressed by a pronominal index and cross-referenced by a conominal in Kodhi receives a definite interpretation; consequently generic referents do not typically take index-based marking, as exemplified by (38).

- (38) Hapi mu rumba.  
hapi muyo rumba  
cow eat grass  
'Cows eat grass.'

However, a co-indexed free NP, such as *warico?* ‘woman’, may surface with or without a definite article (e.g., *a* ‘DEF.SG’) and still receive a definite interpretation under coindexing. The reason is that definiteness is contributed by the pronominal clitic: object clitics in Kodhi are intrinsically specified as DEF=+ for the grammatical function they realise (e.g. OBJ), so a coindexed NP need not overtly bear a definite article in order to be interpreted as definite, as illustrated in (39a). By contrast, an indefinite referent cannot be coindexed with a pronominal clitic; hence, in the absence of object indexing, the free NP in (39b) is interpreted as indefinite. Conversely, a definite-marked free NP (with *a* ‘DEF.SG’) without coindexing is infelicitous/ungrammatical in this construction, because the definiteness cue (*a*) conflicts with the absence of the clitic that normally licenses a definite object interpretation.

- (39) a. Napaluya (a) waricoyyo.  
na=palu=y a waricoyyo  
3SG.NOM=hit=[3SG.ACC ]<sub>i</sub> [DEF.SG woman]<sub>NP\_i</sub>  
‘He hit the/\*a woman.’  
b. Napalu waricoyyo / \*a waricoyyo.  
na=palu waricoyyo a woman  
3SG.NOM=hit woman DEF.SG waricoyyo  
‘He hit a/?\*the woman.’

We capture the empirical point exemplified above in terms of a conditional negative constraint applied to the functional structure, as formulated in (40). This states that if a grammatical function carries a negative value for its definiteness feature, it cannot carry a case feature (i.e., any value: NOM, ACC, or DAT).



The pronominal index alternation with the predicate *kalete* ‘ride’ in (42) can be described as follows. The structure in (42a) is verbal and transitive, with the verb’s [P-A] (*na=*) and [P-P] (*=ya*) realised as NOM and ACC, as expected under the mapping principles in (28c.i-ii). By contrast, (42b) is a nominalised construction, as indicated by the presence of the GEN clitic, parallel to ordinary possessive NPs (cf. (26)). This GEN clitic corresponds to the [P-A]/NOM index in the verbal transitive structure in (42a). In addition, the [P-P] index *=ya* in (42a) corresponds to DAT in (42b), consistent with index-based case-series assignment in (28c.iii.b)/(29b.iii) for a non-prototypical, stative nominal domain.

The structure in (42b) is pragmatically marked, with both the predicate and the progressive marker *tengere* in contrastive FOCUS. Its partially annotated c-structure and f-structure are given in (43a)–(43c). As evident from the translation, two elements receive contrastive FOCUS; this is explicitly represented in the i-structure in (43b). We adopt an independent i-structure representation, distinct from f-structure (see Butt 2014, Butt & King 1996). To ensure that the predicate ‘RIDE’ is included in the FOCUS set, we specify that the nominalized structure IP in the POSS construction bears the appropriate GEN clitic and i-structure annotations, as shown in (43c). The slot CL.GEN represents the class of GEN clitics shown in Table 1, with the entry for *=na* provided in (43d).

- (43) a.
- b. i-structure:
- $$\left[ \begin{array}{l} \text{FOCUS} \left\{ \begin{array}{l} \left[ \begin{array}{ll} \text{ASPECT} & \text{PROG} \end{array} \right] \\ \left[ \begin{array}{ll} \text{FOCUS-TYPE} & \text{CONTRASTIVE} \end{array} \right] \\ \left[ \begin{array}{ll} \text{PRED-FN} & \text{'RIDE'} \end{array} \right] \\ \left[ \begin{array}{ll} \text{FOCUS-TYPE} & \text{CONTRASTIVE} \end{array} \right] \end{array} \right\} \\ \text{TOPIC} \left\{ \begin{array}{l} \left[ \begin{array}{ll} \text{PRED-FN} & \text{'DEER'S HEAD'} \end{array} \right] \\ \left[ \begin{array}{ll} \text{TOPIC-TYPE} & \text{PRIMARY} \end{array} \right] \\ \left[ \begin{array}{ll} \text{PRED-FN} & \text{'(3SG.)PRO'} \end{array} \right] \\ \left[ \begin{array}{ll} \text{TOPIC-TYPE} & \text{CONTINUING} \end{array} \right] \end{array} \right\} \end{array} \right]$$
- c. Nominalised IP with the GEN clitic:
- $$\begin{array}{lll} [[\text{VERB} & =\text{CL}_{\text{GEN}}]_{\text{NP}} & \text{CL}]_{\text{IP}} \\ (\downarrow_i \text{ PRED-FN}) \in (\uparrow_i \text{ FOCUS}) & (\uparrow \text{ POSS}) = \downarrow & (\uparrow \text{ SUBJ}) = \downarrow \\ (\uparrow_i \text{ FOCUS-TYPE}) = \text{CONTRASTIVE} & (\downarrow_i \text{ PRED-FN}) \in (\uparrow_i \text{ TOPIC}) & (\downarrow_i \text{ PRED-FN}) \in (\uparrow_i \text{ TOPIC}) \\ & (\uparrow_i \text{ TOPIC-TYPE}) = \text{CONTINUING} & (\uparrow_i \text{ TOPIC-TYPE}) = \text{PRIMARY} \end{array}$$
- d. *na*  $\text{CL}_{\text{GEN}}$   $(\uparrow \text{ PRED}) = \text{'PRO'}$   
 $(\uparrow \text{ CASE}) = \text{GEN}$   
 $(\uparrow \text{ PERS}) = 3$   
 $(\uparrow \text{ NUM}) = \text{SG}$

## 5 Conclusion and final remarks

This paper has presented the first in-depth description and analysis of dative (DAT) marking in Kodhi, a previously under-explored Austronesian language spoken in western Sumba, Indonesia. The empirical

findings have underscored Kodhi's typologically intriguing patterns of DAT marking, particularly its unusual case-stacking phenomena where two distinct objects within a ditransitive clause can both bear DAT marking. This distinctive pattern enriches the typological understanding of DAT marking cross-linguistically, highlighting the potential diversity and flexibility inherent in DAT systems.

Kodhi's clitic/case system was analysed through the lens of LFG, incorporating insights from Localist theories and Jackendoff's Lexical Conceptual Structure (LCS). This framework allowed us to capture not only the distribution of DAT, but the full paradigm of pronominal and TAM clitics (NOM/ACC/DAT/GEN, including stacking patterns), and to show how their selection emerges from the interaction of event semantics (affectedness, intentionality, result vs. non-result), argument-structural prominence and linking (SUBJ/OBJ1/OBJ2 mapping), and discourse-information structure (e.g. mirativity and contrastive focus). In particular, Jackendoff's two-tier LCS (action/reaction tier and thematic tier) provides a transparent way to represent the fine-grained distinctions that underwrite Kodhi's clitic choices and alternations across intransitive, transitive, and ditransitive constructions.

The broader theoretical significance of our analysis lies in its demonstration of how affectedness, intentionality, and participant prominence interact systematically with case marking and argument structure. By utilizing the LFG framework, we were able to explicitly model how semantic and pragmatic considerations interface seamlessly with grammatical structure, notably in capturing the alternations between ACC and DAT marking in Kodhi's split-intransitive and ditransitive constructions.

This study thus contributes significantly both empirically and theoretically. Empirically, it enriches the typological database by documenting and analyzing previously unreported features of Kodhi DAT marking. Theoretically, it advances our understanding of the semantic-pragmatic foundations of grammatical relations, emphasizing the effectiveness of integrating Localist theories and Jackendoff's LCS within the LFG framework. Furthermore, the analysis provides support for Lakoff's (1987) view, as well as that of Goldberg's (1995) Constructional Grammar, that spatial metaphor is a cognitive universal, shaping grammatical constructions across languages. The Kodhi case demonstrates how constructional form-meaning patterns are transparently grounded in such spatial schemas, offering valuable evidence for the role of conceptual metaphor in grammar. These insights pave the way for future comparative studies exploring DAT marking and affectedness cross-linguistically.

As a final remark, several promising areas for future research emerge from this study, particularly concerning the historical development of DAT marking within the Austronesian context. According to Ross (2006, 2015) and Blust (2015), Proto-Austronesian (PAN) did not have a dedicated DAT case; instead, it employed NOM, GEN, and OBL (or LOC) paradigms. Roles like recipient, stimulus, and goal were typically marked through oblique forms associated with initial *\*n-* morphology, potentially the diachronic source of nasal expansions observed in Kodhi's current pronominal system, including its DAT markers.

The dedicated DAT paradigm observed in Kodhi, therefore, represents a clear case of language-internal innovation rather than retention from PAN. It likely arose through analogical extension of older ACC markers, influenced by phonological processes involving prenasalized stops and velar nasals. Geographical considerations reinforce this innovative perspective, as Kodhi is distant from languages that exhibit DAT marking derived from combinations of NOM and OBL markers (as in Formosan languages) or voice-related morphology (as in Philippine languages), minimizing the likelihood of historical borrowing or direct contact.

Additionally, Kodhi's DAT marking does not share cognacy with the DAT markers found in languages such as Tagalog (Kroeger 1993), Kimaragang (Kroeger 1996), or Formosan languages like Saisiyat (Hsieh & Huang 2006), further underscoring its status as an independent innovation. However, clear cognacy with related Sumba languages such as Kambera (Klamer 1998: 62) suggests a shared Proto-Sumba DAT system. Thus, Kodhi's DAT marking emerges as a unique and locally developed phenomenon, highlighting an intriguing area for deeper historical and comparative Austronesian linguistic research.

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# Stitching together dialogue: The inter-sentential syntax and semantics of fragment answers

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## 1 Introduction

Language offers many possibilities to leave things unsaid without obscuring communicative intent. This is arguably due to the ability of interlocutors to seamlessly reconstruct intended meanings in certain contexts. Examples of this are *pro-drop*, *ellipsis*, *sluicing*, and *gapping*, illustrated in (1a)–(1d).<sup>1</sup>

- (1) a. Join kahvia.  
drink.PAST.1SG coffee.PART  
'I drank coffee.' (Finnish, Toivonen 2023)
- b. Abby can play the guitar and Ben can, too. (Merchant 2013)
- c. Lena hat einen großen Mann geheiratet, aber ich weiß nicht wie groß(\*en)  
Lena has a tall.ACC man married, but I know not how tall(ACC)  
'Lena married a tall man, but I don't know how tall.' (German, Barros et al. 2014)
- d. Lisa lubiła Nelsona, a Nelson Lisy nie.  
Lisa.NOM.F like.PAST.F NelsonACC.M but Nelson.NOM.M LisaGEN.F NEG  
'Lisa liked Nelson, but Nelson didn't like Lisa.' (Polish, Patejuk & Przepiórkowski 2017)

The broad goal of this paper is to provide a survey of linguistic silence as analyzed in LFG. Furthermore, we explore how these analyses extend to a phenomenon that, to my knowledge, has not received any attention within LFG, namely, *fragment answers*, which share various characteristics with the cases of *silence* mentioned above.<sup>2</sup> Fragments are clausally incomplete utterances that come in various shapes and forms (e.g., Merchant 2005, Merchant et al. 2013). They are usually analyzed as being dependent on an implicit or explicit question in the preceding context (Griffiths 2019). This paper will target two instances, usually assuming explicit antecedent questions: the fairly well-researched NP fragment (2), and what I call predicative fragments, as in (3). Such fragments are built around a verb and require a certain compatibility with the verb used in the antecedent question. We show that these requirements are not solely semantic but also have a syntactic component related to tense/aspect marking.

- (2) Wer hat den Kuchen gegessen?  
Who have.3SG DEF.ACC cake eaten  
'Who ate the cake?'
- a. der Hund.  
DEF.NOM dog (German)

<sup>1</sup>For cited examples, I preserve the original structure and glossing so as not to obscure the author's intended presentation.

<sup>2</sup>For the remainder of this paper, I use the cover term *silence* for linguistic material that is not expressed overtly but can be derived from the context. I do not argue that the underlying mechanism is always the same for all the mentioned phenomena.

- (3) Was machst du heute?  
 What do.2SG you today  
 ‘What are you doing today?’  
 a. Einkaufen.  
 shop.INF  
 b. In die Stadt gehen.  
 To DEF.F city go.INF (German)

My goal is, broadly put, to sketch an analysis of fragment answers in Lexical Functional Grammar (LFG; Kaplan & Bresnan 1982) that captures their syntactic, semantic, and pragmatic constraints. As it turns out, there are numerous challenges that need to be addressed in providing such a holistic analysis of fragment answers. Rather than solving all of these issues, this paper acts as a survey that brings attention to them.

One crucial aspect of this paper is the assumption that, for the sake of economy, the previous context is stored not only semantically but rather in terms of LFG’s mutually constraining structures, which allows for the re-use of different aspects of previously uttered material for new contributions to a discourse (see also Fiengo & May 1994). Broadly, this explains different levels of linguistic priming (e.g., Bock 1986, Meyer & Schvaneveldt 1971). More specifically, it explains how fragment answers get away with omitting large parts of an utterance, while providing fairly clear evidence that these fragmentary utterances are part of a larger, unpronounced linguistic (i.e., both syntactic and semantic) structure. In the course of exploring this idea through the lens of LFG, I propose some extensions to various aspects of the formalism that I deem useful, particularly for analyzing semantic and pragmatic aspects of language.

In Section 2, I describe the relevant data in more detail against the backdrop of the literature on silence more generally. For this, I include prominent analyses of silence in the LFG framework in 3. In Section 4, I discuss fragment answers in detail through the lens of LFG and highlight some challenges for syntactic modeling. Section 5.1 leads this discussion into the domain of semantics and pragmatics, highlighting some serious challenges from this perspective. Finally, Section 6 concludes.

## 2 Silence and the presence or absence of linguistic structure

This paper is about linguistic expressions that appear to miss some explicitly expressed material without compromising their grammaticality. Different instances of this have been identified and discussed in the literature, raising various questions about the architecture of natural language grammar. In particular, the question of whether there is some larger underlying structure that remains unpronounced (in some sense) and questions about the characteristics of this structure have engaged researchers for decades.

Some of these instances are small (i.e., only small parts of an expression are omitted), as is the case for *pro-drop*. Consider the following example from (Bresnan et al. 2016: 159, ex.10) illustrating *pro-drop* in Chicheŵa. There, as the name *pro(noun)-drop* suggests, an overt subject can also be expressed as an implicit pronoun. In the LFG literature, this instance of *pro-drop* is called *pronoun incorporation*, referring to a situation where the morphological makeup of the verb, i.e., the agreement morphology, is responsible for optionally invoking an implicit pronoun, as indicated by the glossing in (4b).

- (4) a. Njûchi zi-ná-lúm-a a-lenje  
 10.bee 10.S-PAST-BITE-FV 2-hunter  
 ‘The bees bit the hunters.’  
 b. Zi-ná-lúm-a a-lenje  
 10.S-PAST-BITE-FV 2-hunter  
 ‘They bit the hunters.’ (Chicheŵa, Bresnan et al. 2016: 159)

For example, Butt (2007) shows that it is not always the structure of the verb that licenses the possibility to drop an argument. As she explains, in (5a), the verbal morphology agrees with the subject *they*, which has nominative case. In (5b), the subject is dropped as indicated by the glossing. Crucially, if this subject

were realized, it should carry the ergative case, triggering object agreement in the verb. Consequently, Butt (2007) argues that pro-drop is not licensed by morphosyntactic means, but rather on the basis of information structure, i.e., discourse structural or pragmatic means.

- (5) a. [ye]<sub>T</sub> b<sup>hi</sup> mer-i=ki tarã hẽ  
 Pron.3 also I.GEN-F.SG=GEN.F.SG like be.PRES.PL  
 ‘They<sub>topic</sub> are also like me.’ (Hindi, from *Dilwale Dulhania Le Jayenge*, cited by Butt 2007)
- b. jahã dana dek<sup>h</sup>-a  
 where seed.M.SG.NOM see-PERF.M.SG  
 ‘where (they<sub>cont.topic</sub>) see a seed’
- c. udar ga-ye aur peṭ bar kar ʊṛ ga-ye  
 there go-PERF.M.PL and stomach.M.SG.NOM fill having rise go-PERF.M.PL  
 ‘there (they<sub>cont.topic</sub>) go and having filled (their) stomach (they<sub>cont.topic</sub>) fly away.’  
 (Hindi, Butt 2007)

Languages without a case system as articulated as that of Hindi can also display discourse pro-drop, even more radically than discussed so far. This has been demonstrated by Rosén (2011) for Vietnamese. In (6b), all arguments of the verb are dropped. Thus, Rosén (2011) argues that information structural considerations are not enough to explain pro-drop, but rather, what she calls *relational givenness*. That is, this concept describes the idea that pro-drop is not (only) licensed by aboutness (topichood, cf. e.g., Huang 1984) but also by what arguments are *given* in relation to specific verbal (i.e., eventuality) descriptions. In (6a) all arguments of the verb *tặng* ‘give’ are made explicit. Thus, they can be dropped in the subsequent discourse in (6b).

- (6) a. Ông Ba có tặng anh Lan một cái đồng hồ bằng vàng, không?  
 Mr. Ba exist give Mr. Lan one CL watch made.of gold not  
 ‘Did Mr. Ba give Mr. Lan a gold watch?’
- b. Dạ, có tặng.  
 polite particle exist give  
 ‘Yes.’  
 (Vietnamese, Rosén 2011)

This suggests that pro-drop happens on a spectrum from more syntactically controlled environments to more semantically and pragmatically controlled environments. The different types of pro-drops illustrated in this section are instances of rather small units of speech that are left unsaid, and that yet indicate some real repercussions for the morphosyntax of a language (as indicated for Chicheŵa and Hindi). Overall, varying kinds of linguistic units in varying sizes can be omitted across languages, and we might expect that they lie on a similar spectrum. In the next section, we will discuss other instances of silence that pertain to larger linguistic units.

## 2.1 Ellipsis and sluicing

Material that is unpronounced at the surface level but arguably present syntactically is often referred to under the umbrella term of ellipsis (largely overlapping with what I call silence). This term covers specific types of ellipsis, e.g., VP or NP-ellipsis, but also, among other things, sluicing and fragment answers, which we will discuss in Section 4. An example of VP-Ellipsis is shown in (7). As illustrated there, *eliding* material is, at least, possible when an overt form-identical antecedent is present.

- (7) Abby can play the guitar and Ben can, too. (Merchant 2013: 2)
- a. Abby can play the guitar and Ben can [<sub>VP</sub> ~~play the guitar~~ ], too.

Another instance of silence with somewhat similar properties is *sluicing*. It differs from ellipsis in terms of the kind of elided phrase. More concretely, sluicing pertains to the deletion of phrases embedded under Wh-words and is illustrated in (8).

- (8) a. Somebody called Susan, but I don't know who ~~called Susan~~.  
 b. Ana visited Paris. I wonder when ~~Ana visited Paris~~. (Romero 1998: 4)

In the examples above, the struck-out material (henceforth elided material) has a clear antecedent in the preceding clause. The exact relation between this antecedent and the elided material has been explored in detail in the literature, e.g., Merchant (2001), Romero (1998), and Rooth (1992). Generally speaking, both syntactic and semantic factors seem to be at play there, as highlighted by Fiengo & May (1994). Here, I only present a number of prominent effects that occur in ellipsis and sluicing impressionistically as a baseline for a theory of this kind of silence. Importantly, these effects provide evidence that the elided material must be present in some shape or form (usually in the syntax or logical form; LF).

## 2.2 Syntactic identity conditions

An argument for a syntactically similar structure in a sluiced question comes from German. In example (9) from Ross (1969), the remaining Wh-phrase (usually called the *remnant* of the elided material) exhibits case-marking, suggesting that at some level of analysis it had to be linked to a verb whose object position it filled.

- (9) Er will jemandem schmeicheln, aber sie wissen nicht wem / \*wen.  
 He wants somebody-DAT flatter, but they know not whom-DAT / \*whom-ACC.  
 'He wants to flatter someone, but they don't know who.' (German, Ross 1969: 253)

Another argument for some level of syntactic identity comes from Merchant's (2001) example in (10). As illustrated there, the source of the ellipsis cannot be arbitrarily reduced.<sup>3</sup>

- (10) Abby [<sub>VP</sub> met [<sub>DP</sub> [<sub>DP</sub> someone ]from Kentucky]], and then Ben did.  
 a. <meet someone from Kentucky>  
 b. ≠ <meet someone> (Merchant 2001: 24)

Fiengo & May (1994) introduce the broad term of 'reconstruction' to explain the *source* of an ellipsis, assuming parallelism across the use of lexical items and syntactic configuration. Thus, the term 'source' refers to a set of sentences, i.e., an equivalence class of constructions that can serve as the origin of an elided clause. Intuitively, a sentence with an elided element is strictly parallel to at least one source up until the point where material is elided. Thus, in (7) and (8) the sources can be reconstructed by recovering the struck-out material.

*Sources* can be broadly divided into two categories: isomorphic sources and non-isomorphic sources. The examples discussed so far suggest a strong syntactic (and semantic; see Section 2.3) parallelism between source and antecedent. Such sources are called isomorphic. However, Barros et al. (2014), for example, flesh out the idea that non-isomorphism can explain several cases of ellipsis that are unexpected under a more strict identity condition. They discuss the following examples:

- (11) **Short source:**  
 a. We need to know what he is doing, and why ~~he is doing it~~  
 (cf. #...and why ~~we need to know what he is doing~~) (Barros et al. 2014: 4)
- (12) **Cleft source:**  
 a. Either something's on fire, or Sally's baking a cake, but I don't know which ~~it is~~.  
 (Barros et al. 2014: 6)

<sup>3</sup>This could also be an instance of the antecedent and the source requiring the same indices (see Section 2.3).

(13) **Predicational source:**

- a. Lena hat einen großen Mann geheiratet, aber ich weiß nicht wie groß(\*en) ~~er war~~.  
 L. has a tall.ACC man married, but I know not how tall(.ACC) ~~he was~~.  
 ‘Lena married a tall man, but I don’t know how tall (~~he was~~).’

(German, Barros et al. 2014: 16)

Example (11) suggests that the elided material does not correspond fully to the preceding clause, but only to a part of it, which (at least in some cases) is required to avoid island violations (Merchant 2001). In example (12), the preceding *either...or* clause cannot be the source of the ellipsis, but an anaphoric reference to one of the disjuncts as part of a cleft construction is possible. The German example in (13) shows that a predicational source (i.e., using *be*) is sometimes possible when an isomorphic source is not available.

Trying to reconstruct the elided material in these examples from the preceding material is at the very least difficult.<sup>4</sup> Thus, there seems to be some flexibility with respect to the *source* of an ellipsis. While isomorphic sources seem to be the default, syntactic constraints seem to be looser in some cases.<sup>5</sup>

**2.3 Semantic identity conditions**

In addition to syntactic constraints, elided material also follows certain semantic conditions. The first semantic well-formedness condition we consider here is *scope parallelism* (Romero 1998), which states that the order of scope-taking operators in the antecedent and the source of an elided phrase must be the same. This is illustrated in the following example:

- (14) Exactly three boys admire every professor, and exactly three girls do, too.
- a. ‘There are exactly three boys that admire every professor, and there are exactly three girls that admire every professor too.’ ( $\exists \forall, \exists \forall$ )
- b. ‘For every professor, there are exactly three boys that admire him/her, and, for every professor, there are exactly three girls that admire him/her too.’ ( $\forall \exists, \forall \exists$ )
- c. \*‘There are exactly three boys that admire every professor and, for every professor, there are exactly three girls that admire him/her.’ ( $\exists \forall, \forall \exists$ )
- d. \*‘For every professor, there are exactly three boys that admire him/her, and there are exactly three girls that admire every professor.’ ( $\forall \exists, \exists \forall$ )
- (Romero 1998: 14)

As, for example, explored in Shieber et al. (1996), scope parallelism is obfuscated by a number of factors, particularly, the distinct semantics of indefinites (see Heim 2019 for an overview). Furthermore, the issue requires the consideration of various other semantic effects possibly related to scope-taking operators such as the *de dicto/de re* distinction and the resolution of anaphoric dependencies.

Generally, pronouns and their resolution provide a second important diagnostic for the underlying semantics of an ellipsis source. Here, I only discuss one more widely explored aspect: the distinction between strict and sloppy readings in examples like (15). There, two readings are available, indicating that there is a covert pronoun in the elided clause. This pronoun can either refer to Harold or to the speaker of the sentence, i.e., it can co-refer to the subject of the antecedent or the subject of the elided clause.

- (15) Harold scratched his arm and I did ~~scratch PRO’s arm~~, too. (adapted from Ross 1967: 268)

<sup>4</sup>All of this postulates that the omitted material follows the same felicity conditions as its overt counterpart, i.e., we assume that the source, even if it diverges from the antecedent, must adhere to syntactic well-formedness conditions, aside from syntactic identity.

<sup>5</sup>Incidentally, the examples here all involve sluicing, but if, e.g., Merchant (2001) and Barros et al. (2014) are on the right track, they highlight a potential general property of linguistic silence that needs to be taken into consideration when exploring related phenomena.

This has led researchers to adopt the notion of semantic equivalence up to but not including indices (usually attributed to Fiengo & May 1994). While there is certainly more to say about this issue, as indicated at the beginning of this section, this will serve as our baseline for a theory of silence in LFG.

To finalize this section, I will discuss a few cases of ellipsis where there is an apparent mismatch between syntactic and semantic parallelism. One such example is (16). There, the source of the elided clause requires active voice to be compatible with the remnant *I do*; however, as a reviewer points out, an anaphoric source like *I do so/this* may be possible.

- (16) A lot of this material can be presented in a fairly informal and accessible fashion, and often I do.  
(Chomsky, 1982, p. 41, cited by Shieber et al. 1996: 440)

Another case comes from the apparent equivalence of pronouns and referring expressions as noted, e.g., by Fiengo & May (1994). In (17), the R-expression *John* in the source of the ellipsis is violating condition C of Chomsky's binding theory that states that a referring expression cannot be co-referential with a pronoun that c-commands it.

- (17) Mary loves John<sub>i</sub>, and he<sub>i</sub> thinks that Sally does [VP ⟨ love him<sub>i</sub> / \*John<sub>i</sub> ⟩] too.  
(Fiengo & May 1994: 220)

Nonetheless, the example is perfectly grammatical. A simple way to resolve this issue, noted by Fiengo & May (1994), is that pronouns referring to the same entity are equivalent to the respective referring expressions in all aspects except for a *pronoun* feature. They argue that this feature is modified under ellipsis to the effect that the strict syntactic identity between source and antecedent is violated, while maintaining semantic parallelism. This is often called *vehicle change*.

Altogether, there are a host of properties pertaining to the parallelism between antecedent and source that require attention when analyzing an instance of linguistic silence. The list presented here is not exhaustive, and the discussion of the elements presented here only scratches the surface. However, we can identify some key dimensions across which we can analyze instances of silence:

- Isomorphic vs. non-isomorphic sources
- Scope parallelism
- Anaphoric binding in elided elements

Overall, when considering even the omission of 'small' linguistic units, e.g., pro-drop, there is considerable variation across languages that pertains to the involvement of syntax, semantics, and pragmatics. In the next section, we turn to the discussion of silence in LFG. Particularly, we explore analyses of pro-drop and gapping, as some of the few analyses of silence present in LFG. On the one hand, this gives further insights into the properties of linguistic silence. On the other hand, this paves the way for the discussion of fragment answers in the light of LFG.

### 3 Silence in LFG

Lexical Functional Grammar (LFG; Kaplan & Bresnan 1982) proposes that grammar can be described in terms of modular mutually constraining representations or projections (coining the term 'parallel projection architecture'; more on this in Section 5.1). This idea has been primarily explored in syntactic research, targeting c(onstituent) structure capturing information about constituents and their linear order, and f(unctional) structure. The presence of two separate representations lends itself to a view of silence as a mismatch between the two.

### 3.1 Pronoun incorporation

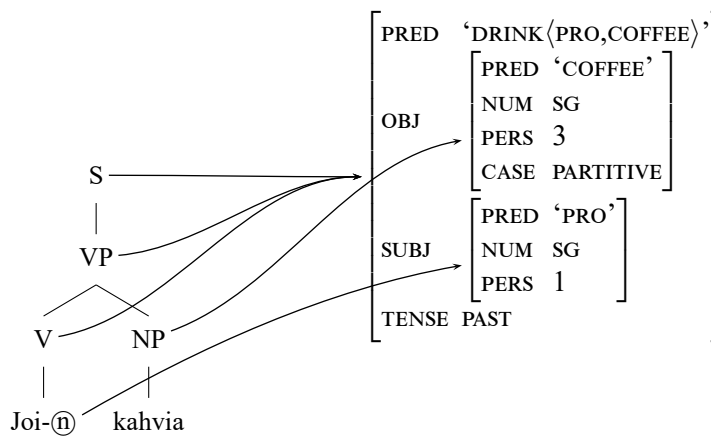
Pronoun incorporation is an instance of silence that serves as an explanation for certain cases of pro-drop, concretely, those cases where an originally independent pronoun is incorporated into the verb in a grammaticalization process from pronoun via clitic to incorporated pronoun (Toivonen 2023, Bresnan et al. 2016: 151–195). An example of this is given in (18).

- (18) Join kahvia.  
 drink.PAST.1SG coffee.PART  
 ‘I drank coffee.’

(Finnish, Toivonen 2023)

- (19) First-person singular morphology (in Finnish):

+1SG (↑ SUBJ NUM) = SG  
 (↑ SUBJ PERS) = 1  
 ((↑ SUBJ PRED) = ‘PRO’)



(based on Toivonen 2023: ex. (6))

The main point of this analysis that is relevant here is that, possibly through morphological means (see (19)), the verb contributes information to two independent f-structures, namely its own and that of its subject. Conversely, different f-structures do not necessarily map to individual constituents. In fact, the example in (20) is expressed by exactly the same f-structure as that of (18).<sup>6</sup>

- (20) Minä join kahvia.  
 I.NOM drink.PAST.1SG coffee.PART  
 ‘I drank coffee.’

(Finnish, Toivonen 2023)

It is well known that an f-structure forms an equivalence class over sentences generated by a grammar. If we assume that the f-structures for (18) and (20) are the same, then this naturally invites the question of whether f-structures are suitable to describe possible sources of ellipsis. The answer is likely not always affirmative, as in examples (11) through (13), different types of sources receive different f-structures than their antecedents. However, the question then remains, *when* stricter syntactic identity by virtue of f-structure compatibility is required. All in all, generation from f-structure is an integral part of the puzzle of how to analyze silence in LFG.

#### 3.1.1 Gapping

Patejuk & Przepiórkowski (2017) and Przepiórkowski & Patejuk (2023) propose an analysis of gapping that allows us to investigate this claim further. *Gapping* refers to instances of silence where the main verb

<sup>6</sup>Except maybe for nominative case (see Toivonen 2023). Furthermore, a grammar might differentiate between `NULL_PRO` and `PRO`, but while this formalizes the difference, it does not explain it.

of a clause remains unpronounced (Ross 1970), leaving (potentially) multiple remnants. In (21a), for example, only the verb is elided, with all its arguments becoming remnants. Gapping requires fairly strict identity conditions between the antecedent and the clause containing the gap, although there is some leeway, e.g., with respect to case marking, as is also shown in (21a).

- (21) a. Marge gave an apple to Lisa and Homer a donut to Bart.  
 b. Lisa lubiła Nelsona, a Nelson Lisy nie.  
 Lisa.NOM.F like.PAST.F Nelson.ACC.M but Nelson.NOM.M LisaGEN.F NEG  
 ‘Lisa liked Nelson, but Nelson didn’t like Lisa.’ (Polish, Patejuk & Przepiórkowski 2017)

To capture these facts, Patejuk & Przepiórkowski (2017) use a mechanism called distribution, which spreads information from the antecedent f-structure to the gapped clause, thus, intuitively, postulating that the antecedent f-structure crucially informs the representation of the source of the ellipsis. Let us examine this analysis in more detail. The important ingredients are the three rules in (22).

- (22) IP  $\longrightarrow$  IP1 Conj IP  
 $\uparrow=\downarrow$   $\uparrow\in\downarrow$   
 $(\downarrow \text{LOCAL}) \in \uparrow$   
 IP1  $\longrightarrow$  DEP\*, I  
 $(\uparrow (\text{LOCAL})) = \downarrow$   
 IP  $\longrightarrow$  DEP\*, (I)

The first rule indicates that a conjunction is essentially a set formation operation. The second IP straightforwardly contributes its contents to this set, as exemplified in the shape of the second f-structure (23). IP1 defines the set of local dependencies (i.e., arguments) of the main verb. That is, those arguments that are particular to the first conjunct, thus contributing the first element in (23).

- (23) **Coordination set:**

$$\left\{ \begin{bmatrix} \text{SUBJ} & [\text{PRED 'MARGE'}] \\ \text{OBJ} & [\text{PRED 'APPLE'}] \\ \text{OBL} & [\text{PRED 'LISA'}] \end{bmatrix}, \begin{bmatrix} \text{SUBJ} & [\text{PRED 'HOMER'}] \\ \text{OBJ} & [\text{PRED 'DONUT'}] \\ \text{OBL} & [\text{PRED 'BART'}] \end{bmatrix} \right\}$$

Neither of the conjuncts corresponds to a well-formed f-structure as the grammatical functions (GFS) are not governed by an appropriate PRED-value. As illustrated above, this PRED-value should be the same for both conjuncts. For this, Patejuk & Przepiórkowski (2017) cleverly employ the distinction between *distributive* features and *non-distributive* features in LFG. Concretely, the dependents stored in LOCAL, which are also part of the f-structure corresponding to the first conjunct, are non-distributive; all other features, particularly the PRED-value, are distributive and, thus, distributed to all members of the conjunct set by the annotation  $\uparrow=\downarrow$  on IP1. The final ingredient of this analysis is the rule for IPs, which indicates that IPs conjoined to some IP1 do not necessarily need to contain a verb (occupying I). Thus, the difference between a gapped clause and a fully realized conjoined IP (see example (24)) is subtle, mainly surfacing in the shared indices of distributed material in the gapped version.

- (24) Marge gave an apple to Lisa and Homer gave a donut to Bart.

Thus, both receive the f-structure in (25) modulo indices:

(25) **Complete coordinated f-structure:**

$$\left[ \left\{ \begin{array}{l} \left[ \begin{array}{l} \text{PRED } \langle \text{'GIVE'} \langle \text{MARGE, APPLE, LISA} \rangle \rangle \\ \text{SUBJ } [\text{PRED } \langle \text{'MARGE'} \rangle] \\ \text{OBJ } [\text{PRED } \langle \text{'APPLE'} \rangle] \\ \text{OBL } [\text{PRED } \langle \text{'LISA'} \rangle] \\ \text{TENSE } \text{PAST} \\ \text{VOICE } \text{ACTIVE} \end{array} \right] \\ \text{LOCAL } \boxed{1} \end{array} \right\} , \left\{ \begin{array}{l} \left[ \begin{array}{l} \text{PRED } \langle \text{'GIVE'} \langle \text{HOMER, DONUT, BART} \rangle \rangle \\ \text{SUBJ } [\text{PRED } \langle \text{'HOMER'} \rangle] \\ \text{OBJ } [\text{PRED } \langle \text{'DONUT'} \rangle] \\ \text{OBL } [\text{PRED } \langle \text{'BART'} \rangle] \\ \text{TENSE } \text{PAST} \\ \text{VOICE } \text{ACTIVE} \end{array} \right] \end{array} \right\} \right]$$

Of course, another difference is the fact that the first conjunct is part of *LOCAL*, but the linguistic status of this attribute is not entirely clear as gapping is also possible in syntactically independent clauses. In such cases, we have to postulate a discourse-level syntax to enable the distributivity mechanism (see also Section 5).

### 3.2 Summary

We can conclude that existing analyses of (certain aspects of) linguistic silence in LFG operate under the assumption that the f-structure is the pivotal structure for expressing the ‘intended’ syntax of elided elements.<sup>7</sup> From a functional perspective, the intended structure is almost identical for a *surface complete* string and an elliptical string. We have hypothesized that approaches following this idea might struggle with instances of elided material whose underlying structure does not correspond directly to its antecedent. However, in this paper, I show that the gapping approach provides a reasonable starting point for analyzing fragment answers.

In the next section, I start discussing fragment answers through the lens of LFG. Concretely, I will follow the trend of treating them as a mismatch between c- and f-structure, where the mismatch is resolved by carrying over functional material from the antecedent question to the fragment answer.

## 4 Analyzing fragment answers in Lexical Functional Syntax

Fragments are linguistic expressions that are characterized by grammatically incomplete units, e.g., noun phrases, or non-finite verbs that still have a ‘semantically propositional character’ (Merchant 2005: 662). They can appear in the context of questions, but also without immediate linguistic antecedents. This leads some researchers to believe that the antecedents of fragments are recovered from the context, more concretely, questions-under-discussion (QUD; Roberts 2012). This idea is also informed by research into the relation between focus and ellipsis (Rooth 1992, Romero 1998), and more recently, e.g., by Weir (2018) and Griffiths (2019). For now, I simply assume that a suitable antecedent has been identified and its f-structure information is accessible.

### 4.1 Nominal fragments

As with ellipsis and sluicing, there are indicators of a missing larger structure that fragments belong to. This is further supported by their generally propositional character. It is also reflected in their morphosyntax, as is corroborated by languages with explicit case marking like German. The contrast in (26) and (27) illustrates this. The fragment answers pattern with the respective Wh-words. In LFG terms, this suggests that they fill a GF position that is filled by the question constituent in the antecedent question. Concretely, the SUBJ function is filled in (26) and the OBJ function in (27).

<sup>7</sup>There is work on ellipsis and sluicing by, e.g., Crouch (1999) and Asudeh & Crouch (2002a) which takes a more semantic approach. This is discussed in more detail in Section 5. We postpone it for now, as they mainly focus on semantic identity criteria, omitting syntactic identity requirements (following Dalrymple et al. 1991).

- (26) Wer hat den Kuchen gegessen?  
 Who.NOM have.3SG DEF.ACC cake eat.PST.PTCP  
 ‘Who ate the cake?’ (German)  
 a. Der Hund ~~hat den Kuchen gegessen~~.  
 DEF.NOM dog
- (27) Wen hat der Hund gejagt?  
 Who.ACC have.3SG DEF.NOM dog chase.PST.PTCP  
 ‘Who did the dog chase?’ (German)  
 a. Den Hamster ~~hat der Hund gejagt~~.  
 DEF.ACC hamster

Through these examples, we can form a first hypothesis: fragments fill GFs of unpronounced f-structures. This is in line with the analyses of linguistic silence in LFG that we have seen so far. However, the situation is far from clear-cut. In example (28), the two possible realizations of the answer suggest that it is not always clear whether the fragment corresponds to a full GF or parts of it. Comparing (28a) and (28b), it seems that the oblique argument of the verb *schicken* ‘send’ can be realized as a prepositional phrase but also by the noun phrase that is embedded under the preposition.

- (28) An wen hast du den Brief geschickt?  
 To who.ACC have.2SG you DEF.ACC letter send.PST.PTCP  
 ‘To whom did you send the letter?’/‘Who did you send the letter to?’ (German)  
 a. An Maribel  
 to Maribel  
 b. Maribel

To explore this further, observe the two f-structures in (29), which represent two ways of providing the GF OBL in LFG. The two analyses differ with respect to the analysis of prepositions as semantic or non-semantic. Both of these would reflect answer a) in (28). However, b) is also a possible answer which conflicts with both of the f-structures indicating the presence of a preposition.<sup>8,9</sup> This suggests that fragment answers do not always refer to a GF of an elided verb, but potentially their substructures; here, this would be the OBJ of the prepositional phrase. However, if the preposition is analyzed as non-semantic, then it seems that (28b) should be impossible because an OBL is usually constrained by a PFORM feature,

<sup>8</sup>It may be the case that (28b) corresponds to a dative object rather than the object of an (accusative) PP. This difference can be tested by using pronouns which are marked for case, but the judgments are subtle as shown in (i).

- (i) a. An ihn  
 to him.ACC  
 b. ?ihn  
 him.ACC  
 c. ??ihm  
 him.DAT

Thus, further systematic experimental testing or a corpus investigation is required. However, we also present an example of a fragment answer filling an embedded GF with clearer judgments in the following paragraph.

<sup>9</sup>Example (28a) is semantically equivalent to the following question.

- (i) a. Wem hast du den Brief geschickt?  
 Wem.DAT have.2SG you DEF.ACC letter send.PST.PTCP  
 ‘Who did you send the letter to?’  
 b. ?An Maribel  
 to Maribel

In this case, the answer has to look like a dative object NP (i.e., a nominal rather than a prepositional phrase), while the oblique PP is less acceptable, at least, degraded.

which would not be available. We leave a more extensive exploration of prepositional phrases for future work.

- (29) a. 
$$\left[ \begin{array}{l} \text{PRED 'TO' } \langle (\uparrow \text{OBJ}) \rangle \\ \text{OBJ } \left[ \begin{array}{l} \text{PRED 'MARIBEL'} \\ \text{NTYPE PROPER} \end{array} \right] \end{array} \right]$$
- b. 
$$\left[ \begin{array}{l} \text{PRED 'MARIBEL'} \\ \text{NTYPE PROPER} \\ \text{PFORM TO} \end{array} \right]$$

A clearer case of a fragment answer not reflecting a GF is provided by possessive questions as in (30). There, in a typical LFG analysis, *Maribel* would be subordinated to the noun, occupying the POSS function, whose GF status is disputed. At least, it is not selected for by verbs. However, POSS might correspond to SUBJ in the nominal domain (Bresnan 2001).<sup>10</sup>

- (30) Wessen Buch hat er gelesen?  
 Who.GEN book have.3SG he read.PST.PTCP  
 ‘Whose book did he read?’ (German)
- a. Maribels  
 Maribel.GEN

Given the examples above, let us examine the assumption that fragment answers must reflect GFs in their source representation more closely. First, let us briefly discuss a typical analysis of questions in LFG. Example (31) describes the f-structure for (26). The f-structure for (30) is given in (32). The analysis follows Börjars et al. (2019) in assuming that the wh-phras is best captured as a grammatical discourse function indicating its information structural status (essentially, question focus).<sup>11</sup> In addition to FOCUS, this analysis also tracks the Wh-element in the f-structure. This is done to ensure that the (fronted) Wh-word is part of the corresponding FOCUS, and, thus, also GF.

- (31) 
$$\left[ \begin{array}{l} \text{PRED 'ESSEN' } \langle (\uparrow \text{SUBJ}), (\uparrow \text{OBJ}) \rangle \\ \text{PRON-INT } \boxed{1} \left[ \begin{array}{l} \text{PRED 'PRO'} \\ \text{PRON-TYPE INT} \\ \text{CASE NOM} \end{array} \right] \\ \text{FOCUS } \boxed{1} \\ \text{SUBJ } \boxed{1} \\ \text{OBJ } \left[ \begin{array}{l} \text{PRED 'KUCHEN'} \\ \text{SPEC } \left[ \text{DET } \left[ \text{PRED 'DEN'} \right] \right] \\ \text{CASE ACC} \end{array} \right] \end{array} \right]$$
- (32) 
$$\left[ \begin{array}{l} \text{PRED 'LESEN' } \langle (\uparrow \text{SUBJ}), (\uparrow \text{OBJ}) \rangle \\ \text{PRON-INT } \boxed{2} \left[ \begin{array}{l} \text{PRED 'PRO'} \\ \text{PRON-TYPE INT} \end{array} \right] \\ \text{FOCUS } \boxed{1} \\ \text{SUBJ } \left[ \begin{array}{l} \text{PRED 'PRO'} \\ \text{PERS 3} \\ \text{NUM SG} \end{array} \right] \\ \text{OBJ } \boxed{1} \left[ \begin{array}{l} \text{PRED 'BOOK'} \\ \text{POSS } \boxed{2} \end{array} \right] \end{array} \right]$$

Consequently, the Wh-constituent is represented as having two layers. The narrow layer consists of only the question word, whereas the second layer describes the grammatical discourse function FOCUS.

<sup>10</sup> It is worth pointing out that using a proper name plays a special role here, as a definite DP answer, for example, is not possible in the same fashion:

- (i) a. \*Des Professors  
 DET.GEN professor.GEN  
 b. Das des Professors  
 DET.PRON DET.GEN professor.GEN

<sup>11</sup> Börjars et al. (2019) do not strictly argue that TOPIC should be a grammatical discourse function, but they suggest it for the sake of not dealing with a full-fledged information structure. In the light of the fact that this is also the approach taken by computational grammars, I adopt it here, but see King (1997) for arguments against it.

Given this distinction, another way to analyze (28) and (30) emerges. In the latter, the answer must only satisfy the narrow layer of the Wh-phrase, i.e., PRON-INT, whereas in the former, both can serve as a representation of the fragment answer. This naturally extends to cases where the two coincide, like (26). However, this still poses the question of what the conditions are under which a fragment must coincide with FOCUS and when it may only correspond to PRON-INT. One possibility is that the size of the corresponding noun phrase plays a role, e.g., assuming that pronouns, proper names, and definite noun phrases are DPs, NPs cannot be realized as fragment answers (Elbourne 2013; see also fn. 10).

In the case of D-linked questions as in (33) it seems that the fragment answer must always correspond to the whole FOCUS, which can be potentially traced to the fact that the Wh-word clashes with constraints on D in the fragment answer, or even more clearly an answer like *die Graue* ‘the grey one’ already occupies the D position, blocking the Wh-word *Welche* ‘which’ from being used in the fragment answer.<sup>12</sup>

- (33) Welche Katze hat die Maus gefangen?  
Which cat have.3SG DEF.F mouse catch.PST.PTCP  
‘Which cat caught the mouse?’  
a. Mimi

A final case I want to discuss here is that of D-linked Wh-phrases that embed partitive constructions, as in (34) and (35). Here, it appears to be the case that the answer can correspond to either the Wh-word (PRON-INT) or the full Wh-phrase (FOCUS). This could suggest that the partitive construction is not necessarily a part of the source of the fragment answer. However, if it is, syntactically, this shows that PRON-INT remnants work with discontinuous constituents, without violating the FOCUS structure.

- (34) Von den Kuchen hat sie WELCHE gegessen?  
Of DEF.ACC cakes have.3SG she which.PL eat.PST.PTCP  
‘Of the cakes, which ones did she eat?’  
a. Die ohne Ei.  
DEF.PL without egg  
b. Die ohne Ei ~~hat sie gegessen~~.  
DEF.PL without egg has she eat.PST.PTCP  
‘She ate those without egg.’  
c. Von den Kuchen hat sie die ohne Ei gegessen  
of DEF.ACC cakes has she DEF.PL without egg eat.PST.PTCP  
‘She ate those of the cakes without egg.’
- (35) [Aus der Schule]<sub>i</sub> hat WER<sub>i</sub> sie besucht?  
from DEF.DAT school have.3SG who.NOM her visit.PST.PTCP  
‘Who from school visited her?’  
a. Ihr Sitznachbar  
her benchmate  
b. Ihr Sitznachbar ~~hat sie besucht~~.  
Her benchmate has her visit.PST.PTCP  
c. Ihr Sitznachbar ~~aus der Schule hat sie besucht~~  
Her benchmate from DEF.SG school has her visit.PST.PTCP  
‘Her benchmate from school has visited her.’

<sup>12</sup>A reviewer questions the role of c-structure categories here, as proper names can sometimes occur with an overt determiner; however, they do not share a distribution pattern with proper names, and it is not clear whether they would behave the same way in fragment answers. More critically, they also point out that f-structure well-formedness constraints could prohibit the formation of such fragments just as well. Although this is more in the spirit of LFG, I still believe that looking at c-structure, f-structure, and semantic constraints may reveal additional nuances of possible fragment answers.

These examples suggest that certain complex constructions might be syntactically reduced. However, as discussed in Section 2.2, the syntactic reduction does not eliminate semantic constraints. Thus, the noun phrase in the above examples remains implicitly semantically restricted to those entities satisfying the additional syntactic material in the antecedent question. This suggests that not all syntactic material must be part of the source of a fragment answer (or an elided clause in general). Once again, preserving indices may be the important factor (Fiengo & May 1994).

## 4.2 Predicational fragments

The decomposed focus analysis presented for nominal fragments allows us to capture the distribution of possible fragment answers, although some questions remain regarding the possibility of substituting either the whole FOCUS constituent or only the more narrow Wh-constituent (PRON-INT). In the case of, e.g., *what* and *where*-questions, the situation is even more complicated. Consider the following question.

- (36) Was mach-st du gerade?  
 What make-3SG you right now  
 ‘What are you doing right now?’ (German)

The answers in (37) highlight a somewhat subtle difference, namely, that the semantically relatively unspecific verb *machen* (to do) licenses more answers than expected. First, (37a) illustrates an NP fragment as discussed above. However, in (37b), we get a predicational fragment which consists of a non-finite clause missing both tense information and its subject (i.e., an infinitival fragment). In this case, the verb in the answer replaces the verb in the question, as illustrated in (38). There, the nominalized *einkaufen* cannot serve as the object of an isomorphic source.

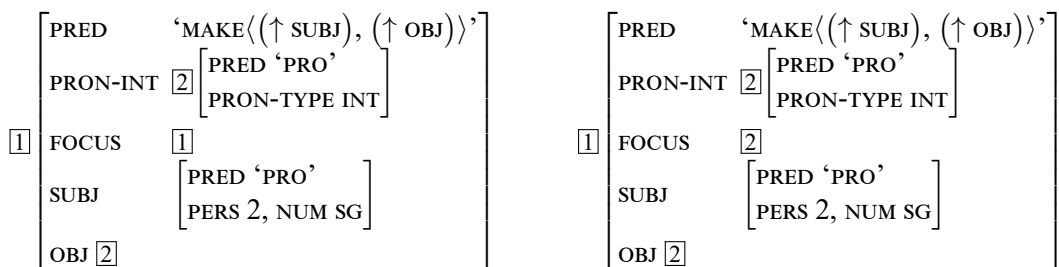
- (37) a. Hausaufgaben.  
 homework.PL  
 b. (bin) Einkaufen  
 (am) shop.INF  
 c. in die Stadt fahren  
 into the city drive.INF

- (38) a. \*~~Ich mache~~ Einkaufen.  
 I make shop.INF  
 b. Ich bin einkaufen.  
 I am shop.INF

Thus, to extend our analysis to *what*-questions, we also need to consider the full verb f-structure as a possible focus element.

This also leads to a possible mismatch between the focus element and the GF of the question word. More specifically, the focus selected for by *what* is ambiguous between an embedded GF and the verb’s f-structure itself, as shown in (39). Consequently, the syntax and semantics of *what* questions are less uniform. Both of these considerations provide challenges for the grammatical discourse function analysis of questions, for which this paper does not have a satisfying answer.

- (39) What are you doing?



However, I try to provide further insights into the relation between clausal question focus, as in the example above, and predication fragment answers. Concretely, we see in (37b) and (37c) that the predicate used in the fragment answer must be more specific than the predicate used in the question. We also see that, syntactically, the predicate in the answer can inherit certain tense/aspect features from its antecedent question. This becomes clearer when they are used in the past tense. In (40), we see that the aspectual auxiliary *have* can be omitted. However, tense congruence is required so that *schlafen* is not a possible answer.

- (40) Was hast du gestern gemacht?  
 What have.2SG you yesterday do.PST.PTCP  
 ‘What did you do yesterday?’ (German)
- a. geschlafen / habe geschlafen / war schlafen  
 sleep.PST.PTCP have.1SG sleep.PST.PTCP be.1SG sleep.INF
- b. \*schlafen  
 sleep.INF

In contrast, in (41a), the auxiliary is obligatory.

- (41) a. bin geschwommen  
 be.1SG swim.PST.PTCP
- b. \*geschwommen  
 swim.PST.PTCP

These examples show that predication fragments must provide certain aspectual features that merge with the tense features in the antecedent question. This becomes clearer when we compare two ways to construct the perfect in German: with *haben* ‘have’ and with *sein* ‘be’. As (41a) suggests, these must match between question and answer for the answer without auxiliary to be felicitous. This seems to be borne out as it extends to examples where the *sein*-perfect is used in the question, as in (42). There, (42a) and (42b) provide compatible predicates and inherit their tense information from the question. However, in (42c), this process is blocked by using an incompatible verb (i.e., a verb that forms the perfect with *haben*). In this case, the aspectual/temporal auxiliary *have* is obligatory.

- (42) Wo bist du hin?  
 Where be.2SG you to  
 ‘Where did you go?’
- a. In die Schule gelaufen.  
 to the school walk.PST.PTCP
- b. zum Bahnhof gegangen.  
 to the train station go.PST.PTCP
- c. habe meine Mutter besucht.  
 have.1SG my mother visit.PST.PTCP

Similarly, answers to (40), which form the perfect with *haben*, are grammatically more acceptable if they also form the perfect with *haben*. Thus, as both (40a) and the answers in (42a) and (42b) show, the aspectual auxiliary can be more easily omitted if the question verb matches the verb in the response on the unergative/unaccusative (*haben/sein*) split. This split is explained in more detail, e.g., in Bjorkman (2011).

What does this mean for an analysis? If the verb is semantically relatively underspecified in its meaning, then predication fragments are possible. These predication fragments carry some aspectual features that must be compatible with the tense/aspect features of the question. We can call this an *aspectual matching condition*. If this condition is violated, then we get something that looks like pro-drop instead of a predication fragment, i.e., only the subject pronoun can be omitted (see Section 2). Then, it

is unclear whether the information is distributed from the antecedent question, or whether a pro-drop mechanism is at play, or, perhaps, they are the same.

At least, we come to the fairly intuitive conclusion that a higher level of syntactic congruence between antecedent and source allows for the omission of more material. This also seems to be true for NP fragments. Consider the possessive example again:

- (43) Wessen Buch hat er gelesen?  
 Who.GEN book.N have.3SG he read  
 ‘Whose book did he read?’  
 a. Maribels  
 Maribel.GEN  
 b. Das der Professorin  
 DEF.N DEF.GEN professor  
 c. Die Biographie der Professorin  
 DEF.F.SG biography.F DEF.GEN professor
- (44) a. \*Die der Professorin  
 DEF.PL DEF.GEN professor  
 b. Die Bücher der Professorin  
 DEF.PL book.PL DEF.GEN professor

Here, the gender of the determiner must match the gender of the noun in FOCUS, or a fitting noun must be introduced in the answer.<sup>13</sup> The same can be shown for number marking, as the contrast in (44) shows, where a number mismatch (with the question in (43)) must be explicitly realized in the answer, leading to a clear split in the constraints on answer formation: matching number and gender allows for more reduced answers compared to answers containing a mismatch in these features.

## 5 Towards implementing fragment answers in computational LFG

We have seen two types of fragments: functional fragments that generally correspond to some GF or its parts in the antecedent, and predicational fragments that partially match the f-structure of the verbal spine of the antecedent. In (45), grammar rules based on Patejuk & Przepiórkowski (2017) are presented that suggest a corresponding solution for the presented data.<sup>14</sup> NP fragments are already covered by the original analysis. Here, we show that the analysis can be easily extended to deal with predicational fragments. The key aspect of this analysis is that the verb may be used only locally in the antecedent question. Thus, the fragment answer can consist of just a VP. The aspectual matching condition is then enforced via the AUX-FORM-feature on the auxiliary in the antecedent question, which can only unify with a suitable answer. However, if the answer explicitly provides tense/aspect form features, then the

<sup>13</sup>This observation hinges on the fact that we treat *die* and *das* as determiners. A reviewer points out that they could potentially be interpreted as deictic pronouns. However, additional remnants of the NP, e.g., adjectival modifiers, indicate that there is, at the very least, an ambiguity between a deictic and determiner interpretation. Thus, the latter is still in need of an explanation.

- (i) Wessen Kleid hat sie bewundert?  
 Who.GEN dress have.3SG she admire.PST.PTCP  
 ‘Whose dress did she admire?’  
 a. Das Rote der Sängerin  
 the red of the singer.F  
 ‘The red one of the singer.’

The constraints on gender mismatch may also be influenced by the fact that *die* is a syncretic form covering both singular and plural.

<sup>14</sup>We omit additional annotations concerning grammatical discourse functions for clarity. Thus, our implemented analysis is more general and may be reconciled with different views on information structure.

corresponding features in the question are interpreted locally (i.e., are not distributed to the answer). This captures the aspectual matching condition. A deeper analysis of the underlying features, e.g., based on the unergative/unaccusative split, is left for future work, as it would require a more in-depth look at the morphological makeup of auxiliaries and their interaction with the main verb. This could presumably be done, e.g., in L<sub>R</sub>FG (Asudeh & Siddiqi 2022).

(45) **Rules:**

$$\begin{aligned}
 \text{DISCOURSE} &\longrightarrow \begin{array}{ccc} S_{\text{question}} & & S_{\text{fragment}} \\ \uparrow=\downarrow & & \downarrow \in \uparrow \\ (\downarrow \text{LOCAL}) \in \uparrow & & \end{array} \\
 S_{\text{fragment}} &\longrightarrow \begin{array}{c} \{\text{VP} \mid \text{DP} \mid \text{PP} \mid \dots\} \\ (\uparrow (\text{GF})) = \downarrow \end{array} \\
 S_{\text{question}} &\longrightarrow \begin{array}{ccccccc} & \text{NP} & & (\text{AUX}) & & \text{NP} & \text{VP} \\ (\uparrow \text{LOCAL GF}) = \downarrow & \uparrow=\downarrow & & (\uparrow (\text{LOCAL}) \text{GF}) = \downarrow & & (\uparrow \text{AUX-FORM}) & \uparrow=\downarrow \end{array} \\
 \text{VP} &\longrightarrow \begin{array}{ccc} (\text{AUX}) & \text{V} & \text{NP} \\ \uparrow=\downarrow & (\uparrow (\text{LOCAL})) = \downarrow & (\uparrow (\text{LOCAL}) \text{OBJ}) = \downarrow \end{array}
 \end{aligned}$$

(46) **Lexicon:**

$$\begin{aligned}
 \textit{hast} \quad \text{AUX} \quad &(\uparrow (\text{LOCAL}) \text{AUX-FORM}) = \text{HAVE} \\
 &(\uparrow (\text{LOCAL}) \text{TNS-ASP}) = \text{PRES} \\
 &(\uparrow \text{PARTICIPLE}) =_c \text{PAST} \\
 \textit{geschlafen} \quad \text{V} \quad &(\uparrow \text{PRED}) = \text{'SCHLAFEN'} \langle (\uparrow \text{SUBJ}) \rangle' \\
 &(\uparrow \text{AUX-FORM}) =_c \text{HAVE} \\
 &(\uparrow \text{PARTICIPLE}) = \text{PAST}
 \end{aligned}$$

Although this analysis captures the syntactic interactions between question and answer, it does not explain all aspects of the flexibility of fragment answers. In particular, it does not explain why fragments can be used in contexts where a certain question has been made salient, without being explicitly uttered, or rather is not part of the immediate linguistic context.

As already discussed in Section 3, syntax alone cannot explain when we choose silence vs. overt realization. This is not to say that such an approach is not useful: we have established that fragments have certain well-formedness conditions at c-structure that operate with some mechanism to ascertain f-structure well-formedness, and this approach allows us to capture that.

Thus, the final challenge of fragments for LFG's syntax is that it highlights the fact that even larger instances of linguistic silence obey discourse effects that require modeling. The only conclusion we can draw at this point is that the context must contain some kind of reference to the syntax, which forces fragment answers to exhibit the syntactic reflexes they do, e.g., case agreement for NP fragments, and aspectual matching for predication fragments. In the next section, I propose some thoughts on how to extend this analysis to semantics (also considering Przepiórkowski & Patejuk 2023).

## 5.1 The semantics and pragmatics of fragments

So far, we have treated silence as a mismatch between c-structure and f-structure. However, we have also established that there must be more to it than that to account for a variety of semantic and discourse effects. To model these formally, we at least need a way to deal with anaphora. I will use partial compositional discourse representation theory (PCDRT; Haug 2014, Dalrymple et al. 2018) as it suits LFG's modularity fairly well. Furthermore, it provides a non-monotonic account of anaphora, which is generally desirable. The main property we are interested in here is that parts of the f-structure and the semantics are linked via INDEX features, and pronoun resolution boils down to establishing links between these indices. Consider example (47) in Figure 1. There, discourse referents come in two variants: either as registers that are

(47) A woman appeared. She smiled.

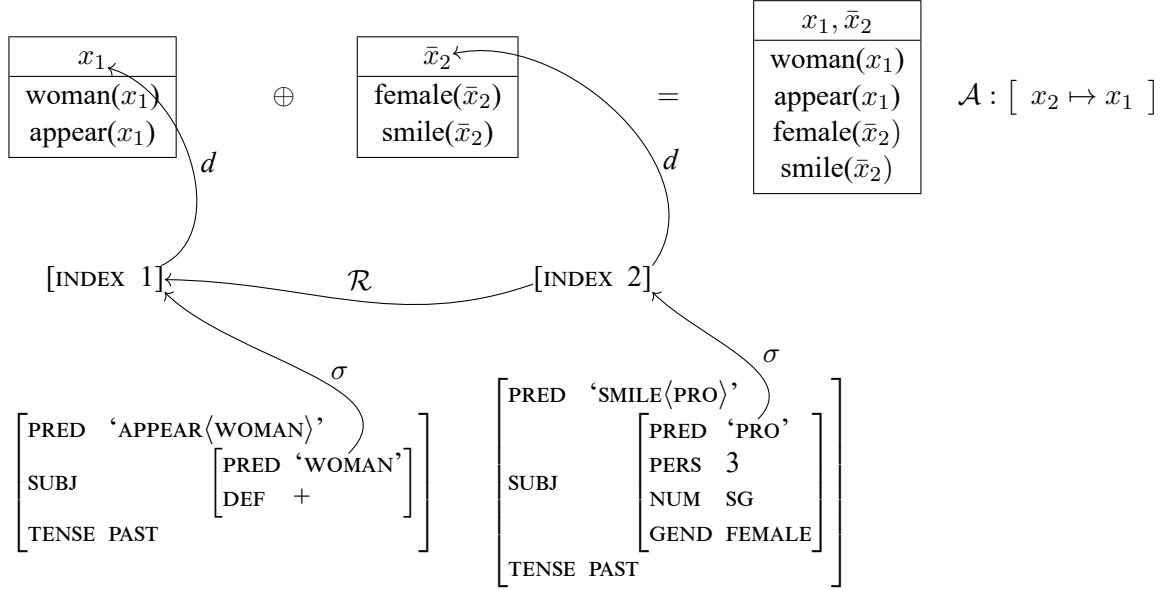


Figure 1: An example of a simple third-person pronoun in PCDRT.

inhabited by an element of the domain of entities ( $x_1$ ), or registers that need to be anaphorically linked to a register that is inhabited by an element of the domain. This is indicated by an overbar (e.g.,  $\bar{x}_2$ ). Together with a mapping between indices and discourse referents  $d$ , the relation  $\mathcal{R}$  establishes the relation between the pronoun and its antecedent and, since indices mediate between f-structure and semantics,  $\mathcal{R}$  can obey both syntactic and pragmatic constraints.

Semantically, this is resolved to the set of mappings  $\mathcal{A}$ , that holds between discourse referents, thus:

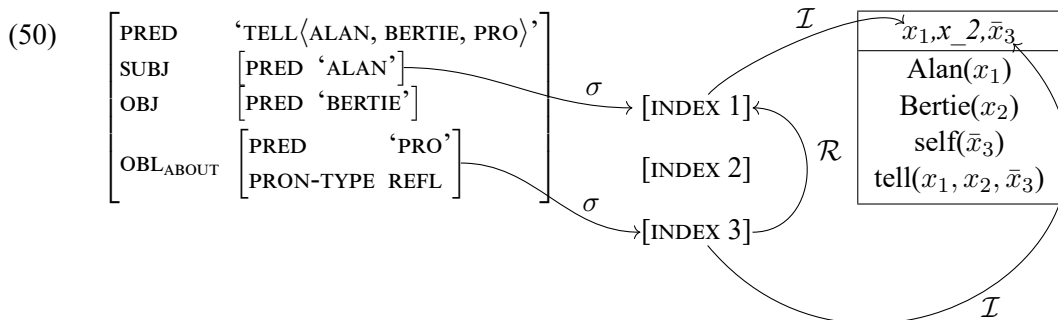
(48)  $\mathcal{A}_s(x) \equiv [\mathcal{I}^- \circ \mathcal{R}^* \circ \mathcal{I}](x)$ , for some state of interpretation  $s$

This means essentially that  $\mathcal{R}$  serves to identify possible antecedents, whereas  $\mathcal{A}$  identifies a concrete mapping at some point of interpretation. Thus, while  $\mathcal{R}$  is derived from syntactic and discourse configurations statically,  $\mathcal{A}$  may change dynamically as new information becomes available.

The process applies in the same fashion to intra-sentential pronouns, particularly reflexives. This is illustrated in (49). There, both Alan and Bertie are possible antecedents for himself, making the structure ambiguous. However, instead of producing two separate structures, the only element that needs changing is the mapping  $\mathcal{R}$  and, correspondingly,  $\mathcal{A}$ .

(49) a. Alan<sub>*i*</sub> told Bertie about himself<sub>*i*</sub>.  
b. Alan told Bertie<sub>*i*</sub> about himself<sub>*i*</sub>.

The analysis of (49) is given in (50), based on Dalrymple et al. (2018: ex. (40)).



The semantics for (49) can be stated as follows:

$$(51) \quad \begin{array}{|c|} \hline x_1, x_2, \bar{x}_3 \\ \hline \text{Alan}(x_1) \\ \text{Bertie}(x_2) \\ \text{self}(\bar{x}_3) \\ \text{tell}(x_1, x_2, \bar{x}_3) \\ \hline \end{array} \quad \mathcal{A} : \left[ \begin{array}{l} [\text{A1}]: x_3 \mapsto x_1 \\ [\text{A2}]: x_3 \mapsto x_2 \end{array} \right]$$

The notation in (51) makes use of contexts used in the packing system of the XLE. Thus, A1 and A2 are mutually exclusive mappings for the reflexive *himself*. This representation oversimplifies the complex architecture underlying PCDRT, but it is sufficient for the present purposes.

This also, in principle, allows us to state the semantics of questions as an actual anaphoric element. Concretely, interrogative pronouns may behave like kataphors (Altshuler & Haug 2017). In that case, they may rely on a specific question-answer discourse relation indicating that the interrogative pronoun does not have an antecedent in the previous discourse. Thus, an interrogative pronoun is simply a pronoun for which  $\mathcal{A}$  is undefined in the state corresponding to the question. The semantic representation would look something like this:

$$(52) \quad \begin{array}{|c|} \hline \bar{x}_1, x_2 \\ \hline \text{cake}(x_2) \\ \text{eat}(\bar{x}_1, x_2) \\ \text{who}(\bar{x}_1) \\ \hline \end{array} \quad \mathcal{A} : [ x_1 \mapsto \# ]$$

Here, # indicates that  $x_1$  is not defined in the current state of the discourse. In this conception, questions differ in the types they are about. While *who* targets entities of type  $e$ , *what* may target, for example, eventualities ( $v$ ) or situations ( $s$ ). However, we also have to constrain the relation  $\mathcal{R}$ . Thanks to PCDRT's unique architecture, we can impose semantic constraints, but also f-structure or even constraints provided by other projections. This allows us to structure meanings in the sense of, e.g., Weir (2018) and Griffiths (2019) without necessarily representing this structure in the semantics. Thus, a discourse referent that serves as a suitable answer to some question must ensure that its f-structure counterpart is equal to or included in the FOCUS of the antecedent question.

While these semantics are fairly simplified, they provide an interesting vantage point for a formal computational implementation of questions that is tractable in the sense that it does not rely on spelling out virtually infinite alternatives. However, a more precise formulation remains for future work.

## 5.2 Semantic composition

Now that we have a target semantic representation, it is time to discuss semantic composition. According to Przepiórkowski & Patejuk (2023), the distributivity approach can also be extended to the semantics. This means that it is, in principle, possible to distribute missing meaning constructors from an antecedent to fragment answers. While this essentially works, it does not explain scope parallelism (e.g., Romero 1998). The next two examples are chosen such that they have a clear scope preference: surface scope for (53) and inverse scope for (54). The corresponding answers then must mirror this scope configuration.

- (53) a. Who tasted every cake?  $\exists < \forall$   
 b. A connoisseur
- (54) a. Who did everyone invite?  $\forall < \exists$   
 b. A friend.

If we simply follow Przepiórkowski & Patejuk (2023) then we would simply reduplicate the proof for the fragmented f-structure without constraining it. To solve this puzzle, we first have to establish how the scope might be constrained in the question in the first place. There exist various proposals, e.g., Gotham (2019, 2021), Lev (2007), Findlay & Haug (2022), and Zymła (2024). Of those, Findlay & Haug (2022)

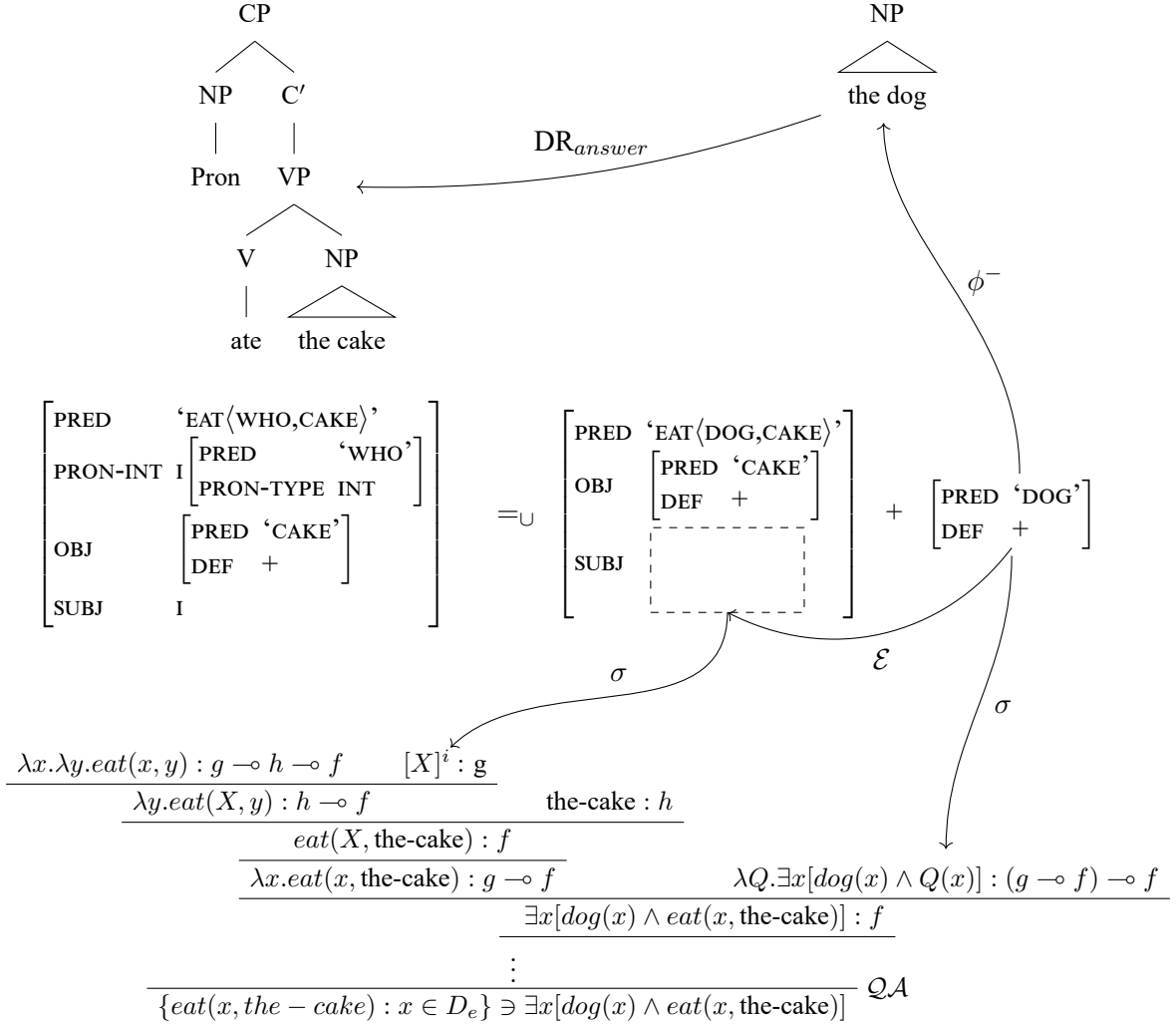


Figure 2: Analysis sketch for fragment answers across projections

and Zymla (2024) constrain scope guided by constituent structure. Essentially, meaning constructors are anchored in the constituent structure and organized based on constraints on c-structure nodes. This approach provides an obvious problem for the present conception of ellipsis as a mismatch between c-structure and f-structure. Namely, that fragment answers would not have any c-structure nodes in which meaning constructors could be anchored. Even if we ignore this obvious problem, there are essentially only two possibilities. Either the fragment answer subordinates the distributed meaning constructors by the question, or they would subordinate the meaning constructors contributed by the question. It is not at all clear whether these two configurations are sufficient, but it seems unlikely.

Approaches that do not anchor meaning constructors in the c- or f-structure like Gotham (2019, 2021) but argue for more semantic autonomy are also not clearly favorable, however. As (53) and (54) show, both scope configurations need to be possible. This means it is not possible to statically constrain the scope of quantifiers. In other words, it is not clear how constraining the scope dynamically would be achieved in Gotham’s approaches.

Essentially, what would be required would be an approach that takes the fully assembled proof of an antecedent and replaces those resources that correspond to the fragment answer, which is the solution proposed by, e.g., Crouch (1999) and Asudeh & Crouch (2002b). However, how this is achieved computationally is the final challenge that this paper poses without a clear answer.

## 6 Conclusion

Figure 2 provides a sketch of an analysis of fragment answers, as discussed in this paper: we need a mechanism for determining discourse relations (DR) between LFG representations. Then, we need to go through the projection architecture and stitch together the individual parts to capture the correct behavior of fragment answers. We have to define the relation  $=_{\cup}$  that determines what information the antecedent question provides to the fragment answer, e.g., via distributivity. We furthermore have to make sure that the question and answer also match semantically. This all needs to be built on a semantics that allows us to handle questions, anaphora, and, not discussed in this paper, presuppositions. All of these are exciting questions that are worth pursuing. On a brighter note, this paper presents a host of interesting data from German regarding fragment answers that generally support the view that fragment answers are sensitive to some kind of implicit syntax and compositional semantics.

More generally, this paper can be seen as a call to action that argues that LFG should not just do what it is good at, but also target challenges that have received a lot of attention in other formal grammar frameworks and only little attention in LFG. This is where new discussions can emerge, and it is what can drive new innovations in the framework (see, e.g.,  $L_RFG$ , which may help address some of the challenges raised in this paper, particularly the aspectual matching constraint). Finally, this paper pushes towards a holistic view of modeling linguistic phenomena that also incorporates pragmatics, an aspect of language that has received very little attention in the LFG literature.

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The list of people I have to thank goes on and is too long to name in full; thus, I conclude by thanking the editors of this volume, who allowed me to be part of it, and everyone who has taken the time to read this contribution. Thank you!

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## **Part III**

# **Language, mind, and reality: Theoretical and philosophical foundations**



# Linguistics: Theories and formalisms

K. P. Mohanan

Tara Mohanan

## 1 Introduction

The construction of a theory of language structure calls for several building blocks and strands. To unpack these blocks and strands, it would be useful to distinguish between the concepts and propositions that the theories are composed of on the one hand, and on the other, the languages in which they are, or can be, expressed. This is true not only of language structure, but across academic domains, ranging from mathematics and the sciences to logic and philosophy.

As we see it, there are three broad categories of languages that express the concepts and propositions of theories: **natural languages**, **formal languages**, and **diagrammatic languages**. Just as there can be two or more alternative theories that yield the same logical consequences (called theorems in mathematics and predictions in the sciences), there can be multiple natural languages, multiple formal languages, and multiple diagrammatic languages that make the same predictions.

Within each of these categories of languages, it might be useful to distinguish between **conceptual** differences on the one hand, and **terminological** or **notational** differences on the other, granted that differences in terminology and notation can carry some conceptual differences. If there are conceptual differences between two theories, their postulates may yield distinct **logical consequences**. For all practical purposes, perfect translation equivalents across natural languages and perfect synonyms within a natural language may not exist. This is true of terminological equivalents as well. However, approximate equivalents, with different degrees of approximation, do exist. In such instances, it makes sense to talk about **logical equivalences** without implying logical identities. If so, terminological differences in the technical language of academia and notational differences in formal or diagrammatic languages would be examples of **logically equivalent differences**. The use of ‘ $\sim$ ’ vs. ‘ $\neg$ ’ to express negation in logic, the use of ‘ $\wedge$ ’ vs. ‘ $\cap$ ’ to express conjunction in set theory,<sup>1</sup> and the use of tree diagrams vs. Venn Diagrams or brackets to express compositionality in diagrammatic languages are examples of **notational differences**.

A **formalism** is a system of abstract algebraic symbols or visual notation that lends itself to the derivation of inferences. In this sense, the following are examples of formalisms:

- the system of equations with an equality symbol in mathematics and physics;
- the system of equations with an arrow symbol in chemistry to represent chemical changes;
- the arrow symbol to represent conditionals in formal logic; and
- the arrow symbol in phrase structure rules to express compositionality of sentence structure in linguistics.

These systems have both a syntax and a semantics, granted that the boundary between syntax and semantics of formal systems can be fuzzy. A case in point is the use of the letters  $x$ ,  $y$ , and  $z$  in algebra to denote quantitative variables, and the use of  $P$  and  $Q$  in propositional calculus to mean propositional variables.

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<sup>1</sup>In set theory, the notation for the intersection of sets  $A$  and  $B$  is  $A \cap B$ . If all members of set  $A$  have property  $P$ , and all members of set  $B$  have property  $Q$ , then the intersection of set  $A$  and set  $B$  has members who have property  $P$  and property  $Q$ .

If the reader accepts the above remarks, it makes sense to say that a **theory** is a body of logically connected and consistent postulates that yield logical consequences, called theorems in mathematical inquiry, and predictions in scientific inquiry.

While the power of theories is enhanced through the use of formalisms, it is important to recognise that theories begin with substantive concepts and propositions, as in the case of the verbally expressed axioms, definitions, and other postulates in Euclid's *Elements*, in contrast to the more frequent use of algebraic formalisms in analytic geometry. Without the theoretical concepts and propositions underpinning the formalisms, the formalisms in scientific theories would be largely (though not completely) devoid of empirical content.

In language structure, there are two kinds of postulates. One involves the postulation of the representations of individual objects (sounds, words, phrases, sentences, and so on). The other involves the postulation of regularities in these representations (whether categorised as definitions, axioms, rules, laws, principles, constraints, or conventions). These postulates are expressed in terms of three types of languages:

- formal languages (using algebraic symbols);
- diagrammatic languages (e.g., tree diagrams); and
- natural languages (words, phrases, sentences, ...).

We must hasten to add that by 'formal languages', we do not restrict ourselves to the formal languages that Chomsky (1955) explores, namely, the languages generated by regular grammars, phrase structure grammars, and transformational grammars, corresponding to finite state automata, push down automata, and Turing Machines. Rather, we mean the languages used by formalisms, including those of mathematics, physics, chemistry, logic, and linguistics. We use 'algebraic languages' and 'formal languages' as synonymous, such that Boolean Algebra and Propositional Calculus are both formal systems that present formal languages for computation of truth values.<sup>2</sup>

In what follows, we will explore the use of these three types of languages in the construction of linguistic theories. We advance the following postulates, with elucidation and exemplification, but without defending them or providing adequate scholarly references:

- A. Theoretical concepts and postulates need to be distinguished from the three languages that express them.
- B. It is undesirable to conflate a theory with the formalisms that encode its postulates and concepts, even though the boundary between them can be fuzzy.
- C. When confronted with formal expressions in a theory, it is important to unearth the postulates and concepts they express.

Just as there are multiple natural languages, multiple theories of natural languages, and multiple diagrammatic languages, there are multiple formal languages. Our fourth postulate is about this multiplicity:

- D. In linguistic theory, we need to explore multiple formal languages and the theoretical substance that each of them expresses.

We must point out that this is a reflective essay that makes an attempt to share what we take as our ideas developed over decades of teaching and research in theoretical linguistics, motivated by the goal of helping research students understand some of the epistemological and ontological aspects of theoretical linguistics. Even though we may point to a few examples to place this article in the context of the research

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<sup>2</sup>We may view calculation either as a synonym of computation, or as a special form of computation that involves the use of quantitative information represented by numbers subject to all arithmetic operations.

literature, our purpose is to invite readers to examine the foundations of theoretical linguistics, not to advance knowledge claims supported by evidence and arguments with scholarly references.

In this sense, the mode of discourse that this article employs is that of the script for a talk without power point slides and without scholarly references. Readers may find this mode somewhat disconcerting.

Many of the points we make in this article would be obvious to theoretical linguists of our generation. We apologise for what may strike them as obvious, trivial, or condescending; we hope you will indulge us, seeing that our purpose is pedagogical. We also apologise to those who are not familiar with the various formalisms such as those of phrase structure rules, transformational rules, phonological rules, and non-transformational grammars.<sup>3</sup>

If we were to place this article within a category of academic research, we would say that it comes under the philosophy of the theory of language structure. Its main branches include the epistemology of the study of language structure, and the ontology of language structure. We may also call it the conceptual and formal foundations of theories of language structure. This is a discipline-specific extension of our project of exploring the transdisciplinary foundations of academic knowledge and inquiry (Mohanani & Mohanan 2023).

Unlike academic pursuits like philosophy of mathematics, of science, of physics, and of language, philosophy of linguistics is not yet a flourishing field of inquiry. However, the reader can gain a sense of what it covers from Scholz et al. (2025).

As far as we know, Scholz et al. do not explore the issue of formal, natural, and diagrammatic languages in the construction of theories of language structure. Nor has the use of these three types of languages been investigated in the published literature in the philosophy of science. Hence, we are not in a position to cite works as antecedents of the issue under consideration.

This article is structured as follows. Section 2 outlines the three languages of theory construction, using the concept of circle in mathematics, specifically the Euclidean theory of geometry. Section 3 defines a theory, whether in mathematics or in the sciences, as a set of logically connected postulates that yield a set of logical consequences (theorems or predictions). Sections 4 and 5 explore formalisms that use the equality symbol in mathematics and physics, and the arrow symbol in chemistry, logic, and linguistics. Sections 6 and 7 place the formal and diagrammatic languages of linguistics against the backdrop of the formal and diagrammatic languages of mathematics, physics, chemistry, and logic, and explore the foundational concepts and propositions they express.

## 2 The concept of circle in three languages

To illustrate the nature of similarities and differences between natural languages, algebraic languages, and diagrammatic languages in the construction and exposition of theories, let us take the concept of circle in geometry. Before we do so, however, we should clarify that we are not talking about the English word ‘circle’ as understood by five-year-old children who speak English. Given a set of stimuli of cardboard cut-outs with different shapes, most English speaking five-year-olds can answer questions like: ‘Is that a circle, a square, or a triangle?’

When we move from common sense discourse to academic discourse, we note that the Euclidean concept of ‘line’ is different from the everyday use of the word *line*. First, a Euclidean line has no breadth. Therefore, it cannot be subject to sense perception or measurement. It can only be apprehended by the mind. Second, the Euclidean concept of line includes both straight lines and curved lines, so that a circle and its arcs are curved lines. This concept is part of the world that the theory of Euclidean geometry invents as one of the logically consistent imagined worlds of mathematics.

To engage with the objects in that world, we need to create them through definitions. Euclid defines ‘circle’ as:

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<sup>3</sup> We acknowledge the reviewer who pointed out the difficulty of seeing the relevance of a trans-disciplinary understanding to the understanding of theoretical linguistics.

“A circle is a plane figure bounded by one curved line, and such that all straight lines drawn from a certain point within it to the bounding line, are equal. The bounding line is called its circumference and the point, its centre.” (Euclid, Definition 15, Book 3)

If we define a circle as a figure on a flat surface bounded by one curved line, it is a two-dimensional object. And if so, that curved line is a one-dimensional object which is not a circle. If, on the other hand, we define a circle as the set of all and only the points equidistant from a point called the center, then a circle is a one dimensional object. The former has area; the latter does not.

The idea of juxtaposing these definitions is to point out that the English word ‘circle’ is ambiguous between (a) a one-dimensional circular line, and (b) a two-dimensional region enclosed by that line.

The point of distinguishing between these two concepts of a circle is to emphasize the degree of intellectual hygiene needed in the discourse of mathematics, which enables us to prove or disprove conjectures on the basis of axiomatic and definitional postulates.

While the definitions of ‘circle’ provide a reasonable understanding of the concept, it is hard to arrive at an experiential understanding without a diagrammatic representation of a circle. The distinction between a one-dimensional circle and a two-dimensional circle, however, is not easy to understand even in terms of diagrams.

Euclid used both the diagrammatic language and natural language to denote geometric concepts. The full use of algebraic formulae and equations, however, came into geometry only centuries after Euclid. For an appreciation of the difference between the algebraic language and natural language, consider the equation for a circle in coordinate geometry.

In an  $x - y$  Cartesian coordinate system, the circle with centre coordinates  $(a, b)$  and radius  $r$  is the set of all points  $(x, y)$  such that

$$(x - a)^2 + (y - b)^2 = r^2 \quad (\text{Equation 1})$$

Given this equation, a circle is any object that satisfies the constraint expressed by the equation. To understand the concept of points, circle, and radius, however, we still need the diagram and the words. The letters  $x, y, a,$  and  $b$  represent locations of points along a coordinate and the letter  $r$  represents the length of a straight line from the centre to any arbitrary point on the circumference. The equation given above is built on Pythagoras’ theorem:

$$a^2 + b^2 = c^2 \quad (\text{Equation 2})$$

where  $a$  and  $b$  are the lengths of lines whose vertex forms a right angle in a right-angled triangle, and  $c$  is the hypotenuse.

Now compare these equations of the circle in geometry with an equation in algebra:

$$(a + b)^2 = a^2 + b^2 + 2ab \quad (\text{Equation 3})$$

In Equation 3, the symbols  $a$  and  $b$  are variables that denote numbers without any reference to circles, right-angled triangles, two-dimensional space, or points on a plane. It doesn’t even tell us which category of numbers (integers, rational numbers, real numbers, and so on) the letters represent.

In most cases, the algebraic language of equations uses the equality symbol ‘=’ to mean ‘equal with respect to quantity expressed in numbers’. What lies to the left and to the right of the equality symbol are formulae. Central to the use of such equality equations is what we may state as a formal postulate, which can be viewed as the law of the conservation of quantity:

*Equality Postulate:*

The numerical value of the combination of the formula on the left of the equality symbol is the same as (equal to) that on the right of the symbol.

Take, for instance, the familiar equation for force in classical mechanics:

$$f = m \cdot a \quad (\text{Equation 4})$$

This equation can be viewed as a definition of force (saying that the term ‘force’ refers to the product of mass and acceleration). Alternatively, it can be viewed as a law. If interpreted as an equation, it says, as pointed out in Section 1, that the quantitative value of force is equal to the product of the quantitative values of mass and acceleration. To connect this to what is measurable in terms of numbers, we need fundamental units of time, length/distance, and mass/weight, and derived units like speed and velocity.

The central point of this section is that an expression of the form  $\alpha = \beta$  expresses the idea that the quantitative value of  $\alpha$  is the same as that of  $\beta$ . When we move from algebra to science, we imbue  $\alpha$  and  $\beta$  with empirical content. Hence:

Formally equivalent symbolic expressions may yet be conceptually ambiguous with respect to the concepts and propositions they express.

### 3 Theories and formalisms

The above discussion must have made it clear that natural languages, algebraic languages, and diagrammatic languages are just three languages that can express the propositions of a theory. We would now like to focus on the need to distinguish between theoretical concepts and propositions on the one hand, and on the other, the languages that express them (Postulate A in the introduction), by contrasting theories expressed in terms of natural languages and those expressed in algebraic languages.

When someone asks, ‘What are the propositions of theory X?’ the response is typically in terms of sentences of a natural language that state the propositions, accompanied by formalisms and diagrams.

What is a theory, then? One way of answering this question is to say that:

A theory is a set of Premises, Conclusions, and the Derivation (steps of reasoning) connecting the premises to the conclusions.

If we accept this definition, the following example would count as a (toy) theory of biological categories.<sup>4</sup>

The term ‘animal’ denotes a category.

The term ‘vertebrate’ denotes a subcategory of animals.

The term ‘mammal’ denotes a subcategory of vertebrates.

Having cells is a definitional property of animals.

Zeno is a mammal.

Therefore, Zeno has cells.

This theory is articulated exclusively in terms of the words, phrases, and sentences of English. In contrast, the following formulation employs  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ , and  $\rho$  as algebraic symbols instead of English words, and  $\therefore$  as the algebraic symbol for entailment, expressed in English as *therefore*:

$\alpha$  is a category.

$\beta$  is a sub-category of  $\alpha$ .

$\gamma$  is a sub-category of  $\beta$ .

<sup>4</sup>A theory of categories in science is not the same as what is called set theory or category theory in mathematics. A set is generally characterized as a well-defined collection. In this sense, a collection stipulated as  $\{4, 5, 27, 498, 767\}$  is a set, because given the candidates 27 and 28, we can tell that the former is in the set and the latter is not.

A category is a set such that its members share a definitional property. For instance, we can treat the property of having six legs as definitional of insects, and then take the property of having compound eyes as a law on insects. Alternatively, we may treat having compound eyes as definitional of insects and treat the property of having six legs as a law that holds on that category.

$\rho$  is a definitional property of  $\gamma$ .  
 $\delta$  is a member of  $\gamma$ .  
 $\therefore \rho$  is a property of  $\delta$ .

We can further reduce the use of English words by adapting the formal notation of set theory, and building it into a theory of categories.

- (a)  $\alpha$  is a category
- (b)  $\beta \subset \alpha$  (read: category  $\beta$  is a (proper) sub-category of category  $\alpha$ )
- (c)  $\gamma \subset \beta$
- (d)  $\rho$  is a definitional property of  $\gamma$
- (e)  $\delta \in \gamma$
- (f)  $\therefore \rho$  is a property of  $\delta$

Here, (a)–(e) are premises, which yield the conclusion in (f) as a logical consequence. To derive this consequence, we need the following rule of inference:

The properties of the members of a category are inherited by the members of its subcategory.

It is this rule that validates the syllogistic reasoning in the following example:

All humans are mortal.  
Socrates is a human.  
Therefore, Socrates is mortal.

The rule of inference in the logic of categories needs to be supplemented by the rule of inference in the logic of propositions (called ‘propositional logic’), to validate the following example:

If Plato had a beard, then Socrates was tall.  
Plato had a beard.  
Therefore, Socrates was tall.

To move from logic to mathematics and the sciences, we may ask: What would count as premises in mathematics and the sciences?

Euclid categorizes the premises that he uses for his proofs as **definitions**, **postulates**, and **common notions**. Postulates are specific to geometry, while common notions apply to all of mathematics, including number theory. So we might treat postulates and common notions as two different categories of axioms, postulates being specific axioms, and common notions being general axioms. Suppose also that we define a postulate as *what we postulate*. If so, both axioms and definitions are postulates, and what are called laws in science are also postulates.

If we accept the above statements, we can redefine the concept of theory as follows:

A theory is a body of logically connected and logically consistent postulates from which we derive a set of logical consequences – called theorems in mathematics and predictions in science.

Notice that the core rules of inference that hold in the theory of scientific categories, illustrated above in terms of biological categories, are

- the transitivity of the subcategory relation, and
- the postulation of categories, definitions, and laws.

Now, even though the subset relation is transitive in set theory, the logical consequences derived from a theory of categories in science do not follow from set theory, or from category theory in mathematics.

Given what we have said about what a theory is, when we examine a particular theory of language structure  $T$ , we need to ask:

- I. What are the postulates of theory  $T$ ?
- II. What are the logical consequences of the postulates?
- III. How do we demonstrate the validity of the derivation of those logical consequences (predictions)?
- IV. Do these logical consequences:
  - (a) match the observational generalizations arrived at from samples of data points; and
  - (b) explain what is puzzling in these generalizations?

In the sections that follow, we will focus on types of theories and types of formalisms relevant for language structure. To explore types of formalisms, we will compare the formal language of equations with:

- the equality symbol in mathematics and physics, and
- the arrow symbol in chemistry.

We will then contrast them with:

- the arrow symbol in logic, and
- the arrow symbol in theories of language structure.

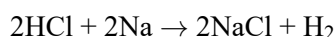
From the point of view of the sciences, we may view these different formal languages as ways of mathematizing scientific theories. The most dominant way of doing this has been that of algebras, combined with formal logics. We have provided a sense of the logico-mathematical theory of categories, which as far as we know, has not been explored in the published literature. The project of mathematizing scientific theories also calls for the diagrammatic language of graph theory, to express relations such as **compositionality** (in structure and subcategorisation), **causation** (in processes), and **ancestry** (in evolution).

#### 4 Equations in chemistry: the arrow symbol

In Section 2, we took a close look at the language of equations in mathematics, extendable to physics. In this section, we will contrast these equations with those in chemistry that use the arrow symbol. In the next section, we will look at the use of the arrow symbol in logic to express relations of implication.

The equality postulate relevant for the language of equations using the equality symbol, explored in Section 2, does not apply to equations with the arrow symbol  $\rightarrow$  in chemistry. Chemical equations are laws that capture the regularities of chemical changes resulting from the interactions between molecules. The arrow represents a chemical change of the form  $\alpha$  to  $\beta$ , where  $\alpha$  is the number and formulas for the molecules that form the input to the change, and  $\beta$  is the number and formulas that form the output of the change.

Take, for instance, the following equation:



The conceptual content of this equation can be stated as follows:

*Law of the interaction between hydrogen chloride and sodium:*

Two molecules of *hydrogen chloride* and two atoms of *sodium* change to two molecules of *sodium chloride* and one molecule of *hydrogen gas*.

The general conventions for the interpretation of chemical equations can be expressed as follows:

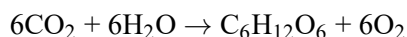
The integers to the left of each formula indicate the number of molecules, and the subscript integer indicates the number of atoms of each element in a single molecule.

An important regularity that governs all chemical changes is what we may call the Law of the Conservation of Atoms:

The number of a given category of atoms in the input to a chemical change is equal to that in the output of the change.

In the equation given above, the number of hydrogen atoms in the input is two, which remains the same in the output. Similar remarks apply about the number of sodium atoms (two) and the number of chlorine atoms (two).

Take another example:



The equation says that in the input and the output, the number of carbon atoms is 6, the number of oxygen atoms is 18, and the number of hydrogen atoms is 12.

Underlying what is called ‘balancing chemical equations’, routinely taught to students in Chemistry, is the Law of the Conservation of Atoms. This property is expressed in Dalton’s (1808) theory as the axiom that says that:

In a chemical change, i.e., one that applies to atoms and molecules, atoms cannot be subdivided, created, nor destroyed.

This law holds on chemical changes, but not on subatomic changes.

To compare the formal properties of arrow equations and equality equations:

The equality symbol in the equations in mathematics and physics expresses a symmetric relation: the string to the left of ‘=’ and to its right can be exchanged (e.g.,  $f = m \cdot a$  is the same as  $m \cdot a = f$ ). In contrast, the arrow in the arrow equations in chemistry expresses a process, which is asymmetric.

In equality equations, a substring to one side of ‘=’ can be moved to the other side. As part of that operation:

- In addition and subtraction, a ‘+’ becomes a ‘–’ and a ‘–’ becomes a ‘+’ (e.g.,  $x + y = z$  is the same as  $x = z - y$ , and  $x - y = z$  is the same as  $x = z + y$ ).
- In multiplication and division, the nominator moves into the denominator and vice versa (e.g.,  $x \cdot y = z/m$  is the same as  $x = z/(m \cdot y)$ ).

Even though chemistry equations use the ‘+’ symbol, there are no negative numbers in these equations, and no operations of subtraction, multiplication, and division. Hence, the formal properties of equality equations noted above do not hold on the change equation. While equality equations are quantitative laws, change equations in Chemistry are qualitative (categorical) laws.

In the language of the mathematical theory of relations, the equality relation is transitive, symmetric, and reflexive. Since what is expressed by the arrow symbol in Chemistry is a process and not a relation, these properties are not relevant for the arrow equations.

In passing, it is worth noting that while equations in chemistry express regularities in the changes in the number and structure of molecules, the formulae in these equations are representations of the structure of those molecules. Thus, the chemical formula  $\text{CO}_2$  says that a molecule of carbon dioxide is composed of one atom of carbon and two atoms of oxygen. The formula  $\text{HCl}$  says that a molecule of hydrogen chloride is composed of one atom of hydrogen and one atom of chlorine. Hence, we may think of chemical formulae as expressing laws governing the structure of molecules.

In contrast, equations in physics that state physical laws do not say anything about structure. The laws of motion, for instance, express regularities in the changes of location. These equations express laws that govern the gradient/continuous changes in terms of a rational (or a higher) number, while chemical equations express qualitative/discrete laws governing changes in the category, number, and structure of molecules.

As pointed out earlier, there are as many laws in chemistry as there are changes in the structure of molecules in chemical changes. The five postulates of Dalton's theory of chemical combination unify these diverse laws:

- (1) Elements are made of extremely small particles called atoms.
- (2) Atoms of a given element are identical in size, mass, and other properties; atoms of different elements differ in size, mass and other properties.
- (3) Atoms cannot be subdivided, created, or destroyed.
- (4) Atoms of different elements combine in simple whole-number ratios to form chemical compounds.
- (5) In chemical reactions, atoms are combined, separated or rearranged.

Postulates (3) and (5) hold on chemical combinations, but not in particle physics, which assumes that:

- the indivisible units of matter are fundamental particles, not atoms; and
- atomic fusion and fission can create and destroy atoms.

Readers who are familiar with conservation laws (e.g., law of conservation of mass, law of conservation of energy, what is preserved as symmetry under transformation, and so on) would have noticed that postulate 3 is a conservation law.<sup>5</sup> What is conserved in this law is the structure and number of atoms, while what is changed is the structure and number of molecules.

## 5 The arrow symbol in logic

Unlike the arrow symbol in chemistry equations, the arrow symbol in logic expresses the relation of implication, expressed in propositional calculus as:

$$P \rightarrow Q \quad (\text{where } P \text{ and } Q \text{ are propositions}).$$

Suppose we replace the  $P$  and  $Q$  with the symbols  $\alpha$  and  $\beta$ :

$$\alpha \rightarrow \beta \quad (\text{where } \alpha \text{ and } \beta \text{ are simple or compound propositions}).$$

Suppose we use the symbol T for 'true', representing it as 'plus' (+), and the symbol F for 'false', representing it as 'minus' (−). These symbols, plus (+) and minus (−), do not have the same meaning as the symbols + for addition and − for subtraction, or the symbols for positive numbers and negative numbers. Nor is the plus symbol the same as the plus symbol in the chemistry equations.

In terms of + and − as the truth values of propositions,  $\alpha \rightarrow \beta$  in logic says:

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<sup>5</sup>We are grateful to Gangan Prathap for bringing this point to our attention.

If the truth value of the proposition  $\alpha$  is +,  
then the truth value of the proposition  $\beta$  is +.

In this formalism, if we exchange what is to the left of the arrow and to the right of the arrow, we get  $\beta \rightarrow \alpha$ , and in the process, + and – are reversed:

If the truth value of the proposition  $\beta$  is –,  
then the truth value of the proposition  $\alpha$  is –.

Ignoring the meanings of + and –, we may say that this property is what we saw earlier in the difference between the formalism of equality equations and change equations (Section 3). The arrow symbol in logic has other formal properties that have to do with the symbols for conjunction (' $\wedge$ ') and disjunction (' $\vee$ '), and their relation to negation (' $\neg$ ' or ' $\sim$ ').

To summarize, the reader would have noticed that Section 4 is about the language of what are called equations. Mathematics and physics employ the equality symbol that expresses the relation of equality. Chemistry employs the arrow symbol that expresses structural changes of molecules subject to the law of conservation of the structure and number of atoms, continuing to use the term 'equation' to refer to the relation. Section 5 has to do with the use of the arrow symbol in logic to express implications, governed by rules of inference, but not called equations.<sup>6</sup>

Note that according to Noether's (1918) theorem, symmetries in a physical system, stated in terms of forces – for instance, translational symmetry in momentum, and rotational symmetry in angular momentum – have a corresponding conservation law. This theorem can be extended further to discrete symmetry, needed in laws of chemical changes and theories of language structure.

That the laws stated in terms of equations in mathematics and physics obey a principle of conservation should not be surprising, because that is what the formalism of equations with the equality symbol is meant to express. What is surprising, however, is that it is found in chemical equations, and as we will see in what follows, in the laws of language structure as well.

## **6 Units, categories, and functions**

### **6.1 Units and sub-units**

We assume that readers familiar with syntax would be aware of the following postulates in the study of language structure:

- (1) Sentences exist.  
(e.g., 'Tracy gave three books to Miriam' is a sentence in English.)
- (2) Sentences are composed of one or more phrases.  
(e.g., 'three books' is a phrase in English.)
- (3) Phrases are composed of one or more words.  
(e.g., 'three' and 'books' are words.)
- (4) Words are composed of one or more morphemes.  
(e.g., 'book' and 's' are morphemes.)

These postulates contain theoretical concepts that cannot be observed in behavioural or corpus data. Hence, their legitimacy calls for careful thought and discussion. As signalled by Anderson (1992), postulate (4) involving the concept of morpheme is controversial. As discussed in Mohanan (1995), the concept of word is not the same across multiple dimensions. This results in mismatches between, say, phonological, syntactic, and semantic words, between categorial and functional words, and so on.

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<sup>6</sup>It is unclear why the term 'equation' is used in Mathematics, Physics, and Chemistry, but not in Logic or Linguistics.

Dependency Grammar (De Marneffe et al. 2006) abandons the concept of phrase in (2), replacing it with the relation of head and dependent. Turning to the concept of sentence, its existence is not observable in speech corpora.

It must be emphasized that the units we call sentence, clause, phrase, and word, like the relation of dependency, are theoretical constructs, not observational ones, as is the case with phonological or even phonetic segments. Just as phonological and phonetic segments do not exist in spectrograms or cineradiographic records, the boundaries between sentences, clauses, phrases, words, morphemes, and formatives do not exist in the physical data.

The relation expressed by the abstraction ' $x$  is composed of  $y$ ' where  $x$  is a unit and  $y$  is a set of one or more sub-units, is ubiquitous in the physical, biological, and human worlds. For instance:

- (5) A human body is composed of organs.
- (6) An organ is composed of cells.
- (7) A cell is composed of biomolecules.
- (8) A bio-molecule is composed of inorganic molecules.
- (9) An inorganic molecule is composed of atoms.
- (10) An atom is composed of fundamental particles.

A philosophically sophisticated scientific theory must ask: 'What is  $x$ ?' in each of the propositions (1)–(10): What is a sentence? What is a phrase? What is a word? What is a morpheme? What is a body? What is an organ? and so on. Such questions are part of the conceptual foundations of scientific theory, to be explored in conjunction with the formal foundations.

## 6.2 Levels of units

The statement that  $y$  is a subunit of  $x$  (i.e.,  $x$  is a unit composed of  $y$  and perhaps other units) is equivalent to the statement that  $x$  is a superunit of  $y$ . The distinction between the two is in terms of levels of units. When we say 'sub-unit', we are talking about the level below the one we are looking at. When we say 'super-unit', we are talking about the level above it. Thus, word is a sub-unit of phrase, and sentence is a super-unit of phrase. In what follows, we will see that these two ways of expressing the same idea are parallel to ' $y$  is a subset of  $x$ ', and ' $x$  is a superset of  $y$ '.

Units of measurement (e.g., of length, weight, and so on) and the units that we postulate in our theories (e.g., particle, atom, molecule, morph, word, and so on), pose distinct epistemological challenges. In Section 6.1, we talked about the problems of segmentation, which is the same as unitization, on par with categorization. They call for theories of units and categories. Once these theories are constructed, their application extends across domains, including human history, where words like *period*, *era*, and *age* are used descriptively without the search for theoretical justification, and to music and dance, where the concepts of rhythm and beat, when closely examined, prompt research questions.

## 6.3 Categories

In addition to *units* and *sub-units*, scientific inquiry also needs to postulate *categories* and *subcategories*. To illustrate, the terms 'electron' and 'photon' denote categories of units of fundamental particles; the terms 'hydrogen atom' and 'carbon atom' denote categories of atoms; and the terms 'water molecule', 'carbon molecule', and 'carbon dioxide molecule' denote categories of molecules.

The terms 'animal', 'vertebrate', 'mammal', 'primate', and 'human' denote categories of organisms, at different levels. Mammal is a subcategory of vertebrate, and animal is a supercategory of vertebrate. These three terms imply that they belong to higher and lower levels of the groupings of organisms into taxa. The terms 'domain', 'kingdom', 'phylum', 'class', 'order', 'family', 'genus', 'species', and 'varieties' refer to levels of units, although this terminology is devoid of empirical substance, and hence spurious.

Likewise, while ‘sentence’, ‘phrase’, ‘word’, and ‘morpheme’ denote levels of units in language structure, the terms ‘declarative sentence’, ‘interrogative sentence’, and ‘imperative sentence’ denote categories of sentences, just as noun phrases and verb phrases denote categories of phrases.

In this section, we briefly mentioned the logic of categories and subcategories. We also showed how the subcategory relation, unlike the subset relation, yields the rule of inference that says that the properties of a category are inherited by its subcategories and members.

Now, the subcategory relation is a relation of compositionality, which allows us to express the structure and connectedness of categories in terms of a graph theoretic representation. As an example, consider the following partial postulates of taxonomy in biology:

Humans, bonobos, and chimpanzees are subcategories of primates,

Primates, bats, and whales are subcategories of mammals.

Mammals, birds, and fish are subcategories of vertebrates.

Vertebrates, insects, and worms are subcategories of animals.

The information given above, expressed in English sentences, can be expressed as a tree diagram as in Figure 1.

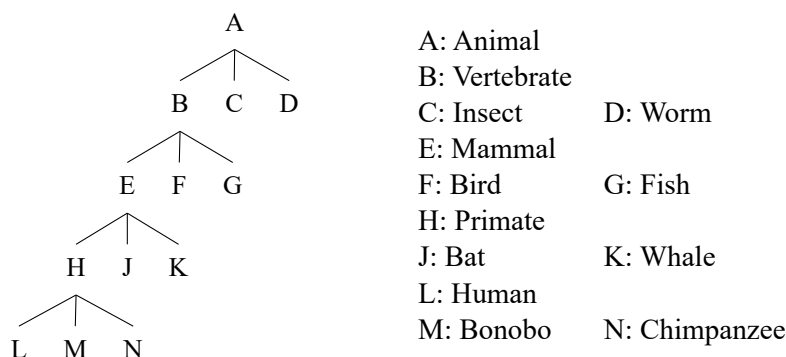


Figure 1: The formal structure of tree diagrams

A tree diagram is a representation of a Directed Acyclic Graph (DAG). The letters in the tree are place holders (indices), the specification on the right are their categories, and the branches in the tree indicate compositionality. As we shall see later, in the study of language structure, DAGs can express structural relations involving categories and functions across different levels and dimensions of structure.

## 6.4 Functions

In phonology, distinctions like voiced and voiceless, nasal and non-nasal, labial and non-labial, high and non-high denote categories of segments. In contrast, the terms ‘onset’, ‘nucleus’, and ‘coda’ denote the functions of these categories in the structure of a syllable. A vowel, for instance, is a non-consonantal segment functioning as the nucleus of a syllable, while a semivowel is a non-consonantal segment functioning as an onset or coda. The phonemic transcription of the English word *bite* as /bait/ carries the assumption that the third segment is part of the nucleus, while the transcription /bayt/ carries the assumption that it is not part of the nucleus. Likewise, the transcription of *mute* as /myuut/ carries the assumption that the second segment in the word is not part of the nucleus.

In syntax, the terms ‘noun’, ‘noun phrase’, ‘verb’, ‘verb phrase’, ‘adjective’, ‘adjectival phrase’, ‘declarative sentence’, ‘interrogative sentence’, and ‘imperative sentence’ denote syntactic categories, while the terms ‘subject’, ‘object’, ‘adjunct’, ‘predicate’, and ‘clause’ denote syntactic functions. This terminology becomes somewhat confusing if we refer to functional distinctions as ‘functional categories’.

In semantics, the concepts of agent, actor, causer, undergoer, goal, beneficiary, location, time, manner, and so on are semantic functions (called thematic roles or theta roles) associated with the syntactic entities.

We would like to suggest, without defending our probably controversial position, that in morphology, the terms ‘bound morph’ and ‘free morph’ denote categorial distinctions, while the terms ‘past tense’, ‘present tense’, ‘present participle’, ‘past participle’, ‘passive marker’ and so on denote distinctions of morpho-syntactic and morpho-semantic functions.

## 7 Unpacking theories of language structure

### 7.1 Theories and theoretical frameworks

In the previous section, we outlined a theoretical framework for language structure that would go into the formulation of theories – a configuration of formally and conceptually related concepts.

A given theoretical framework can serve as the basis for or lead to multiple theories. Take, for instance, the conceptual framework underlying multiple theories of gravity in physics, which include the concepts of gravity, force, acceleration, velocity, momentum, mass, weight, displacement, rate of displacement, as well as distance, direction, magnitude, space, and dimension. Using these concepts, we can construct multiple theories. For instance, consider Newton’s law of gravitation:

*Newton’s Law of Gravitation:*

Any two objects with mass attract each other with a force that is **inversely** proportional to the square of the distance between them, and **directly** proportional to the product of their masses.

This is Newton’s universal law of gravitation, to be combined with the three laws of motion. Given the Newtonian framework, it is possible to postulate the following Alternative Laws:

Alt. Law 1: Any two objects with mass attract each other with a force that is **directly** proportional to the square of the distance between them, and **inversely** proportional to the product of their masses.

Alt. Law 2: Any two objects with mass attract each other with a force that is **inversely** proportional to the square of the distance between them, and **inversely** proportional to the product of their masses.

Alt. Law 3: Any two objects with mass attract each other with a force that is **directly** proportional to the square of the distance between them, and **directly** proportional to the sum of their masses.

Given these alternative postulates, we choose Newton’s version because it is the one that makes correct predictions.

Einstein’s introduction of the concept of field in mechanics constitutes a change not only in the theory of gravity, but also in the theoretical framework itself. We will not go into the details of this revolution here.

### 7.2 Laws and representations

The Chomskyan lineage of linguistic theory had its origins in a combination of Alan Turing’s celebrated 1950 article and the formal logic of the fifties. Not surprisingly, this lineage conceptualises scientific **laws** as **rules**. In the epistemology of scientific inquiry, a rule is a statement of a regularity in nature, expressible as: ‘If  $\alpha$  is true, then  $\beta$  is true’. In contrast, a rule in computer science is an instruction of the form ‘If  $\alpha$ , then DO  $\beta$ ’.

The conception of laws (constraints/principles) in science leads to the formulation of laws as what are called **declarative formalisms**. In contrast, the concept of rules as explicit instructions in an algorithm leads to a **procedural formalism**. In computer science, this distinction is expressed as **declarative** and **imperative programming**.

To be neutral to the two types of computer programming, we will use the terms **laws** and **representations** instead of rules and representations.

### 7.3 Laws governing structure

Phrase structure rules are generally of the following form:  $A \rightarrow B C$ . Here, the constituent  $A$  is separated into the two sub-constituents  $B$  and  $C$ .

The term ‘constituent’ means a part of a whole, where the parts are specified for their **categories**, i.e., the subunits of a unit. So the notation of the arrow in the phrase structure rule means: Category  $A$  is **composed of** categories  $B$  and  $C$ .

Without the specification of categories, the specification of part-whole relations does not yield phrase structure. Consider the representations in Figure 2. Unlike the representation in (b), the representation in (a) is not subject to any rules or constraints of phrase structure.

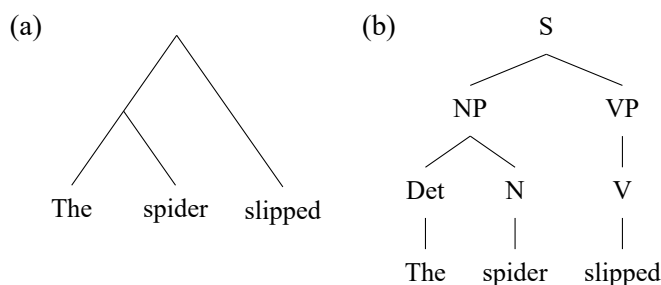


Figure 2: Tree diagrams instantiated in syntax

Given that an NP can be composed of just a single N, and a VP of a single V, the abstract rule format must be:

$$\alpha \rightarrow \beta^+$$

where we use  $^+$  to mean one or more units of the same or different categories (as distinct from the use of the Kleene star).

Consider some of the examples of phrase structure rules for English:

$$S \rightarrow NP \quad VP$$

$$NP \rightarrow (Det) \quad N$$

$$NP \rightarrow (AP) \quad N \quad (PP)$$

One interpretation of the formal notation of the arrow symbol in these rules is as a law or constraint of the form:  $\alpha$  is composed of  $\beta^+$ .

The first rule reads: A S(entence) is composed of a NP (noun phrase) followed by a VP (verb phrase). The second rule reads: A noun phrase is composed of an optional Det (determiner) followed by a N(oun). The third rule reads: an NP is composed of a N(oun) preceded by an optional AP (adjective phrase) and followed by an optional PP (prepositional phrase). The brackets indicate optionality of the units. This interpretation is in harmony with **declarative** formalisms.

Another interpretation is that of a PS rule as an instruction in a mechanical procedure (algorithm) that says:

If  $\alpha$  is the input, provide the output  $\beta^+$ .

This interpretation is consistent with a **procedural formalism**.

There has been a great deal of discussion on whether or not these two formalisms are empirically equivalent. In our own published work in syntax and in phonology, we have taken the position that while the two are largely different ways of saying the same thing, there are also important empirical differences between them that point to a preference for the declarative over the procedural. It might also be the case that we need both, each for a different purpose. This would be parallel to the Euclidean theory of geometry which includes both declarative postulates, and also the procedure of constructions.

#### 7.4 Structure across levels and dimensions

Suppose we view phonological structure, syntactic structure, and semantic structure as different **dimensions** of language structure. The structure of sentences, of phrases, and of words can then be conceptualised in terms of **levels** of units and **dimensions** of structure. The combination of levels and dimensions yields the following distinctions:

|                    |                 |                    |
|--------------------|-----------------|--------------------|
| word phonology     | word syntax     | word semantics     |
| phrase phonology   | phrase syntax   | phrase semantics   |
| sentence phonology | sentence syntax | sentence semantics |

To turn now to the procedural and declarative approaches, the procedural lineage of theoretical linguistics views the relation between active and passive sentences, between causatives and non-causatives, between clefts and non-clefts, and so on as changes or transformations. In this conceptualisation, the structure of what remains unchanged (variously called symmetry, homology, invariance, and so on) is called deep or underlying structure, and the structure that expresses the differences is called surface structure.

In the declarative conceptualisation, the metaphor of change (transformation) is abandoned, and conceptualised as non-transformational relations between different constructions. This approach expresses the **relations** between different constructions as a pairing between them: the relatedness of active and passive constructions, causative and non-causative constructions, cleft and non-cleft constructions, declarative and interrogative constructions, and so on, rather than as **processes** that yield one construction from the other. Instead of the ‘passive transformation’, ‘move-NP’, or ‘move-*wh*’, the picture is that of the active-passive relation, the causative-noncausative relation, and so on, expressed as differences in the association between levels and/or dimensions in the two members of each pair.

The association across levels and across dimensions can be many-to-many, and not necessarily one-to-one. To illustrate, consider the diagrammatic representation of the relation between the syntax of sentences and their semantics, as in Figure 3:

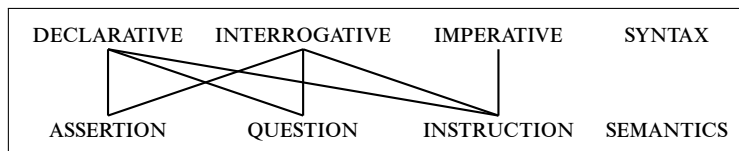


Figure 3: Many to many relations in form and function

The regularities in such associations, expressed by what we will refer to as association laws, are captured by Association Conventions in Autosegmental Phonology (Goldsmith 1976), linking rules (Levin 1986, Bresnan & Kanerva 1989), and correspondence rules in Jackendoff (1978).<sup>7</sup>

To return to the issue of the equivalence of the declarative and procedural formalisms, Joan Bresnan (p.c.) has raised an important question about whether the distinction extends to a comparison between transformational derivations and associations/correspondences/linkings/mappings between parallel representations. Many researchers who have worked within these traditions, whether in syntax, phonology, or semantics, have argued for their non-equivalence. For the purposes of this article, we leave that as an open question, except for noting that the annotations on phrase structure rules in terms of the formalism of ‘↑’ (up arrow) and ‘↓’ (down arrow) in LFG can be replaced by correspondence constraints across levels and dimensions of representation. We must also note that if a formal expression is to be called an equation, it must express a symmetry/conservation. If so, many of the formal expressions in LFG that use the equality symbol along with the up and down arrows are not equations.

## 8 Natural languages as explananda and explanans

In this section, we return to point D in the introductory section. The discussion, as well as the title, was prompted by one of the reviewers of the article, who suggested that we explicitly discuss the issue of using the words and phrases of natural languages to construct explanatory theories (explanans) of what is puzzling in natural languages (explananda).

An important pedagogical principle that we subscribe to in the design of curricula for bachelor’s programs – whether in linguistics or in other sciences – is that we do not introduce formalisms with algebraic symbols and formulae until the novices have become adept at theory construction using natural languages. If we subscribe to this pedagogy, it is important that we distinguish between the concepts denoted by the words and phrases in everyday discourse and those in academic discourse. The word *field* in the technical expressions *magnetic field* and *gravitational field*, for instance, does not have the same meaning as in *a field of grass* or *killing fields*. In precisely the same way, the English words *language*, *dialect*, *grammar*, *rule*, *representation*, *argument*, *theory*, *syllable*, *noun*, *verb*, *predicate*, *subject*, and *object* in an undergraduate program in linguistics may not denote the same concepts as in an undergraduate program in literary studies, sociology, or law.

Notice that in our discussion of the ‘language’ of algebraic formalisms and the ‘language’ of tree diagrams, we have already extended the ordinary meaning of the English word ‘language’. Without the conceptual clarity that necessitates a constant awareness of the distinction between ordinary language and academic language, our students would confuse the concepts built into the two kinds of natural languages, and simply repeat the words and phrases without an understanding of the theory. Unfortunately, this is what often happens in textbooks and classrooms that use terms like INFL, DP, transformation, percolation, annotation, and so on without the conceptual clarity of a philosopher, logician, mathematician, and scientist.

To quote the reviewer, an important lesson arising from the above discussion is: ‘Scientists of language will have to have extra vigilance and scientific hygiene in co-opting/reusing elements of natural language in their building of theories of natural languages’.

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<sup>7</sup>Our references are at best insufficiently scholarly. Joan Bresnan has rightly pointed out to us (p.c.) that Jackendoff’s idea of formation rules and correspondence rules is antedated by the declarative approach in LFG syntax; and that autosegmental representations in phonology were probably hinted at by Firth in his work on prosodic units. The reader is justified in feeling that we have not mentioned many important works on parallel representations in the terrain of phonology or syntax or semantics. We ask for the reader’s indulgence: as mentioned earlier, this article is not intended as an erudite piece of research with comprehensive references.

## 9 Concluding remarks

What we have outlined in the preceding sections is a way of unpacking the strands and building blocks that go into the making of theories of language structure, such that we can critically evaluate the various individual pieces, improve upon them if needed, and learn to build better theories. As mentioned earlier, this enterprise comes under what may be called philosophy (including epistemology and ontology) of the theory of language structure, or the conceptual and formal foundations of theories of language structure.

Central to this enterprise of unpacking is the concept of three languages for the construction of theories in any academic domain, especially of mathematics and of the sciences, including scientific theories of language structure.

As stated in the introduction, what we offer is not to be taken as knowledge claims of research to be defended or debated. They are an invitation meant primarily for young researchers to seek to develop further their capacity to construct and evaluate (linguistic) theories, with an emphasis on the formal and conceptual strands we have tried to identify in this article.

In sum, we might say that this article points to the need to initiate a research project to explore the conceptual and formal foundations of academic knowledge and inquiry, integrating the work on the foundations of mathematics, physics, biology, anthropology and sociology, history, philosophy, and aesthetics, and so on, as such cross-pollination would enrich theoretical research in linguistics.

## Acknowledgements

With this article, we felicitate Miriam Butt and Tracy Holloway King on their remarkable careers and their contributions to the linguistics community, and thank them for their friendship over half our lifetime.

We are immensely grateful to Joan Bresnan and John Goldsmith for very detailed feedback, suggestions, and objections that have resulted in considerable improvement of the paper, and have helped us iron out a number of problems. We gratefully acknowledge feedback from Wee Lian Hee, Gangan Prathap, Vigneshwar Ramakrishnan, Kishor Patwardhan, and two anonymous reviewers, both of whom prompted us to think carefully and articulate our thoughts with greater clarity.

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# Hierarchy and linearity: Discussions across frameworks

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## 1 Introduction

The history of syntactic research and discovery is full of morphological and word order patterns, order being the most obvious sensory manifestation of patterning in the linguistic signal. More recently, hierarchical organization has emerged in the theoretical literature as one of the defining features of natural language, a view which distinguishes natural language patterning from the kinds of patterns representable by coloured beads on a string, embodying rather the kind of organization that requires the existence of internal structure in the form of sub-units and super-units of various sizes and natures, and where nesting/dominance relationships exist alongside concatenation in building a syntactic representation. No current syntactic framework fails to acknowledge these twin aspects of linguistic organization, but there are profound differences within frameworks with respect to weight/importance attached to hierarchical vs. linear relationships, and to the notations devised to capture how these are manifest in languages.

In this article, I discuss some issues arising from the interplay of hierarchical and concatenative relationships in syntax and how they relate to problems of representation in syntactic frameworks. In doing so, I draw on my recent discussions with Miriam Butt on the graphical representation of syntactic information and the mutual frustrations we have experienced in communicating patterns and relationships that go against the grain of current formalisms.

This paper is not a standard scientific piece of linguistic research which proposes and argues for a particular analytical solution to some clearly described linguistic phenomenon. Rather, it is a more philosophical and meta-theoretical exploration of the ways in which we as linguists choose to represent linguistic information, and in particular how we represent the often tightly connected properties of hierarchical and sequential relationships within language.

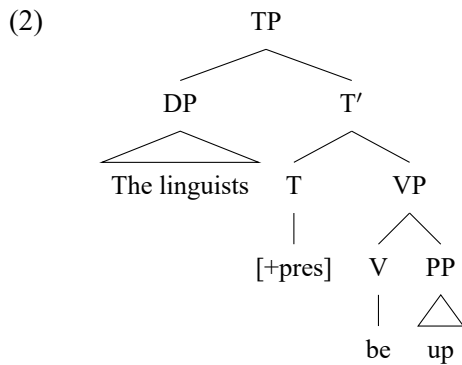
My conclusion will be that while different implementational and visualization choices can be in principle neutral with respect to more abstract theoretical commitments, implementation nevertheless *does* matter since it frames the ways in which analytic problems are stated and constrains the imagination in constructing the hypothesis space for the solutions.

## 2 On Drawing Trees

The English sentences I will use as my pivotal examples in this discussion are the ones shown below in (1), for reasons that will become clearer as we proceed.

- (1) a. The linguists are up.
- b. The tent is up.
- c. Our time is up.

In standard generative phrase structure representations, sentence (1a) above could be pictured roughly as in (2) below.



It is useful to unpack the assumptions behind the ‘tree’ diagrams standardly used in syntactic representation. For example, in *The Logical Structure of Linguistic Theory* (Chomsky 1955), a phrase structure grammar is a collection of rules that *concatenate* linguistic symbols into strings of those symbols, and rewrite rules that rewrite those strings of symbols as other strings. If we think of a derivation as a set of ‘rewrite rules’ that connects a start symbol to a final string, then a phrase marker represents the set of all the ‘lines’ in a legitimate derivation to this final string. A phrase marker in this sense can then be represented by a tree structure such as the one given above (which has become the standard way to visually present this information), but this is just a graph-theoretic way of representing the information present in the derivation (see Adger 2025 for discussion). The tree seems to directly ‘picture’ constituency and category (when labeled) in addition to order, but only because this information is already implicitly present in the derivation. The tree diagrams give a natural static, geometric shape to our intuitions about constituency and part-whole relationships within a sentence. Moreover, the derivation via the phrase structure grammar rules produces a string of symbols at the final step in the derivation, which is conveniently represented visually at the bottom of the graph, giving a diagram that iconically represents inclusion relations between abstract units and seriality of the actual symbols within the same graph.

In early transformational grammar, then, tree structures are just alternative ways of representing phrase markers which are sets of statements representing the derivations in the form of rewrite rules. Dominance is encoded in the vertical dimension while order is represented in the horizontal dimension. In those days, the transformational component also made crucial reference to word order, since these rules were themselves defined over phrase markers (or on tree structures that represented them). Thus the transformational rules themselves were sensitive both to the order and nature of the symbols in question.

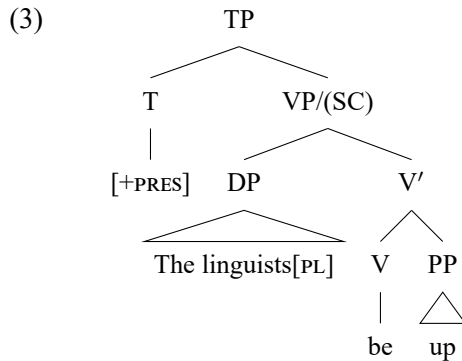
But phrase structure trees like the one shown in (2), do not need to be linked to string derivations as a matter of logical necessity, and the hierarchical relationships represented by dominance and inclusion do not necessarily need to be part of the same system that delivers the linear order of terminal symbols. Stowell (1981) argued that the phrase structure rules should *not* make reference to the order of symbols, and that a better account of the generalizations found in language could be given via purely hierarchical rules, with order being an independent parameter for a particular language or category.<sup>1</sup>

## 2.1 The Role of Movement

In Stowell’s reconceptualization, the transformational component (or the S(urface)-structure level that was fed by it) determined order, while the D(eep)-structure level could be thought of as order-neutral. It is at this ‘order-neutral’ level that predication and thematic local relationships are established. This level is also standardly used to encode the syntactic selectional relationships between a particular functional item (e.g. T) and the lexical category it was related to (VP in this case). These local selectional and inclusion relationships are part of a hierarchical and labeled representation, that are crucially important for stating generalizations about the meaning of complex linguistic expressions. Turning back to our original sentence ‘The linguists are up’, such hierarchical and predication dependencies would lead

<sup>1</sup>This is perhaps formalized more cleanly in HPSG where the immediate dominance rules are clearly separated from the linearization rules that regulate the linear order of a set of ‘daughters’ (see Müller 2024).

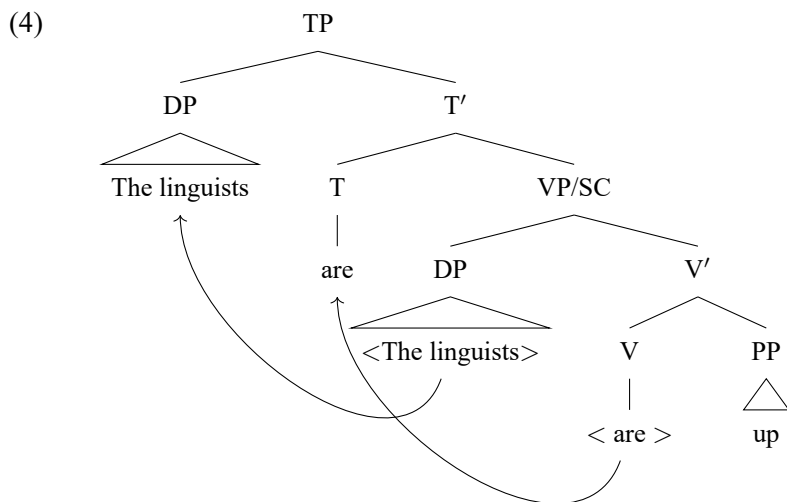
us to representing the predication relationship of ‘the linguists’ to the property ‘up’ in the form of a copular small clause (SC) introducing the HOLDER stative thematic role in specifier position, and then embed that whole structure under a T functional head.



The tree-style ‘picture’ shown above, if it is to be interpreted the way that Stowell suggests, does not really indicate that ‘the linguists’ precedes ‘up’, only that ‘the linguists’ is the HOLDER of the property indicated by ‘up’. Moreover, even though the specific thematic role here is quite abstract and underspecified, one should note that the interpretation of the property of being ‘up’ is highly sensitive to the semantics of the subject of predication: in the case of an animate HOLDER, the word ‘up’ most naturally means ‘awake’ as opposed to ‘in a high location’, or ‘complete’ which it gets with physical objects or abstract objects respectively. It is for this reason that we wish to represent the predication relationship between ‘up’ and ‘the linguists’ locally, and in a position that will reflect the semantic selectional relationship between these two symbolic elements in building up the compositional semantics.

T, on the other hand, is a functional element required at the sentence level over and above predication relationships: all English sentences require finite tense for independent assertability. T in turn requires/selects a constituent headed by an overt verb. For this reason, the dominance relations in the tree structure in (3) have T selecting VP as complement.

The placement of adverbials and the behaviour of VP ellipsis suggests that the tensed form of the verb ‘be’ (*are* in this case) occurs in a hierarchically higher position than the VP itself, motivating the kind of representation shown in (2). The linearization of tensed auxiliaries and *be* in English is usually handled in these theories by head movement of the V to the higher T position. At the same time, the HOLDER argument is also assumed to undergo a movement, raising from the specifier of V into the specifier of T, which is said to be the canonical position for subjects in English. The standard way to represent these things in a Chomsky-style framework is to employ the tree notation for both D-structure and S-structure and relate the two sequentially via the metaphor of ‘movement’ for the symbols that appear to be ordered in a way inconsistent with what might be expected from their D-structure representation.



However this kind of movement picture is not really consistent with the intuition that D-structure itself embodies no ordering relationships because the movement metaphor relies on the idea of a first ‘position’ from which the item is then moved, and the conflation of the two levels of representation into one picture with a movement arrow embodies an implicit claim that D-structure and S-structure representations use the same vocabulary and primitives (and interpretation). Therefore, if one is to truly embrace the idea that D-structure representations are not intended to say anything about order, then neither the metaphor of movement nor the picture in (4) are logical expressions of the pattern we wish to describe. I suspect that most minimalist syntacticians would subscribe to the Stowellian idea that phrase structure trees represent hierarchy and dominance relations rather than linear order, while at the same time continuing to work within a framework that treats phrase structure trees as claims about order and using movements to feed ultimate desired positioning of elements (This view is explicitly held and formalized by Kayne 1994 with his Linear Correspondence Axiom (LCA) and by many minimalists who pursue LCA compatible hypotheses).

## 2.2 No-Movement Theories

Within Lexical Functional Grammar, a generative theory which branched off from the Chomsky lineage at around this time, the differences between different kinds of syntactic relationships found their expression in qualitatively different levels of representation which were co-present in defining the syntactic characterization of a string. The two main important levels of representation, present in LFG since its establishment in the 1970s, are the levels of f-structure (functional structure) and c-structure (constituent structure) respectively. F-structure represents information such as SUBJECT and OBJECT, subcategorization information of lexical items, as well as certain functional information such as tense, aspect (on verbs), and number and case (on nouns). C-structure on the other hand represents word order and constituency of the concrete phrasal expression of these abstract relationships. C-structure is pictured in a tree theoretic fashion and in many ways is similar to the S-structure phrase structure trees of an LSLT (*Logical Structure of Linguistic Theory*)-style framework in embodying both word order and constituency. F-structure on the other hand is pictured as an attribute-value bracketed structure with different relationships potentially nested within each other. F-structure in LFG thus contains no direct information about order, but every language encodes a mapping between f-structure and the c-structure that instantiates it. These mapping principles are language specific rather than universal, although there are some general coherence and completeness conditions on f-structures, and on the function  $\phi$  that maps between the f-structure and c-structure levels of representation within the theory. F-structures represent subcategorization information for lexical items, as well as the abstract functional features that modify them, and so in some sense they

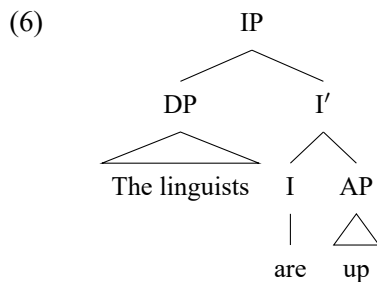
do much of the work of base generated D-structure extended projections in the Chomskian lineage of theories. LFG-style f-structures are also a more logical expression of the idea that order is not present at this level of representation. It is somewhat perverse to draw a tree-like graph, whose expression on the flattened page cannot help but commit itself to a serial ordering of visualized symbols, and then to insist that the picture is misleading and should not be taken literally. How much better to invent a representation that does not have to be selectively interpreted against its own grain, that doesn't insidiously deceive with its tempting visual certainties! Of course, all syntacticians are perfectly convinced of their ability to overcome these kinds of implicit bias in visual representation, and to work objectively and logically with the system as mathematically specified. But my suspicion is that humans are far less good at this than they think they are, and that modes of representation bias us with respect to the kinds of generalizations that stand out to us and the kinds of hypotheses we entertain.

For this reason, it is hygienic to confront our own particular implementational choices by considering how a different toolbox would account for the same intuitions. In the case of the intuition concerning the separability of hierarchical from serial relationships, LFG in particular offers a way of representing the selectional and compositional relationships that capture certain hierarchical relationships distinct from the linear order in which they are eventually expressed.

For example, we might use an f-structure like representation to convey the predication/selectional information between 'up' and its subject 'the linguists' as well as the functional tense information that applies to the predication unit. A toy representation of this type might look as in (5).

$$(5) \quad \left[ \begin{array}{ll} \text{PRED} & \text{'UP(SUBJ)'} \\ \text{TENSE} & \text{PRES} \\ \text{SUBJ} & \left[ \begin{array}{ll} \text{PRED} & \text{'LINGUISTS'} \\ \text{SPEC} & \text{'THE'} \end{array} \right] \end{array} \right]$$

LFG maintains that the two different levels of representation are co-present and that the mapping between f-structure and c-structure is a language specific property, albeit within certain formal limits. For example, a phrase and its head always correspond to the same f-structure, and a functional head and its complement always correspond to the same f-structure. F-structure representations are recursive in the sense that there can be f-structures (complex attribute-value structures) as values for other attributes in a larger attribute value structure. The mapping relation  $\phi$  between c-structure and f-structure associates nodes in the phrase structure tree representations of c-structure with either simple or complex elements of an f-structure representation. In configurational languages, we generally find that a single bracketed f-structure unit corresponds to some constituent at c-structure (although multiple constituent nodes can map to a single bracketed unit in the f-structure representation). For example, in English, the mini f-structure that is the value of SUBJ in (5) above is mapped to by the DP constituent in Spec, IP in the c-structure in (6). Thus, alongside the f-structure for our sentence shown in (5), we would also have a c-structure as shown in (6).



While f-structure quite clearly encodes no word order information (there is no attribute in the representation which has any kind of linearity property as a value), c-structures are like standard LSLT-style trees in encoding both word order and constituency/dominance. But it is important to emphasize that while both f-structures and c-structures have internal recursive structure and therefore part-whole relationships, there

is no automatic correspondence between the units that exist on one level and the ones that exist on the other, other than those that are stated explicitly on a language by language basis.

As a further thought experiment, one could imagine a syntactic theory where syntactic relationships and part-whole structural relationships (in the form of hierarchical embedding of one syntactic representation within another) is represented in an f-structure like notation, but where c-structure is replaced by a kind of representation that *only* traffics in precedence and contiguity relations, a kind of linearization structure or Seq(uential)-structure if you will, where < indicates ‘immediately precedes’

(7) **Seq-Structure:**

The < linguists < are < up

In a fully fleshed out version of this idea, the relation < could be diversified to represent different kinds of phonological juncture, such as the ones found e.g. between ‘words’, between ‘morphemes’, or at a clitic boundary. Linearization (Seq(uential)-structure) could also contain prosodic and accentual information and indicate which symbols are morphologically complex but linearly ‘precompiled’ (i.e. located in declarative memory) and which morphologically complex strings are generated by the language’s combinatoric system. No doubt such systems have been proposed either within LFG or within its sister theories. In HPSG, the idea of separating hierarchical from linear structure has a strong history (Reape 1992, Kathol 2023, see Müller 2024 for details). Such frameworks allow certain problems to be framed and solved in a different way, as Kathol (1995) argued for German word order. Exploring these logical possibilities, and maintaining implementational multilingualism is often crucial to getting an understanding of the true nature of a generalization.

In a grammatical theory like LFG, since all the levels of representation are co-present, any linguistic behaviour or patterning that is sensitive to hierarchical relationships expressed at f-structure is not an argument for folding that information into the Seq-structure representation as well. The logic of the system of parallel representation is that information does not have to be duplicated across levels to account for the linguistic patterns. In LFG, the hierarchical structure expressed in the c-structure trees is of a different level of granularity than that expressed in the nested boxes of f-structure. It is then an empirical question what sorts of linguistic effects (meaning, scope, agreement etc.) are built on which levels of representation. In other words, c-structure in classic LFG, with its hybrid representation of both linear and hierarchical patterning, embodies a claim about the relative silo-ing of different kinds of information and is not a neutral choice.

Hierarchical structure on the other hand has been used by linguistic theory as the scaffolding for supporting compositional interpretation, with selection going hand in hand with function-argument composition and with c-command being correlated with scopal relations. The question for the LFG architecture is whether the structure provided by f-structure representations is rich enough to support the building of semantic structure (as assumed by the standard theory where f-structure is mapped to s(ematic)-structure), or whether the finer grained articulation found in c-structures is also necessary. See Andrews & Manning (1993) for a discussion of these issues. These are live topics within LFG theorizing, with many recent researchers favouring a view by which f-structure provides only one part of a co-description that feeds semantic interpretation (see Asudeh 2023).

Architectural choices are not neutral, even when they are intertranslatable with barely discernible empirical effects. Judgements of which is the ‘better theory’ of some linguistic generalization involve holistic assessments of the simplicity and efficiency of the grammar, a judgement made more difficult if said grammar is also assessed with respect to how well it interfaces with other known facts about cognition more generally (a desideratum enjoined upon us by the minimalist enterprise (Chomsky 1993) but rarely embraced in practice). My purpose in this paper however is not to evaluate the different options placed in front of us, but to draw attention to them.

The LFG framework seems at first blush to be a better implementation of the idea that some levels of representation are word-order neutral (à la Stowell), and that this gives us better purchase on what might be universal in language structuring. In the seventies and eighties, much was made of the fact that LFG

as a theory lacked the kinds of movement devices that GB regularly helped itself to. Word order variation is easy to describe in a multi-stratal theory where hierarchy is uncoupled from linear order. But what you gain on the swings, you can lose on the roundabouts. Strange word orders are easy enough to describe, but it can feel more ad hoc in such a framework to account for when options are in fact more seriously constrained.

If one judges that empirically the mapping between hierarchical structure and linear order is more systematic and pervasive than it is free, then it makes sense to deny the Stowellian claim altogether and double down on the earlier intuition that order and hierarchy are intimately related. In other words, if it turns out that hierarchical embedding relationships have reliable word order implications within natural language then it would be desirable to have a way of representing those two aspects of syntactic patterning in such a way as to make those implications naturally stateable over our syntactic representations. This very empirical claim is the basis of recent syntactic theorizing in the form of the Linear Correspondence Axiom (LCA) of Kayne (1994) and much subsequent work, and of certain cartographic work on word order generalizations (Cinque 2005 on the patterns uncovered originally by Greenberg as Universal 20).

### 3 Capturing Typological Patterns

Typological work has long noted the systematic ordering differences found among the world's languages, and the implicational patterns that seem to be found there, suggesting some underlying system of universal constraints (Greenberg 1966). With respect to capturing the descriptive facts underlying Greenberg's Universals, one can broadly distinguish two major approaches within Chomsky-style generative grammar which use a tree-style graph notation for syntactic representations:

- (i) **Head Ordering Parameters:** Parametrize head-complement order directly (possibly on a category by category basis) (Haider 2000; Abels & Neeleman 2012 on Universal 20)<sup>2</sup>
- (ii) **LCA-style Universal Mapping:** Assume a common phrase structural functional sequence, *with a universal ordering* (Kayne's (1994) LCA) and parametrize the choice of the kinds of *movements* that occur to distort base SVO phrase structures (Kayne 1994; Koopman & Szabolcsi 2000; Cinque 2005 on Universal 20).

The first of these options is more in the spirit of the Stowell proposals, separating hierarchical information from its outward externalization properties. In this case, we need to think of the tree-style graph as being in fact like a hanging mobile in three dimensions, with linearity only derived by a 'flattening' option as determined by the head ordering parameter.

In the second option, we do not need to pretend that tree structures are unordered – they *are* linearization representations, and movement is the tool used to express differences between one stage of ordering and another. The metaphor of movement itself is not necessary in this characterization. Movement and the leaving behind of a coindexed trace, has been re-conceptualized variously over the years as the merge of a copy of the original element plus selective spell out, or as the *re*-merge of the very same element already present in the structure to something in a higher position. These differences of implementation are independent of the strict mapping such theories assume between position in the hierarchy and a position in the linearized string that externalizes the representation.

Since the publication of Kayne (1994), the LCA approach to the interpretation of tree structures has been pursued systematically by many researchers. Even among those who favour the approach in option (i) however, many still maintain a correspondence between hierarchy and order when it comes to relative head ordering, and the leftward positioning of specifiers. Thus, in particular, head movement of the kind visualized in (4) above where the copular verb in English moves to T is still the most common

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<sup>2</sup>Base generation accounts do not eschew movement operations in the syntax entirely, but operate with a more restricted and triggered set of movement operations than Kayneian accounts.

way to reconcile the base position of certain heads with their featural composition and apparent surface linearization.

Just as with LFG, we could contemplate different choices within this system and add a third option (akin to assuming a Seq-structure level), which one might call **Direct Linearization**.

- (iii) **Direct Linearization**: Assume a common (relative) hierarchical system across languages, plus a *learnable* linearization algorithm which is language specific.

The difference between Direct Linearization and the Head Order Parameter approach is that it is *not* assumed that the linearization algorithm is just confined to a parametric choice of head-complement order. Once a direct linearization approach is taken, we no longer assume any operations in the syntax designed purely to affect word order. This includes standardly employed movements such as EPP movements and head movement in addition to the more recently proposed remnant movements, roll-up movements etc. If one pursues a direct linearization approach and does not admit head movement or ‘raising to Spec, IP’ in order to satisfy the subject requirement of English, then statement of typological differences between languages with respect to word order takes on a rather different shape, just as it does in LFG.<sup>3</sup>

The direct linearization approach is the logical extreme of the Stowellian intuition, and can be seen as a natural consequence of the Berwick & Chomsky (2011) definition of externalization:

“Externalization – the translation of the hierarchical and recursive representations characteristic of syntax and semantics into the kinds of serial representations that the sensorimotor systems can manipulate”

(Bennett et al. 2016 on the Berwick & Chomsky 2011 notion of Externalization)

Externalization is a requirement for communication, and linear expression is therefore a core feature of the language signal. But what work is being done by hierarchical structuring in language? One natural conjecture would be that while the linear representation is required for the PF or externalization interface, hierarchical representation is the necessary form of the input to the conceptual and meaning aspects of cognition. Certainly, the fact of creative meaning composition requires a combinatoric system to create complex on-the-fly meanings from the memorized symbolic building blocks of a particular language. For example, in English, it is clear that (8a) has a different interpretation from (8b), corresponding to a difference in ‘scope’ of the different adverbs.

- (8) a. Tracy knocked on the door twice repeatedly.  
b. Tracy knocked on the door repeatedly twice.

Similarly, (9) is ambiguous, the two different available meanings correlating precisely with whether ‘with the telescope’ forms a subunit with the noun phrase ‘the girl’, or with the verb phrase ‘saw the girl’ as a whole.

- (9) Tracy saw the girl with the telescope.

Structure is therefore an important part of the information that delivers compositional interpretation. We also know that certain morphological patterns and regularities such as agreement are sensitive to the hierarchical structure of the linguistic representation and must be stated over a kind of representation where those requisite groupings and relations are expressed.

While LFG uses c-structures to represent constituency as well as order, f-structures while also hierarchical, tend to flatten out those hierarchical levels to some extent. This is because a phrase and its head always correspond to the same f-structure, and a functional head and its complement always correspond to the same f-structure (Dalrymple 2001). Thus, the massively articulated extended projections

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<sup>3</sup>One early form of direct linearization is exemplified by Kural (2005) who proposes a tree traversal algorithm in three different parametric versions which exhaustively linearizes the terminal nodes of a binary branching tree structure in three different ways to recreate the typology of word order variants found in human language.

found in cartographic theorizing (Cinque 1999) do not correspond to an equivalent nesting of f-structure units within LFG, and the ordering/hierarchical crosslinguistic generalizations concerning these functional elements are thus not statable over f-structures. Indeed, they are often not stated or noted as generalizations at all. To the extent that these generalizations exist, they would have to be stated as meta-generalizations over the ways in which the  $\phi$  function is constrained in its mapping from f-structure to c-structures. Despite the flattening relation between the constituency represented in c-structures and nesting of units at f-structure, it is standardly assumed in LFG that f-structure is the level which feeds semantic interpretation (s-structure) via the  $\sigma$  mapping function (Andrews & Manning 1993), although this might not be the *only* such input to interpretation (see Asudeh 2023).

So far I have discussed some of the differences in the representation of word order within LFG and different versions of Chomsky-based syntax. But it is important not to overstate those differences. In some respects the two families are very similar, and there are arguably greater internal differences within the Chomskian traditions and LFG traditions respectively than between Chomsky-style frameworks and LFG. This is because tree structures are still used representationally in both theories and the decision about the relationship between phrase structural constituency and linear order is still an important one that cuts across different frameworks. In the end, all theories need to make a decision about how to represent the mapping between hierarchically structured information and linear expression of symbols, and the extent to which that mapping obeys universal or deterministic principles or is subject to variation. Both families of theory are capable of expressing flexibility in the mapping between hierarchy and order, and both have the formal wherewithal to state generalizations concerning that mapping. The differences lie in the division of labour between subsystems and the way information flows between them. These in turn have implications for any future detailed theorizing about linguistic cognition and its more algorithmic level implementation in real brains. On the other hand, the differences we have seen between frameworks are not significant from a descriptive point of view if we just seek a notation for capturing the information present in a particular linguistic expression.

While I believe the links to processing and cognition represent pressing challenges, I would like to make a different point here, one more related to methodology and the ways in which implementational toolboxes are used in the service of theoretical advance. Choice of framework turns out to be significant in the sense that different formulations have an influence on which patterns look most salient, and the lines of analysis or explanation that look most promising to explore. In the next section, I explore an example of a proposed typological word order generalization and the different ways in which tree-graphing theories have attempted to express it. I then contrast the tree-theoretic modes of expression with an alternative description in terms of stack-sorting (after Knuth 1968).

### 3.1 The Anatomy of a Generalization: Greenberg's Universal 20

Greenberg 1966: 87 proposed the generalization Universal 20 which states that “When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they are always found in that order. If they follow, the order is either the same or its exact opposite.” While subsequent typological work has confirmed the fact that the attested orders of these elements within the noun phrase for different languages are indeed highly restricted, this statement only broadly characterizes the pattern. In fact, of the 24 logically possible orderings of Dem, Num, Adj and N only 14 are attested as the unmarked order in natural language (Cinque 2005). Of these, there are indeed more ordering possibilities post nominally than preminally, but it is a non-trivial challenge to describe the constraints that will precisely deliver this pattern. In other words, taking the pattern at face value, we seek a grammatical system which will generate all 14 attested orders and fail to generate the 10 unattested ones. Cinque (2005) proposes exactly this, using a toolbox of assumptions that embraces binary branching phrase structure representations with an LCA style Specifier < Head < Complement linearization, and with a base hierarchical ordering of Dem dominates Num dominates Adj dominates N. Based on this phrase structural template, the two components of the theory of movement that generate the attested orders are:

- (i) all movements target a c-commanding position;
- (ii) all relevant movements target a subtree containing N.

Under this story, it is the constraints on syntactic movement that conspire to create some derived trees (and hence some orderings) and not others. It is important to note that the movements in question are not independently required by any known feature checking or syntactic process, they are there to produce the phrase structure that will map to the correct ultimate order, given the LCA. The fact that (ii) is a necessary constraint for deriving the attested orders is not something that currently has a natural explanation. But the very fact that an LCA style system can predict asymmetries in linearization possibilities that would not be predicted by a symmetrical head parameter account is claimed to be an argument for the linear correspondence axiom in the first place and the relationship it proposes between hierarchy and order.<sup>4</sup>

The fact that some linearizations of a hierarchy are possible mappings while others are not is an important one and one that we would like to understand better. We have seen above that the Cinque (2005) analysis offers us a generalization in terms of the nature of the constituent that is targeted for word order movements in particular (that the moved subtree contain N). I have presented this example because I want to contrast it with what the generalization looks like if we adopt the Direct Linearization approach described above and eschew word order movements altogether.

### 3.2 Stack-Sorting

Some recent work on U20 that doesn't filter the generalization through the language of movements, offers an intriguing possibility for where the explanation might lie. Medeiros (2024, 2018) makes the important observation that if you have a hierarchy (stated as a sequence 1,2,3,4 with 1 the most deeply embedded), then the typologically attested orders are just those that can be sorted into that hierarchy by Knuth's (1968) simple stack-sorting algorithm. In the statement of the algorithm below, imagine an input sequence with first incoming element I, a separate 'stack' with top element S fed by the Push operation which places an element from the input on the top of the stack, and a final output that is fed by the Pop operation from the top of the stack to the output.

#### **Stack-Sorting Algorithm** (from Medeiros 2024):

```
While input is nonempty,  
    If  $S < I$ , Pop  
    Else, Push.  
While stack is nonempty,  
    Pop
```

What the algorithm says is that if the input element is lower in the hierarchy than the element on the top of the stack then it is pushed onto the stack, becoming the top element itself. If the input element is higher in the hierarchy than the top of the stack then it is sent immediately to the output. For example, let us assume we are trying to output the base hierarchical order 123 (where 1 is the most deeply embedded) then if the *input* is 123, identical to the desired output, each element is pushed and immediately popped. On the other hand, if the input is the mirror image of the output, 321, the entire sequence is first pushed onto the stack, and then popped one by one, reversing its order. The stack essentially acts as a buffer, keeping track of the order of incoming elements and keeping that in 'memory' while/if the elements from the input are still decreasing in functional height. An increase in functional height from the input triggers a pop of the lower element from the stack into the output. In this way, this simple algorithm takes a serialized input of elements and converts it to a sequence that directly aligns with level of embeddedness instead. The output order would be one suitable, for example, to feed bottom up compositional interpretation.

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<sup>4</sup>Abels & Neeleman (2009) argue however that this conclusion is not justified, and that a head parameter grammar that base generates some of the orders is just as explanatory if the movement derived orders follow the constraint that they are always 'leftward'.

Essentially, a language can choose to linearize its hierarchical trees in a variety of different ways and it won't matter to the interpretation device because Stack-Sorter will convert any order you feed it into the order that reconstitutes the hierarchy. It can do this as long as the algorithm has the local information concerning which of two elements 'Input' or 'Top-of-Stack' is the selector (hierarchically locally higher) and which is the selectee. But here's where it gets interesting. Not all possible orderings of a 1-2-3 base hierarchy *can* be stack-sorted back into 1-2-3 by this simple Knuthian algorithm. There are six possible permutations of 123, five of which will successfully return 1-2-3 (123, 132, 213, 321, 312), and one of which will not (231).

| Output   | Stack | Input   |
|----------|-------|---------|
| 1-2-3 ←  | ∪     | ← 1-2-3 |
| 1-2-3 ←  | ∪     | ← 3-2-1 |
| 1-2-3 ←  | ∪     | ← 1-3-2 |
| 1-2-3 ←  | ∪     | ← 2-1-3 |
| 1-2-3 ←  | ∪     | ← 3-1-2 |
| *2-1-3 ← | ∪     | ← 2-3-1 |

Medeiros (2024) demonstrates that the orders that are 'unsortable' by this stack-sorting algorithm are precisely those which are claimed to be unattested in a typological survey of NP internal orderings of Dem, Num, Adj, N. Medeiros (2024) also argues that the Final-Over-Final Constraint (FOFC: Biberauer et al. 2007) can also be derived from a prohibition against non stack-sortable orders.

What does this mean? Knuth's stack-sorting algorithm (and Medeiros's implementation of it) is not some sort of mystical incantation, although it might feel like it at first sight. It is an algorithm designed to do one functionally important thing – from an input *sequence*, it transforms the material to output elements in the order that would correspond to bottom to top hierarchical embedding. This simple algorithm can handle nearly any choice a language might come up with for how the linear order of symbols might proceed and fails on only a few (from the point of view of the algorithm) 'pathological' choices. It turns out that human languages end up avoiding these pathological choices. This suggests in turn that something in the way that language is set up *makes* those order choices pathological, and that the stack-sorting algorithm shares some logical properties with how human speakers actually parse incoming sequences.<sup>5</sup> In other words, the attested word orders are the ones for which a simple domain-general 'processing' algorithm can recoup the order congruent with the underlying hierarchy.<sup>6</sup>

What I take this to suggest for our discussion of the LCA is that the cluster of constraints on movement necessary to derive the typological pattern of \*2-3-1 are plausibly not a syntax-specific set of constraints on movement, but reflect a more general informatic principle concerning how one recoups hierarchical dependencies from a linear presentation for processing. Basically, it shows us that the typological

<sup>5</sup>I am assuming here that the constraint is driven by the mechanisms of comprehension rather than production, since this algorithm sorts left-right sequences into bottom-up representations that would naturally feed a comprehension process. Abels (2016) points out that if you wanted stack-sorting to fail on the typologically bad orders when considering the *production*-motivated mapping from hierarchy into order, then the input would have to be top-down and the output right-to-left to get the correct typological pattern. This in turn suggests that whatever the functional pressures are that are conspiring to make these orders successful or unsuccessful as a language choice, they are related to the mechanisms available to the language learner in developing strategies for parsing input.

<sup>6</sup>Interpreting the stack-sorting generalization in this (possibly simplistic) processing way, assumes that the hearer wants to convert the incoming stream of speech to an ordered output that will feed cumulative meaning composition. It also requires the parser to be able to track 'height' in the functional sequence as an independent fact. This need not be problematic if all we assume the parser is sensitive to is whether the element on the stack 'selects' the incoming element or not.

generalizations underlying the modern understanding of Greenberg's Universal 20 should not be seen as arguments for a parametrization for the movement of certain kinds of chunks of structure in syntax. Rather, they say something about the way working memory works to support the representational conversion from strings to an order directly mirroring underlying hierarchy. Seeing the algorithm from a direct linearization perspective allowed us to see it more abstractly in terms of working memory and tracking of selection. On the other hand, movement algorithms within the LCA style solutions are so parochial to the vocabulary of syntax that they obscure this more abstract interpretation. This is one example of how a difference in implementational choice is not mechanistically innocent, even when the two versions deliver the same results observationally. An important clarification is in order here: the stack-sorting algorithm is not itself a linearization algorithm for a particular language – *all* the attested word orders we find in languages are compatible with stack-sorting. Stack-sorting is a constraint on linearization algorithms, it is not the language-specific linearization algorithm itself. What the stack-sorting generalization tells us (I would submit) is that the formalization in terms of movements of different kinds of constituents is unlikely to be the code in which actual linearization algorithms are written cognitively. There is still an analytic gap between the stack-sorting algorithm itself and the language-specific linearization algorithm that each child has to learn when acquiring their language: which 'tree traversal mechanisms' or 'mappings between f-structure and c-structure', or 'assemblies of tree-graph distorting movements' are learnable solutions to the systematic mapping between hierarchical structuring (categorical selectional dependencies) and linear order? What the Medeiros result suggests is that what needs to be learned is dependent on a set of cognitively general primitives, and is not specific to language-particular modes of organization. In other words, the child comes to know where/when in the signal the mediation of a 'stack' is invoked in the mapping between expressive word order and meaning building, and alternatively when the information could in principle flow unmediated.<sup>7</sup> A precise proposal for a direct linearization algorithm of this type inspired by the stack-sorting generalization is beyond the scope and aims of this short paper, although it aspires to inspire such attempts. The immediate point is a more modest methodological one: the language one uses to express a pattern can help to open up the hypothesis space for further generalization and explanation.

#### **4 Patterns and Pictures**

In some sense, this short paper has been a deconstruction of the tree graph format and its shortcomings. There is great utility and power in a diagramming convention, but with great power comes responsibility. I hope to have shown that care always needs to be taken with tree structure illustrations to be clear about what commitments they do or do not embody for one's theory. The very act of drawing a tree on paper commits one to a particular order for orienting the symbols. The trees can't help themselves, but the *theoretician* needs to be clear about whether those commitments are part of the theory or not. In the case of D-structures, Stowell's (1981) approach would deny that the apparent visual correlations are part of the essential nature of the representation. In the case of LFG's c-structures, the linearizing aspect of the representation is fully embraced, but the theory is less precise about the role that the constituency structure (hierarchical structure) embodied by these c-structure trees plays in the statement of linguistic rules and generalizations, and the input to compositional semantics. In the case of the Specifier-Head-Complement ordering hypothesis entailed by Kayne's (1994) LCA in the minimalist tradition, tree graphs are converted into linearization statements by a universal translation algorithm, thereby making syntactic (movement or spell out) rules an important mechanism for dealing with word order variation. The direct linearization approach on the other hand takes the Stowell position to its logical conclusion but in refusing to confine the linearization flexibilities in principle to just the head-complement ordering parameter it puts the theoretician in somewhat of a quandary when it comes to diagramming at all. For those who take this

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<sup>7</sup>In Adger & Ramchand (2026) we propose a particular direct linearization algorithm for Scottish Gaelic based on the mereological syntactic structure-building proposed in Adger (2025), and which is relevant here is that it utilizes a 'buffer' (which is the inverse of the stack in the Knuthian stack-sorting algorithm in that it is a structure-to-order algorithmic device that generates orders that would be congruent with bottom-up processing).

latter approach, the tree graph-theoretic structure is no longer such an iconic, intuitive or useful display of the relationships embodied by a syntactic representation, at least in so far as the expressive order of symbols is concerned.

In each of these different frameworks, the picture one sees on the page visually and iconically displays certain properties of the proposed syntactic representation or analysis but not others. So the first (and most obvious) point is that linguists need to be as explicit and self-conscious as they can be about what the formal commitments of the implementation are. But my second point is that even when the linguist is rigorously cognizant of their formal commitments, the fact of a diagramming convention seductively influences the shape of the problem in ways that can operate in much the same way as implicit bias in making certain lines of inquiry less salient or attractive. The nature and shape of a generalization as stated within one implementationally coherent toolbox can look very different from the one stated under a different (though perhaps logically equivalent) set of theoretical assumptions. We saw this most strikingly in the example with Greenberg's Universal 20 where the generalization in terms of what kind of subunit is eligible as the input for word order movements is very different from the generalization in terms of the nature of the abstract sorting algorithm that filters the attested orders from the non attested ones. Those two qualitatively different kinds of pattern in turn lead to different hypotheses and follow up questions concerning the nature of the language faculty and how syntactic knowledge is represented in the brain.

#### 4.1 Thinking the Unpicturable

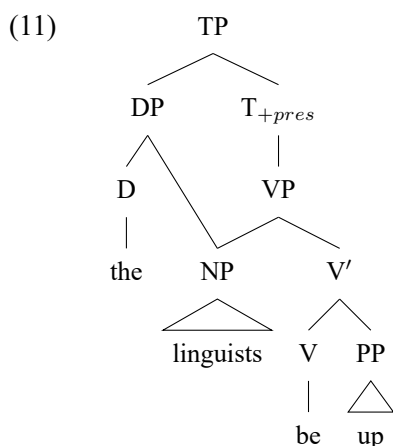
As a corollary to the biasing power of pictures, the graph-theoretic diagramming convention we call tree-diagrams is actively obstructive if the generalization one wishes to express happens not to go with the grain of how the information is displayed. This can have the effect of either impeding the discovery of certain patterns in the first place, or of impeding communication of an idea or hypothesis once it has been proposed.

In the final section of this paper therefore, I would like to return to the core sentences introduced at the beginning and propose a generalization about how sentences are syntactically composed that does not find natural expression in a standard tree diagram. I repeat the core sentences in (10) below.

- (10) a. The linguists are up.  
       b. The tent is up.  
       c. Our time is up.

I have already discussed why the predication relationship between the particle predicate 'up' and the particular choice of subject needs to be expressed locally as part of the predication/thematic structure notated at f-structure in LFG, and at D-structure (or the 'first phase') in Chomskian lineage frameworks. To recapitulate, the selectional relationship between the predicate and the subject HOLDER leads to conceptual modulation of the polysemic possibilities within the predicate's meaning. If the HOLDER of the property is animate, as in (10a), 'up' simply means 'awake'; if the HOLDER is an inanimate artefactual object, it has a more positional or orientational interpretation as in (b), while if it is abstract and non-corporeal, the meaning of 'up' is that of completion. A good theory of syntactic representation should represent the close local selectional relationship between the HOLDER and the predicate 'up' itself. Moreover, it is relevant here to note that the semantic selectional effects relate to the lexical open class element ('linguist' vs. 'tent') and the information about definiteness or plurality is completely orthogonal to this effect. The information about plurality (and potentially other referential features such as person and definiteness) located on the higher functional structure of the extended nominal projection *is* relevant to the relationship between the DP subject and the agreement system associated with finite T in English: the tensed form of the verb 'be' is *are* in the context of the plural subject *the linguists*, but is *is* in the context of the singular subject *the tent*. Neither the actual N lexical item nor the V lexical item are relevant to the feature copying here – it is T and D who are sharing information. At the thematic selectional level, it is N and lexical predicate that are sharing information. One completely logical way of representing this set of syntactic

relationships in graph-theoretic form would be to connect the NP ‘linguists’ as a dependent daughter of the VP, but the fuller phrase DP as the dependent daughter of the TP, as in (11).



The lines on the graph above all represent syntactic dependencies but reflect different planes of interaction: predication and agreement are relationships between phrases of different syntactic categories (what we might call *horizontal nexus*). They crucially differ from syntactic relationships that operate within the extended projection of a single lexical category (correspondingly, *vertical nexus*). The tree I have drawn in (11) is not a proper tree, and I had to coax and modify my standard tree-drawing package to produce it. If we are just representing syntactic dependencies (and not a pronounceable output), there is no reason that such graphs should be ill-formed. It is the history of tree drawing and its relationship to generating ‘terminals’ which can then be concatenated that makes such trees look anomalous in general. Whereas a standard phrase structure tree rewrites the nominal phrase into subparts, the relationship of the nominal extended projection to other phrases is always mediated by its top node, the maximal phrase. This is because, intuitively, the linearization of the nominal projection itself and its internal components seems to be compiled before that phrase is integrated linearly into larger phrasal structures. The graph in (11) however ignores this linearization fact/bias and directly represents syntactic connection between the higher functional nodes of the nominal extended projection and the higher functional nodes for V. In fact, there are some indications that there might indeed be an important set of patterns and generalizations to be uncovered if the fine structure of horizontal nexus is put in focus.

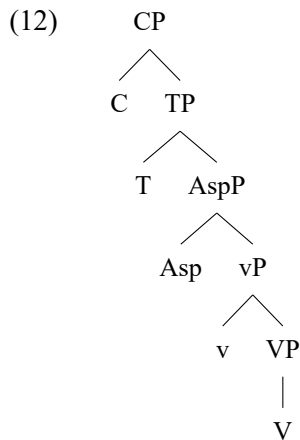
Let us compare briefly, across verbal and nominal projections, the proposals for vertical nexus, which is an elaboration of the notion of extended projection (in the sense of Grimshaw 2005) as in the cartographic project more generally (Cinque 1999). Cartography tells us that there are robust crosslinguistic generalizations about the ordering of meaning elements in an extended functional projection (cf. Cinque 1999). However, at the bottom of every functional sequence, we find evidence for a kind of substantive, conceptual, rich, yet flexible kind of meaning, as denoted by open class items. Evidence for this kind of *layered meaning* is pervasive and exceptionless crosslinguistically and is true crosscategorially as well.

For example, in the verbal domain, the following functional heads are ubiquitous and seem to be universally ordered:

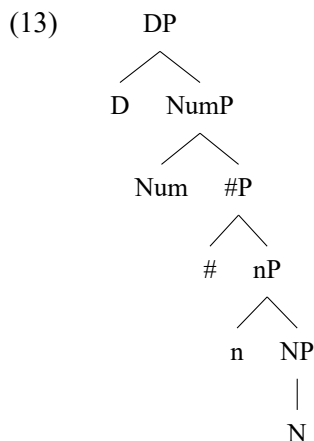
$$\text{Mood}_{\text{speechact}} > \text{Mood}_{\text{evid}} > \text{Mod}_{\text{epist}} > T > \text{Mod}_{\text{circ}} > \text{Asp} > \text{Voice} > \text{Cause} > V$$

(Cinque 1999, Grimshaw 2005, Julien 2000)

Even linguists who are uncomfortable with such universalist claims coupled with fine grained ‘cartography’, nevertheless subscribe to more modestly articulated templates for extended verbal projections (such as a  $C > T > \text{Asp} > v > V$  template of extended verbal projections), and (at least) language specific rigid ordering. (See also Ramchand & Svenonius 2014 for a coarser grained hierarchy in terms of ‘zones’.) For concreteness, I offer a picture of the standard verbal extended projection found in the literature, in (12).



Within the nominal domain, detailed work on the syntax/semantics of noun phrase composition has identified layers corresponding to substance, individuation, numerosity, and discourse level information about reference (familiarity, uniqueness) (Zamparelli 2000, Chierchia 1998, Hinzen 2016). Ever since Abney (1987), the nominal extended projection has contained at least a functional D head (correlated with referential denotation) in addition to N, to which we can add (at least) Num and # corresponding to numerosity and individuation respectively.<sup>8</sup> I picture the nominal extended projection as in (13).



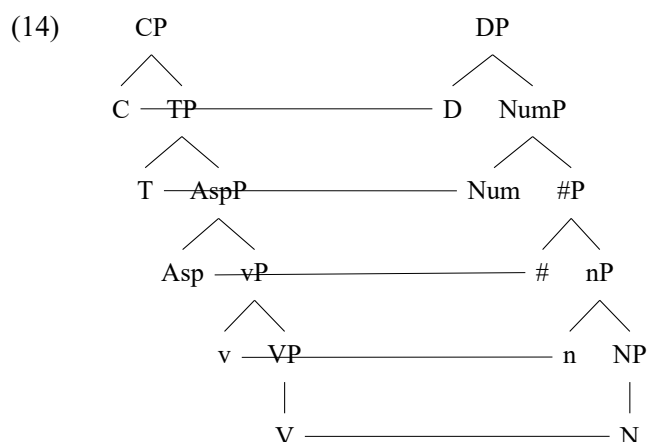
In the phrase structure decomposition above, I have included a *n* head in the decomposition which has been proposed as a phase head corresponding to little *v* in the parallel verbal extended projection. There are those who associate the *n* head with identity criteria (Baker 2003) or with gender features, often also with a categorization role (Kramer 2015). I have not included KP in this decomposition since it is more fundamentally relational, and I choose to focus on the functional heads centrally related to vertical nexus here. In some sense, the exact labeling for these projections or their particular definitions is not the point. Like in the verbal domain, the bottom of the extended projection for the noun is the open class lexical item which embodies rich essential and ‘reusable’ content. Also, as in the verbal domain, there is a layer of functional information that contributes the information relevant to real world reference in a particular context of use. In the verbal domain this takes the form of anchoring spatio-temporal information to build a description of an event particular or token, from a description of event properties (Gehrke 2015, Gehrke & McNally 2015). In the nominal domain, the nominal property description is clothed with information that determines reference to an actual individual (Zamparelli 2000). There is thus an intriguing parallelism here in terms of semantic composition between the lowest zone of the DP and the lowest zone of the CP in terms of conceptually rich content on the one hand, and the middle

<sup>8</sup>I have separated Num (the location of sg vs. plural or more specific numerosity) from # as is common following e.g. Borer (2004), who argues that the head for packaging and individuating substance is logically separate from (but necessary for) actual plurality and counting.

inflectional zone in terms of functional information related to the instantiation of the lexical property in ‘the world’ (for which I will use AspP/TP and #P/NumP as a convenient shorthand for the verbal and nominal versions respectively). Finally, to complete the description of zones argued for in Ramchand & Svenonius (2014), one could see a parallelism between the outermost functional layers of both extended projections which reflect speaker-oriented and discourse-connective information. The granularity and particular choice of labels is not the crucial issue in the present article. My concern is to set up a plausible, hypothetical hypothesis space which takes seriously the claims scattered across the literature of parallelism between the nominal and verbal extended projection (going back to Abney 1987, and Grimshaw 2005). In the context of such claims, it has always been an extra source of uncertainty and debate exactly what the different functional ingredients to each projection are (particularly with their proliferation in the cartographic era: Cinque 1999) and what roles they have, making a clear and precise set of proposals difficult to formulate.

I would argue that what has made such proposals even more difficult to present precisely and theorize about has been the disruption such representations bring to the standard interpretation of graphical trees in their relation to word order. As already noted, it is standardly assumed that the DP as a whole is the entity that is in a syntactic relationship with both V (for thematic selection) and T (for agreement). But another plausible alternative is that #/Num forms horizontal nexus with Asp/T specifically, while N forms horizontal nexus with V. In other words, suppose it is not just that there is a pleasing general analogy at work between the two extended projection types, but that the appearance of analogy is due to a systematic syntactic information-sharing between layers of the respective functional structures, which has pervasive effects on interpretation, agreement, and yes, word order.

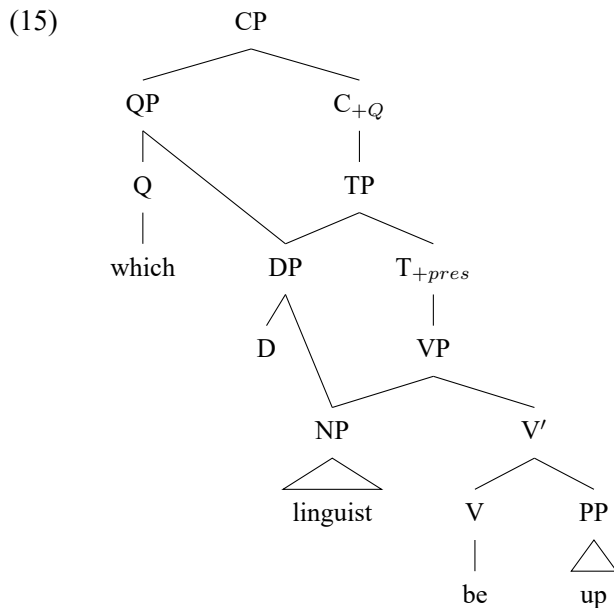
Consider the situation depicted in the picture below. The arms of the tree diagram correspond to dominance, or subjoin in the sense of Adger (2025), while the horizontal lines correspond to some kind of syntactic information sharing, leaving it open for now the granularity of the decomposition, and whether the nature of the relationship might be different between different zones.



But this is not a tree structure anymore – it cannot be seen as a representation of the derivation of a phrase structure grammar, and it cannot be interpreted as a final set of linearization statements without further algorithmic interpretation. It also does not seem to provide a natural base structure from which to build formal semantic compositional statements. If we add to this the idea that the vertical dimension itself is order neutral and that one should potentially be able to add (unordered) adjuncts at any level of the structure, it becomes harder and harder to visually and conceptually interpret. In other words, there are good reasons why we do not draw complex ‘trees’ such as these, and why these kinds of multi-dimensional structures have never been used as tools or as direct input to any linguistic theorizing.

But what if horizontal nexus is really fragmented in this way and the picture above is not just an illustration of an analogy, but a representation of how speakers build complex syntactic representations which then need to be linearized. We could extend the modest tree in (11) previously with the idea,

following Sportiche (2006), that the relationship between quantificational elements such as *wh*-determiners which trigger movement of a nominal extended projection to Spec, CP is due to the fact that the Q position is in a privileged syntactic communication with the CP layer of the clause. If so, then the syntactic representation of an English sentence such as *Which linguists are up?* is actually more like the visualization in (15).



Sportiche (2006) has argued that lower subparts of nominal phrases merge lower in the verbal extended projection than larger projections in a way that tracks semantic relationships. One conjecture would be that the horizontal connections between layers are actually a design feature of syntactic representations, and that growth of the extended projection of different categories is systematically linked to the establishment and extension of horizontal linkages between categories. It might even be that the increase of complexity in one dimension is licensed and triggered by the increase in complexity of the other.

These kinds of representations raise important questions about linearization and force us to be explicit about what sorts of algorithms convert the multidimensional relational molecules of syntactic representation such as in (15) above to a regular and deterministic linearly expressible output.

On the other hand, suppose this hypothesis is correct, and syntactic representations really are as multidimensional as such a theory would suggest, would we ever invent or pursue such a theory if the only diagrams we could ever draw for ourselves were the flattened tree-theoretic graphs of LSLT or the AVM structures of LFG? Conversely, would the technical ability to represent and manipulate patterns in three dimensions liberate hypothesis construction and day to day descriptive linguistics in significant ways?

My own claim is that diagrams *matter*, and that they are important visualization techniques that help human minds to explore patterns and generalizations. In the worst case, the lack of a suitable diagram to represent a pattern can lead to that pattern never being noticed or communicable. My feeling is that the phrase structure tree theoretic graph has had the indirect effect of channeling our search for patterns in a particular direction and that patterns that are not intuitively representable in a tree structure are not part of the hypothesis space.<sup>9</sup>

<sup>9</sup>Miriam and I have been working recently with a researcher within graph theory and molecular chemistry to collaborate on a project that would expand the representational tools and conventions of the linguistic community to create a commonly understood representational language for natural languages that is flexible, multidimensional, and supported by technical drawing and analytical tools in a way that transcends both the limitations of any particular current toolbox but provides a common representation language for crosslinguistic and crossdisciplinary (bio-informatic) comparison. So far the community has not felt the need for such a project, and we have not managed to get it funded.

The main point of this short (and celebratory) article has been a deconstruction of the tree diagram and the general pursuit of cross-talk between frameworks and assumptions about what we mean when we represent syntactic information in this way. My own intuition is that hierarchical representations are qualitatively different from the representations of linear order imposed by sensorimotor systems, and further that syntactic implementations that build in a universal mapping between hierarchical or compositional relationships and sequencing are both descriptively and explanatorily inadequate. While the relationship between hierarchy and order is systematic *for a particular language*, and of necessity learnable, the relationship between the internal representations and their externalization is variable from language to language. This idea is one that is to a certain extent already built in to the LFG architecture from its very inception, but it has a rather more complicated relationship to Chomskian traditions of syntactic representation. Regardless of what the right answer is here with respect to how different framework constraints and assumptions should be stated to facilitate the most productive and fruitful discussions among syntacticians going forward, this article is also an implicit plea for multi-lingualism when it comes to implementational frameworks and assumptions, and for maintaining the kind of cross talk that our Stanford University cohort (class of '93) has continued to stand for.

## Acknowledgements

Miriam Butt and Tracy Holloway King were members of my cohort in graduate school at Stanford University. Without their friendship and collegiality over the years, I would not have had the opportunity to explore and maintain the multilingualism in theoretical formalisms that I believe is so necessary to understanding and progress. I contribute this article as a continuation of that implicit collaboration and as a celebration of their academic achievements over the years.

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# The tripartite distinction between grammar, cognition, and the world

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## 1 Introduction

In the course of their work, theoretical linguists are likely to encounter tricky examples, contradictory judgements, and gradient acceptability. There are many types and sources of linguistic data: grammatical descriptions (such as traditional grammars), written and spoken corpora, introspective judgements, psycholinguistic studies, neurolinguistic studies, etc. The data can be bewildering and frustrating.

This paper is intended to be a reminder that we do not need to account for all language-related information in our grammatical analyses and theories. Many generalizations that can be gleaned from linguistic data are not governed by grammatical principles. For example, suppose we learn that farmers talk about the weather more than stockbrokers do. This might not be irrelevant to a linguist. The frequency of use of vocabulary items relating to weather might have interesting consequences on pronunciation and processing that linguists may (or may not) want to study. However, our grammars do not need to explain *why* farmers talk about the weather a lot. It is simply not a grammatical question. Not all generalizations that we can learn from analyzing linguistic data are directly relevant to understanding language. Some generalizations simply follow from facts about the world. For example, farmers talk about the weather, presumably because it is relevant to them. Kids talk about toys more than grown-ups, presumably because kids care more about toys. We don't need to account for these observations grammatically.

Matters are further complicated by the fact that we only have access to facts about the world through our own understanding of the world. For example, suppose that a psycholinguistic study finds it is easier for participants to parse the sentence 'penguins fly' than 'penguins swim', even though penguins are much better swimmers than fliers. The explanation for the results of the psycholinguistic study might be that people conceptualize penguins as 'the kind of entities that fly', which influences our linguistic processing. This hypothetical case is intended to illustrate that people (who are language users and can serve as linguistic consultants) only have access to facts about the world through their cognitive construal of what the world is like.<sup>1</sup>

This paper is about the interplay between language, our cognitive construal of the world, and the actual world. These three are distinct from each other, but they nevertheless influence each other. The body of this paper explores this tripartite distinction with data sets that pertain to two intricate topics of linguistic importance. Section 2 is about linguistic arguments and core event participants. Section 3 is about animacy. Finally, section 4 offers some concluding remarks.

## 2 Linguistic arguments and conceptual core participants

The conceptualization of an event (e.g., *sleep*) involves entities that participate in the event (e.g., *someone who sleeps*). Those entities can be people, things, locations, manners, time spans, etc., and they will be referred to here as *event participants* (even though *participant* is a bit of an awkward term for entities that are not people). Some conceptual event participants are obligatory in order for the event to take

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<sup>1</sup>This point has been argued for years by, for example, Ray Jackendoff (e.g., Jackendoff 2002: ch. 10).

place. There is a strong tendency for such obligatory event participants to be linguistic arguments. In fact, Dowty (1982) proposes that entailed event participation is one of two criteria that distinguishes arguments from adjuncts.<sup>2</sup>

Consider examples (1)–(2):

- (1) Pat napped.
- (2) Sam quietly polished the chair in her workshop last night.

A napping event entails the presence of a single participant, someone who naps, and the verb *nap* thus takes one argument, which in (1) is *Pat*. A polishing event entails the presence of two participants, someone who polishes and something that is polished, and the verb *polish* takes two arguments. In (2), these arguments are *Sam* and *the chair*. The other phrases in (2) (*quietly, in her workshop, last night*) are adjuncts.<sup>3</sup>

Even though obligatory event participants often align with linguistic arguments, this is not always the case. The cognitive construal of obligatory event participants is not the same thing as the grammatical argument structure of verbs. One clear example of a mismatch between obligatory event participants and linguistic arguments is expletive subjects:

- (3) It is raining.
- (4) a. It seems that the party is over.  
b. The party seems to be over.

In (3) the pleonastic *it* is non-referential. A raining event arguably does not entail any participants, but the verb *rain* requires a subject syntactically. A raising-to-subject verb like *seem* entails only an event, which in (4) is *the party is over*. However, the syntax requires two arguments: a subject and a clausal complement. Using LFG terminology, the clausal complement can be a COMP (a closed complement, as in (4a)) or an XCOMP (an open complement, as in (4b)).

The expletive examples would quite standardly be analyzed as grammar-internal mismatches between semantics and syntax. For example, a common analysis of *seem* would be that it takes one semantic argument and two syntactic arguments. This raises the question of whether *all* cases of mismatches between entailed participants and arguments could, in fact, be analyzed as grammar-internal mapping mismatches. Sections 2.1–2.5 list several sets of examples that, I argue, involve mismatches between core conceptual participants and semantic arguments. Section 2.6 points out that there are some entailed core participants that pattern with linguistic adjuncts, not arguments, in terms of omission in discourse pro-drop languages. Section 2.7 offers some concluding remarks.

## 2.1 Prices

Dowty (1982) notes that his argumenthood criteria might need to be revised in light of certain examples. He highlights verbs like *buy* and *sell* as possible examples. The entailment criterion indicates that *buy*

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<sup>2</sup>Dowty's other criterion is *subcategorization*: arguments can only be added to verbs that subcategorize for them. Dowty intends for the subcategorization criterion to block superfluous arguments, while the entailment criterion ensures the inclusion of all arguments, with the caveat that arguments may be unmentioned but implicitly understood. The effects of the criteria can be compared to the effects of the LFG principles of Coherence for subcategorization and Completeness for entailment (see, e.g., Bresnan et al. 2016 and Butt & King 2015 for Completeness and Coherence). As far as I can tell, Dowty's subcategorization test can fulfill the role of Koenig et al.'s (2003) SPECIFICITY constraint, which limits linguistic arguments to participants that are entailed specifically by the individual verb. This rules out roles that are entailed by most (perhaps all) verbs: any activity or state must take place in a time or location, yet times and places are not typically arguments of the verb. This is because they are generally required in order for anything to happen, but they are not specifically subcategorized for by the verb.

<sup>3</sup>Adjuncts are phrases that contribute extra information that is not seen as integral (Barrie 2024). The argument-adjunct distinction is controversial, yet it is adopted in most (perhaps all) theoretical frameworks. For discussion and references, see, e.g., Somers (1984), Van Valin & LaPolla (1997), Hole (2015), Barbu (2020), and Toivonen (2021).

and *sell* are four-place predicates since those verbs require a buyer, a seller, something purchased and a sum of money. Dowty notes that this is “a somewhat suspicious result” (Dowty 1982: fn. 5).

Indeed, although some verbs (e.g., *cost*, *pay*) do take price phrases as arguments, prices are adjuncts and not arguments when they occur with the verbs *buy*, *sell*, and also *rent*, *lease*. For example, *for \$300* in (5) does not display typical argumenthood characteristics.

- (5) Seren bought a bike for \$300.

The price phrase in (5) patterns with adjuncts according to standard argumenthood diagnostics. For example, it can be *wh*-coordinated (6), and it can be left behind when the VP is preposed (7).<sup>4</sup>

- (6) When and at what price did Seren buy a bike?

- (7) Seren wanted to buy a bike for \$300, and buy a bike she did for \$300.

It should be noted here that syntactic argumenthood diagnostics need to be taken with a grain of salt. For example, even though the coordination of argument *wh*-phrases is restricted (e.g., \**What and to who(m) did Frank give?*), it is not subject to a complete ban. Non-obligatory arguments can often be coordinated with adjuncts (Larson 2013, Melchin & Toivonen 2018, a.o.). Furthermore, many argumenthood tests do not hold cross-linguistically, or they are only implicational, or they might involve unusual constructions where acceptability judgements vary.

However, price phrases clearly pattern with adjuncts in terms of omissibility. Like adjuncts, price phrases are optional. Argument phrases can of course also be omitted under certain circumstances (see Van Luven & Toivonen 2024 for discussion), but price phrases differ significantly from omissible arguments: psycholinguistic studies show that not only are prices optional, they are in fact almost never mentioned in sentence completion tasks for verbs like *buy*, *sell*, *rent*, etc. (Barbu 2015, Barbu & Toivonen 2016b).

Empirical evidence thus supports Dowty’s (1982) suggestion that verbs such as *buy* do not take price arguments even though prices are entailed participants in *buying* events. The verb *buy* entails a price: without a price, the event is no longer *buying*, it is instead a *taking* event. The price is therefore a core conceptual participant of buying events. However, the price phrase patterns linguistically with adjuncts, not arguments.

## 2.2 Instruments

Instrument phrases such as *with a thick brush* in (8) are similar to prices with respect to argumenthood.

- (8) Sara drew the portrait with a thick brush.

An instrument is required for a drawing event to take place: in order to draw, you need something to draw with. Other examples of verbs whose meanings entail instruments include *slice*, *cut* and *paint*. These instruments pattern linguistically with adjuncts: they can be *wh*-coordinated (9), they can be left behind when the VP is preposed (10), among other commonly assumed criteria.

- (9) Where and how did you cut the bread?/ Where and with what did you cut the bread?  
(I cut the bread with a borrowed knife in the kitchen.)

- (10) Monica wanted to cut the bread with a dull knife, and cut the bread she did with a dull knife.

Furthermore, like price phrases, instrument *with*-phrases are optional, and psycholinguistic studies show that they are consistently omitted in sentence completion tasks (Barbu 2015, 2020, Barbu & Toivonen 2016a,b).

Note that there is no ban on instrumental arguments in principle. In examples (11) and (12), *the rusty key* is an argument:

<sup>4</sup> An anonymous reviewer suggests that *for what price* might be a better wording. It seems that *at what price*, *for what price* and *for how much* are all possibilities here.

- (11) The rusty key opened the door.  
(12) Sara used the rusty key to open the door.

However, when instruments are expressed as *with*-PPs, they do not pattern with syntactic arguments.

Instruments have been extensively studied in the theoretical and psycholinguistic literature, and one point of contention has been the argumenthood status (see, e.g., Tutunjian & Boland 2008, Koenig et al. 2003, Rissman 2013, Rissman et al. 2015, Barbu & Toivonen 2016b, Barbu 2020, Russo 2021). One reason for the controversy is that there is a class of verbs whose meaning entails the presence of an instrument, yet the instrument phrases do not pattern with linguistic arguments. In other words, instruments are often core conceptual participants of events which are denoted by verbs that do not take instruments as arguments.

### 2.3 Verbs that entail more than three participants

Natural languages seem to limit the number of arguments of verbs to a low number. The maximum number of arguments is probably three, or four if we include causatives and applicatives. This limitation has been noted by numerous scholars; for example, Tesnière (1959), Hornstein & Nunes (2008), Kearns (2011), Marantz (2013). However, the meaning of a verb can entail more than three event participants. For example, *buy* and *sell* entail four participants: a buyer, a seller, something that is bought/sold, and a price (see Section 2.1 above).

The verb *lease* entails five event participants, as pointed out by Apresjan (1992: 117). Apresjan lists the following participants of *lease*: (1) he who leases, (2) that which is leased, (3) he from whom it is leased, (4) that in exchange for which it is leased (i.e. the pay), and (5) the period of time (for which it is leased). The period of time is conceptually necessary: if the transaction is not time-limited, then we are describing a selling event, not a leasing event. It is possible to find examples where all of these participants are expressed in the sentence, but they are not all linguistic arguments. Example (13) is retrieved from the *www*:<sup>5</sup>

- (13) The town of Hillsborough leased it to them for 99 years at \$1.00 a year.

The verbs *lease* and *rent* are ambiguous between a causative and non-causative reading. The causative reading takes three linguistic arguments, and the non-causative reading takes two linguistic arguments.

Other verbs whose meaning entails many participants are *dispatch*, *elope* and *expel*. The verb *dispatch*, for example, entails six participants according to Apresjan (1992: 140): a subject, an object, a point of arrival, a point of departure, a goal, and a time period. Not all of these are linguistic arguments.

The verbs provided here all serve to illustrate the same point: the number of possible arguments is restricted to three (or four), but the number of conceptual participants is not as strictly limited.

### 2.4 Classes of verbs with related meanings

Some groups of verbs share a basic meaning and entail the same number of event participants, yet they differ in argument structure. There is, for example, a long list of verbs that refer to the ingestion of food: *eat*, *devour*, *gobble*, *munch*, *nibble*, *dine*, etc. All of these verbs entail an eater and something that is eaten. However, they differ in how (and whether) these entailed participants are expressed linguistically. The verb *eat* is optionally transitive and *devour* is obligatorily transitive. For *gobble*, many speakers require a verbal particle *up/down* along with an object. The verbs *munch* and *nibble* take oblique arguments. Finally, *dine* seems to be intransitive in its basic use, with the food optionally mentioned as an *on* PP.

There is similarly a large number of verbs that refer to verbal expression: *say*, *talk*, *chat*, *jabber*, *discuss*, *tell*, *relay*, *utter*, *babble*, etc. These verbs display syntactic and semantic differences (see, e.g., Grimshaw 2015), but they all entail someone uttering something, something that is uttered, and (possibly)

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<sup>5</sup><https://www.orangehistorync.org/our-building>

a listener or companion. Crucially, however, these verbs differ in their linguistic argument structure. For example, *babble* takes one argument, *discuss* takes two arguments, and *tell* takes three arguments.

## 2.5 Applicatives

Sections 2.1–2.4 were concerned with entailed participants that are not linguistic arguments. This section turns to applicatives, where the opposite can occur: applied arguments are not necessarily conceptual core participants of the event.

Although applicatives often involve the promotion of an oblique argument to a direct object, they also sometimes promote non-arguments. This is possible in Rutooro, as shown by several of the examples in Isingoma (2021). One of the examples Isingoma provides is (14), where the time expression *emyaka ikumi* is an applied argument, licensed by the applicative morphology:

- (14) Jeeni a-ka-som-er-a                      Orufaransa emyaka ikumi.  
 Jane 3SG-PAST-study-APPL-FV French      years      ten  
 ‘Jane studied French for ten years.’

The meaning of *-som-* ‘study’ does not entail a time expression as a core participant.

Consider next the Mountain Balinese example (15), from Udayana (2014):

- (15) I      Dora ngadep-ang okke umah.  
 ART name AV.sell-APPL 1      house  
 ‘I Dora sold the house for me.’

The English translation of (15) is ambiguous: the PP *for me* can mean that the action was done ‘for my benefit’ (e.g., in order to please me) or ‘in my stead’ (I was supposed to sell the house, but Dora did it instead). Udayana (2014) explains that the Mountain Balinese interpretation is that Dora is deputized to sell the house. This semantic role (in someone’s stead) is not an entailed core participant of *sell*. Arka (2014) provides further examples from a different variety of Balinese.

Languages without applicative morphology may have applicative-like constructions that promote non-arguments to arguments. Consider, for example, English benefactive NPs, illustrated by *the children* in (16):

- (16) Clara drew the children a nice picture.

Benefactives can be added as object arguments in English, provided that certain restrictions are satisfied (see Toivonen 2013 for discussion, examples and further references). For example, note that *the children* in (16) cannot have a deputizing reading, unlike *okke* in (15). The NP *the children* is a linguistic argument in (16), even though it is not an entailed participant of *draw*.

Another applicative-like construction involves so-called personal datives, illustrated in (17):<sup>6</sup>

- (17) I’m gonna write me a letter to the president.

The use of personal datives is restricted to certain geographical areas (very roughly, to the Southern parts of the United States). The construction signals a special involvement of the subject in the event (Bosse 2014). The construction is linguistically restricted by specific semantic and syntactic requirements (Hutchinson & Armstrong 2014, Wood & Zanuttini 2018). For example, the pronoun is co-referential with the subject even though it does not display reflexive morphology. Note that the construction adds an extra linguistic argument, but this argument does not refer to any additional conceptually necessary event participant.

<sup>6</sup>Example (17) is from Conroy (2007), who also lists additional examples. For further examples, see Hutchinson & Armstrong (2014), Bosse (2014), and Wood & Zanuttini (2018). A reviewer also suggests the following example from the song *Peaches* by The Presidents of the United States of America: *Movin’ to the country/ Gonna eat a lot of peaches/ Movin’ to the country/Gonna eat me a lot of peaches*.

The examples in this section all involve linguistic arguments that are introduced or licensed by applicative morphology or applicative-like constructions. Applied arguments may be promoted oblique arguments, but this is not the case in any of the examples here. The examples above from Rutooro, Mountain Balinese, and English involve linguistic arguments that do not correspond to core event participants associated with the meaning of the verb.

## 2.6 Discourse pro-drop

Some observations from so-called discourse (or ‘radical’) pro-drop provide further illustration that the mapping between entailed core participants and linguistic arguments is not one-to-one. In discourse pro-drop languages, arguments such as subjects and objects can be dropped even though no agreement morphology on the verb or other morphology provides information about the reference of the dropped arguments.<sup>7</sup> A Cantonese example from Matthews & Yip (2011: 97) serves as illustration:

- (18) a. Léih jūng-mh-jūngyi sihk Chiuhjāu choi a?  
you like-not-like eat Chiuchow food SFP  
‘Do you like Chiuchow food?’  
b. Gánghaih jūngyi lāi!  
of-course like SFP  
‘Yes, of course I do.’

The omission of arguments does not lead to confusion in the conversation, because pro-drop is only permitted when certain discourse requirements hold. For example, the referent must be accessible from context (see, e.g., Rosén 1998 for Vietnamese and Frascarelli & Casentini 2019 for Mandarin). Since the reference of the omitted pronoun is clear, I assume that it is represented in the semantics, even though it is not included in the overt syntax.

By contrast, there are no discourse requirements that restrict the omission of adjuncts. Adjunct phrases are easily omitted, and *included* only when they are relevant to the question under discussion (Brunetti et al. 2021, Van Loven & Toivonen 2024).

Sections 2.1 and 2.2 pointed out that instruments and prices are entailed core participants of certain verbs (e.g., *cut* for instrument, *buy* for price), even though they are not linguistic arguments. These non-argument core participants pattern with *adjuncts* not *arguments* in radical pro-drop languages: they are freely omitted. No particular context is required for them to be omitted. Even if the price is not accessible from the context, you can say the equivalent of ‘I bought a car’ without mentioning the price.

Pro-dropped arguments are represented in the semantic module of the grammar, but unexpressed adjuncts are not (at least not routinely) represented in the semantics, even when they are conceptually core event participants. Table 1 makes explicit at what levels the different types of participants are present. For concreteness, I use the LFG terms s-structure (s-s) and c-structure (c-s), which refer to semantic structure and constituent structure, respectively. The conceptualization of what is a core participant in an event is extra-grammatical. S-s and c-s are grammatical levels. LFG avoids the use of empty categories in the phrase structure: if something is present at c-s, it is overtly expressed. Overt adjuncts will of course be represented at s-structure and c-structure, just not as arguments. Covert adjuncts are not represented linguistically at all, even when they are conceptually entailed event participants.

In sum, discourse pro-drop languages place certain discourse restrictions on the omission of arguments and inclusion of adjuncts. Some phrases that denote core event participants (prices, instruments, etc.) pattern with adjuncts and not arguments in terms of these discourse restrictions on omissibility. This is not surprising on a view where participants that are conceptually core to the event are not necessarily

<sup>7</sup>The rich literature on radical pro-drop has debated whether the phenomenon is best analyzed as true pro-drop (implying null pronouns), argument ellipsis or VP-ellipsis. This literature has revealed differences between types of radical argument omission, both language-internally and cross-linguistically. This research will not be reviewed here, but see the recent work by Ke (2025) for Mandarin, Mizuno (2025) for Japanese, as well as Simpson & Ngo (2022) and the classic work by Rosén (1998) for Vietnamese.

|                                    | CORE<br>PARTICIPANT | S-S<br>ARGUMENT | S-S<br>MODIFIER | C-S<br>PRESENT |
|------------------------------------|---------------------|-----------------|-----------------|----------------|
| <i>overt subject</i>               | yes                 | yes             | no              | yes            |
| <i>pro-dropped subject</i>         | yes                 | yes             | no              | no             |
| <i>overt entailed adjunct</i>      | yes                 | no              | yes             | yes            |
| <i>silent entailed adjunct</i>     | yes                 | no              | no              | no             |
| <i>overt non-entailed adjunct</i>  | no                  | no              | yes             | yes            |
| <i>silent non-entailed adjunct</i> | no                  | no              | no              | no             |

Table 1: Representation of overt and covert arguments and adjuncts

linguistic arguments. However, it would be surprising on a view where there is necessarily a one-to-one mapping between entailed participants and linguistic arguments.

## 2.7 Interim summary and comments

Thinking about events that verbs refer to involves conceptualizing what and who needs to be present in order for the event (or state) to be possible. These necessary participants often align exactly with the linguistic arguments of the verb. However, there can also be mismatches between entailed event participants and linguistic arguments, and several such mismatches have been reviewed in this section. Mismatches between core conceptual event participants and linguistic (grammatical) arguments illustrate that our linguistic knowledge, our grammar, does not directly reflect our cognitive construal of the world. This point is supported by recent experimental evidence: Ünal et al. (2024) investigate agents, patients, goals and instruments in linguistic and non-linguistic cognitive tasks. They conclude that even though linguistic participants largely mirror conceptual event participants, the mapping is not strict.

There is of course also a distinction between our conceptual construal of events and actual events that take place in the world (Levin & Rappaport Hovav 2005: 19–20, and others). Our idealized conceptualization of an event that reflects the meaning of the verb *buy* can be quite different from an actual buying event. In an actual buying event, it might be difficult to pinpoint who the buyer and seller are. There might be deception involved. The event may involve a third party who sets up a complicated payment plan. The buyer and seller may carry different beliefs about what is being bought. Any given buying event might in fact include crucial and necessary factors that have little to do with the core meaning of the verb. There might be crucial reasons for the purchase, the purchase might happen by mistake, and the intended recipient might be different from the buyer. Actual events that take place in the world are often messy.

In short, verbs are associated with argument structures in our grammars. Our conceptualization of events includes entailed event participants. Actual events that take place in the world involve concrete and abstract entities like people, things, time spans, motives, etc. Even though it is possible to think about (and model) systematic mappings between linguistic arguments, conceptualized event participants, and actual participants in real events, the mappings are not always direct or one-to-one. There are mismatches between language, our cognitive construal of the world, and events that actually take place in the world.

## 3 Animacy

This section continues to explore mismatches between grammar, cognitive construal, and the world, but the empirical focus is redirected from argumenthood to the concept of *animacy*.

Many languages include ANIMACY as a grammatical feature, comparable to other grammatical features such as NUMBER or TENSE. As such, animacy is part of speakers' formal, unconscious knowledge of language, where it plays a mechanical role. If sentences are manipulated in ways that involve the grammatical/morphological markers sensitive to animacy, speakers will be able to provide judgements

about which strings are grammatical and which ones are not, but they might not be able to tell you exactly why.

The Inari Saami verbal agreement system provides an example of a grammatical pattern where animacy plays a role. Verbs in Inari Saami agree with the subject in three persons and three numbers: singular, dual and plural (Toivonen 2007, Morottaja & Olthuis 2022: ch. 2.2). However, when the subject is inanimate, the verb only inflects for two numbers, singular and plural. When the subject refers to two inanimate entities, the verb is plural, not dual (see Toivonen 2007 for details). This contrast between animates and inanimates is illustrated in (19)–(20):

- (19) Kyeh'ti almaa láin meecist.  
two man be.PST.3DU forest.LOC  
'Two men were in the forest.'
- (20) Kyeh'ti stuorra keeđgi láá meecist.  
two big rock be.PRES.3PL forest.LOC  
'Two big rocks are in the forest.'

The animate subject in (19) triggers dual agreement on the verb, but the inanimate subject in (20) does not. Both subjects refer to two entities.

It is worth noting here that the grammatical animacy effects comparable to what is observed in Inari Saami are very common cross-linguistically. A few other examples of grammatical animacy are provided in sections 3.1–3.2 below, and further examples include agreement marking in Turkish (Bamyacı et al. 2014), number marking on nouns in Tamil (Baskar & Toivonen 2025), ergative/dative case marking (Butt 2006), and the case marking of objects in Spanish (Fábregas 2013: a.o.), Romanian (Barbu & Toivonen 2018), and Hindi/Urdu (Butt 1993).

What exactly does animacy actually mean? What ontological characteristics determine whether or not an entity is animate? A foundational difference between animate and inanimate entities is that animates are *alive* and inanimates are not. However, it turns out not to be all that easy to determine exactly what it means to be alive, to have life. This is a point of debate within and across the fields of biology, chemistry, and philosophy (Fantini et al. 2024, Nurse 2020: and others). One recent characterization of life is provided by Gómez Márquez (2021):

- (21) "In my opinion, living organisms share seven traits: organic nature, high degree of organization, pre-programming, interaction (or collaboration), adaptation, reproduction and evolution, the last two being facultative as they are not present in all living beings."  
(Gómez Márquez 2021)

Based on this definition, Gómez Márquez concludes that viruses are alive, although this conclusion is controversial even among biologists. In grammatical animacy, viruses typically group with inanimates.

Grammatical animacy is not unrelated to biological life and the two concepts often align. However, there are also many mismatches; viruses were mentioned above, but also spores and cells. Plants constitute what is perhaps a more obvious example: plants are clearly biologically living creatures, but they are only rarely classified as animates grammatically. For example, plants pattern grammatically with inanimates in Inari Saami.

A key difference between biological and grammatical animacy is that the biological distinction between alive and not alive is universal in the sense that whatever the distinction is, it will hold everywhere. By contrast, the details regarding where to draw the line between grammatically animate and inanimate are not universal, and languages differ in their animacy classification. Languages differ with respect to many details regarding animacy, but at a general level, they differ in terms of where on the *animacy hierarchy* (22) the dividing line is drawn:<sup>8</sup>

<sup>8</sup>Many formulations of the animacy hierarchy are less or more detailed. See Silverstein (1976) for an early presentation of the animacy hierarchy, and for more detail and further references, see, e.g., Yamamoto (1999: ch. 1).

## (22) HUMAN &gt; HIGHER ANIMALS &gt; LOWER ANIMALS &gt; PLANTS &gt; THINGS

Many grammars group humans and animals together as one group ('animate') and plants and inanimate objects as a different group ('inanimate'). Other grammars draw the dividing line between humans and all other entities. These are the two most common broad splits that are found cross-linguistically; see Yamamoto (1999) and Santazilia (2023) for many examples and extensive discussion.

It is clear from the hierarchy in (22) that alive/not alive cannot possibly be the only trait that is relevant for animacy distinctions. A number of other properties have been argued to be relevant as well (Yamamoto 1999, Becker 2014, Jozwik et al. 2022: a.o.). A list of the main animacy properties is provided in Table 2 below:

|                              |                                                       |
|------------------------------|-------------------------------------------------------|
| <i>life</i>                  | organic nature, reproduction, etc. (see (21) above)   |
| <i>agency</i>                | the ability to deliberately perform actions           |
| <i>perception</i>            | the ability to perceive (see, taste, etc.)            |
| <i>sentience</i>             | the ability to sense pain, pressure, etc.             |
| <i>emotions</i>              | the ability to feel joy, sadness, etc.                |
| <i>language</i>              | the ability to understand and produce language        |
| <i>intelligence</i>          | the ability to solve problems, reason, use creativity |
| <i>self-propelled motion</i> | the ability to instigate and maintain self-motion     |
| <i>sound</i>                 | the emission of animate sound                         |
| <i>shape</i>                 | the appearance of animate shape                       |
| <i>face</i>                  | the appearance of facial features                     |

Table 2: Animacy properties

Multiple studies in psychology and neuroscience have shown that humans show sensitivity to several of the properties in Table 2, often from a very young age (for examples of recent work see Hofrichter et al. 2021, Torabian & Grossman 2023, Félix et al. 2024). It is not clear which ones of these properties are especially important for grammatical animacy. My guess is that attention to different properties might lead to different splits in the hierarchy. For example, a focus on language might lead to a split between humans and others, while a focus on self-propelled motion might lead to a split between animates (humans and animals) and inanimates (plants and things).

Note that a speaker cannot definitively know whether other entities in the world actually have the characteristics in Table 2. It is, for instance, notoriously difficult to know whether others are *sentient* (Harnad 2016, Candiotti 2025). Many questions about sentience in organisms other than humans remain unanswered even among experts. For example, there is an on-going debate regarding whether and how insects (Gibbons et al. 2022) and even plants (Calvo et al. 2017, Nick 2021) are sentient and feel pain.

Since experts in the relevant scientific fields cannot conclusively determine which entities or species possess the kinds of characteristics listed in Table 2, naïve speakers cannot know either. Does a turtle have true agency or does it simply act on instinct? Do bunnies feel longing? Does a sunflower's tracking of the sun count as self-propelled motion? Speakers do not have direct access to factual answers to such questions, yet they are able to effortlessly and automatically classify entities into animacy groups. This classification does not depend directly on actual facts about the world, but rather on speakers' *conceptualization* of entities in the world. The animacy classification of entities is thus only indirectly based on actual properties of those entities. What is encoded is instead the speakers' conceptualization of those entities and speakers' general construal of the world.

I will adopt the assumption that a noun can be inherently specified for grammatical animacy, and that specification may contradict both the conceptual animacy and biological animacy of the referent of that noun (some mismatched examples are provided in Section 3.1). However, nouns are typically specified for grammatical animacy features according to how their referents are conceptualized in relation to one or more of the properties in Table 2. The speaker does not need to hear new nouns in a grammatical context in order to learn their animacy characteristics (unlike grammatical gender on inanimate nouns).

If an entity is conceptualized as animate, the noun referring to that entity will carry (or trigger) animate morphology. In the discussion below, grammatical animacy will be formalized with features, so one way to think about it is that the speaker assigns a feature such as [ANIMATE +] to the relevant noun according to the perceived animacy of the referent. This can be done online if the speaker encounters a novel referent described by a novel noun. In other words, I assume that a speaker can instantly evaluate the animacy of a previously unfamiliar entity, and this determines the corresponding noun's grammatical animacy, unless contradictory information is provided through morphology. This can be compared to how speakers may determine the gender of a person (or animal) based on some conceptualization about the referent's biological sex.

Although very little hinges on it here, I further adopt the assumption that grammatical animacy is binary. Even though the cut-off point in the hierarchy occurs in different places in different languages (and sometimes in different grammatical phenomena in the same language, Baskar & Toivonen 2025), the distinction is always binary. Conceptual animacy, however, is more fuzzy and gradient. This categorical/gradient difference between grammatical and conceptual animacy is argued for at length by de Hoop & de Swart (2018).

The remainder of this section considers linguistic data sets that reflect animacy in different ways. Section 3.1 considers the role of animacy in Persian agreement marking on verbs and plural marking on nouns. Section 3.2 discusses the cross-linguistic tendency for subjects to be higher in animacy than objects. Section 3.3 presents newly collected data on the influence of animacy on judgements about the English pronouns *she* and *it*. Finally, section 3.4 offers a brief summary of the main points.

### 3.1 Persian agreement and number marking

In Standard Persian (Farsi), verbs generally agree in number with *animate* plural subjects but not with *inanimate* plural subjects. This is illustrated in examples (23)–(24), adapted from Lotfi (2006: 126):

- (23) mard-ha umad-an xune.  
man-PL come-PAST.PL home  
'The men came home.'
- (24) ketab-ha bad forush raft.  
book-PL bad sale go.PAST.SG  
'The books sold badly.'

Several Persian grammars (Rosen 1898: 65, Mahootian 1997: 65) note that the verb can sometimes agree even with inanimate subjects. In fact, it seems that agreement with inanimate plural subjects is quite common in modern Persian. The optionality has been investigated by Lotfi (2006), Sedighi (2006), Hashabeiky (2007), and Feizmohammadpour (2013), and is illustrated in (25)–(26), adapted from Sedighi (2006):

- (25) toofan-ha-ye peyapey dehkæde ra viran kærd.  
storm-PL-of constant village ACC destroyed did.3SG  
'Constant storms destroyed the village.'
- (26) toofan-ha-ye peyapey dehkæde ra viran kærd-and.  
storm-PL-of constant village ACC destroyed did-3PL  
'Constant storms destroyed the village.'

Lotfi (2006) shows that plural agreement signals "a distributive conceptualization where the entities are individuated". The generalization is thus that plural agreement signals that the subject is plural and animate *or* distributive/individuated. The generalizations are captured by adopting the agreement features in (27) for singular verbs and (28) for plural verbs:

- (27)  $\emptyset$  ( $\uparrow$  SUBJ PERS) = 3  
 (28) *-an(d)* ( $\uparrow$  SUBJ PERS) = 3  
           ( $\uparrow$  SUBJ NUM) = PL  
           { ( $\uparrow$  SUBJ ANIMATE) = + | ( $\uparrow$  SUBJ DISTRIBUTIVE) = + }

The agreement specification characterized in (27) is ‘unmarked’ phonologically and only marked for PERSON syntactically. It is not associated with any specific phonological form, and it is not specified for number. Even though it is regularly glossed as singular, it is compatible with both singular and plural subjects.

The suffix *-an(d)* in (28) is only compatible with plural subjects. The specification

$$\{ (\uparrow \text{SUBJ ANIMATE}) = + \mid (\uparrow \text{SUBJ DISTRIBUTIVE}) = + \}$$

ensures that the subject must be animate or distributive or both (the disjunction is inclusive). I am assuming some version of morphological blocking, whereby (28) must be used if it can be used, and (27) is the elsewhere case.

Sample lexical entries for verbs bearing these agreement features are given in (29)–(30):

- (29) *umad* ( $\uparrow$  PRED) = ‘arrive’  
           ( $\uparrow$  TENSE) = PAST  
           ( $\uparrow$  SUBJ PERS) = 3  
 (30) *umadan* ( $\uparrow$  PRED) = ‘arrive’  
           ( $\uparrow$  TENSE) = PAST  
           ( $\uparrow$  SUBJ PERS) = 3  
           ( $\uparrow$  SUBJ NUM) = PL  
           { ( $\uparrow$  SUBJ ANIMATE) = + | ( $\uparrow$  SUBJ DISTRIBUTIVE) = + }

Recall that nouns get assigned the grammatical feature [ANIMATE +] or [ANIMATE –] depending on whether the referent is conceptualized as animate or not. The possibility of *personification*, where inanimate entities are talked about as if they are animate, indicates that animacy can be processed online in real time, which is reflected in grammatical animacy: personified biologically inanimate subjects take plural agreement in modern Persian, but also in the classical language, where plural agreement with inanimates was more unusual (Feizmohammadpour 2013, Hashabeiky 2007, Lotfi 2006). This is illustrated by the example in (31), from the 13th century poet Jalal al-Din Muhammad Rumi’s *Fih-e Ma Fih*:<sup>9</sup>

- (31) *Sefat-e to ashegh-e hagh-and.*  
       attributes-of you lover-of truth.be.PRES-PL  
       ‘Your attributes are lovers of the truth.’

Personified subjects are conceptualized as if they are animate, and this is reflected in the grammar, as evidenced by the plural agreement triggered by personified subjects.

The examples above are concerned with morphological marking on verbs. Animacy is also relevant for nominal morphology in Persian. Nouns that refer to more than one individual/thing often carry plural morphology. The most common plural morpheme on nouns is *-(h)a*. However, there is also another, more formal, plural morpheme *-an*. As a general rule, *-an* can occur on animate nouns, but not inanimate nouns. For example, there are two plural forms for ‘man’, *mard-ha* and *mard-an*, but there is only one plural form for ‘pain’, *dard-ha*. The form *\*dard-an* is not acceptable. There are some arbitrary exceptions to this animacy-governed rule, and a few inanimate nouns can take the *-an* ending. The exceptions include *derakhtan* ‘trees’, *fereštegan* ‘angels’, *setaregan* ‘stars’, and *nilufæran* ‘water lilies’ (Hamedani 2011: 19–20).

I propose that *-an* has a grammatical [ANIMATE +] feature, which allows it to combine with animate nouns. Exceptions such as *derakhtan* are listed fully inflected in the lexicon and can be used alongside the

<sup>9</sup>The glosses and translations in (31) are from Lotfi (2006), who also provides other personification examples.



| Animacy       | Subject Manipulation       | Object Manipulation                 |
|---------------|----------------------------|-------------------------------------|
| HUMAN         | The teacher felt happy.    | The changes confused the uncle.     |
| HIGHER ANIMAL | The dog felt happy.        | The changes confused the moose.     |
| LOWER ANIMAL  | The spider felt happy.     | The changes confused the fly.       |
| PLANT         | The maple tree felt happy. | The changes confused the pine tree. |
| THING         | The pen felt happy.        | The changes confused the stick.     |

Table 3: Sample Items from Agyemang et al. (2024)

at least by the ‘alive’ definition (but see Table 2). On the present analysis, *derakhtan* and *nilufæran* are grammatically and biologically animate, but conceptually inanimate.

### 3.2 Animacy and grammatical functions

Consider the examples in (35)–(36):

(35) That accountant danced the night away.

(36) #That brick danced the night away.

Example (35) sounds completely natural, but (36) does not. This is not a grammatical effect; both sentences are perfectly grammatical in English. Sentence (36) sounds odd because of what we know about bricks: a brick is an inanimate object that does not and cannot dance. The contrast between (35) and (36) is due to our knowledge and conceptualization of the world, not grammar.

As is characteristic for conceptual animacy, judgements about what sorts of participants are appropriate subjects or objects of specific predicates are gradient, not categorical. In fact, in cases where a verb ideally takes a human argument, the judgements follow the cline of the animacy hierarchy quite neatly. Agyemang et al. (2024) elicited judgements about sentences with predicates whose prototypical subjects or objects have human referents. The stimulus sentences included subjects and objects with referents that spanned the animacy hierarchy: humans, higher animals, lower animals, plants and inanimate objects. Table 3 contains two of the stimulus sets as examples.<sup>11</sup>

The stimuli were divided over two surveys so that the same participants would not see too many near-identical sentences. 148 native speakers of English were included in the analysis. The naturalness ratings followed the cline of the animacy hierarchy: The median ratings for the stimuli were 7 for humans, 5 for higher animals, 4 for lower animals, 2 for plants, and 1 for inanimate things. This is not a grammatical effect. The effect instead reflects the participants’ conceptualization of events and event participants. When the ideal participant is a human agent or experiencer, the naturalness of the interpretation decreases as the level of animacy of the participant decreases.

Agyemang et al.’s study illustrates the conceptualization of participants and their animacy in individual events. The animacy of participants is also reflected in grammatical tendencies. Agents are animate and commonly subjects (Jackendoff 1972: 32). Humans are ideal agents, so it follows that subjects are often human. Themes and patients, on the other hand, are commonly inanimate and expressed as direct objects. As a result, grammatical subjects are often higher in animacy than objects. These trends have been commonly noted in the literature (e.g., Silverstein 1976, King 1995, Aissen 1997, 1999), and the prevalence of animate subjects and inanimate objects is demonstrated directly in corpora of Swedish (Dahl & Fraurud 1996, Dahl 2000, 2008), Norwegian (Øvrelid 2004), Dutch (Bouma 2008), Tondano

<sup>11</sup> The study additionally contained the following two sets of stimuli:

- (i) *The {passenger/horse/bear/bee/rose/rock} planned the next step.*
- (ii) *The events embarrassed the {violinist/bear/moth/dandelion/road}.*

The exact instructions were: *Please rate each sentence according to how natural it sounds. Rank the sentences on a scale from 1 to 7, where 1 means ‘This does not sound like a natural sentence’ and 7 means ‘This sounds like a completely natural sentence’. There are no correct or incorrect answers, we are simply interested in your intuitions.*

(Brickell & Schnell 2017), as well as in the Multi-CAST cross-linguistic corpus (Haig et al. 2021). These trends follow at least partially from the extra-linguistic tendency to conceptualize events as animate agents acting on inanimate patients (see, e.g., Brocard et al. 2024). In the languages listed above, this is a statistical tendency and not a grammatical rule. Examples such as (37) are perfectly grammatical, just not very common:

(37) The disease destroyed the entire herd of pigs on the farm.

The statistical tendency that favors animate agents is grammaticalized in some languages, as pointed out by Dahl (2008) and others. Navajo (Athabaskan) requires the subject to be at least as animate as the object (Hale 1973), and Mam (Mayan) does too (Minkoff 2000). Blackfoot (Algonquian), Halkomelem (Salishan), and several Mayan languages (e.g., Jakalteq) disallow inanimate subjects in transitive clauses (Craig 1977, Aissen 2003, Deal & Royer 2025). The Blackfoot example in (38) violates the animacy expectation and is therefore ungrammatical (Frantz 2017: 49):

(38) \*Oma istoána ikahksínima annistsi ikkstsíksiistsi.  
that knife cut those branches  
'That knife cut off those branches.'

Frantz (2017: 48) notes that "[i]n general, the subject of a transitive verb in Blackfoot is presupposed to be capable of exercising will." Inanimates are not capable of exercising will, which explains why (38) (with the inanimate subject *knife*) is not acceptable. Blackfoot is thus an example of a language that has grammaticalized the statistical preference for animate subjects.

The animacy preferences in grammatical functions interact in interesting ways with word order preferences, and can perhaps ultimately form part of the explanation for why word orders where subjects (which are often agents) precede objects (which are often patients) are by far the most common in the world's languages (see, e.g., Tomlin 1986, Primus 1999). In their discussion of a production and eye tracking study of Murrinpatha, Nordlinger et al. (2022: 212) make the following suggestion:

"Encoding agents early in sentence production is crucial, since lower arguments are defined with respect to their relationship to the agent; thus this effect suggests that agent prominence may represent a universal property of event conceptualization and could explain why, in free word order languages like Murrinpatha, speakers produce proportionally more A-initial sentences."

In other words, the agent-first preference can shine through even when this preference is not dictated by the grammar. This point is also made by Riesberg et al. (2019), who base their discussion on Austronesian symmetrical voice languages.

Languages differ in how they grammaticalize constraints on grammatical functions (e.g., must the subject be animate?) and also the linguistic expression of grammatical functions (e.g., word order, agreement marking). These constraints and expressions vary drastically cross-linguistically, but certain trends can be clearly observed. For example, subjects tend to precede objects, subjects tend to be higher in animacy than objects, and animate objects are more likely to receive special morphological marking than inanimate objects. At least some of these trends can be explained by how speakers conceptualize events and event participants. In order to understand these phenomena, it is important to separate speakers' knowledge of grammar from their cognitive construal of the world which influences how they process and use language.

### 3.3 English pronouns

Multiple studies have detected small but noticeable animacy effects in different corners of the English grammar. For example, Rosenbach (2008) and others have shown in studies on genitive formation that animates are preferred in the Saxon genitive (*'s*) and inanimates are preferred in *of*-genitives, but several

|           |                                                                                                                                                   |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| HUMAN     | I noticed a <b>teacher</b> . <b>She</b> was tall.<br>I noticed a <b>teacher</b> . <b>It</b> was tall.                                             |
| ANIMAL    | This <b>horse</b> smells strange because <b>she</b> is covered in mud.                                                                            |
| HIGH      | This <b>horse</b> smells strange because <b>it</b> is covered in mud.                                                                             |
| ANIMAL    | The <b>caterpillar</b> was wet. <b>She</b> must have been out in the rain.                                                                        |
| LOW       | The <b>caterpillar</b> was wet. <b>It</b> must have been out in the rain.                                                                         |
| PLANT     | The <b>pine tree</b> was old. <b>She</b> was older than the others.<br>The <b>pine tree</b> was old. <b>It</b> was older than the others.         |
| INANIMATE | The <b>cake</b> is on the counter. <b>She</b> is fresh out of the oven.<br>The <b>cake</b> is on the counter. <b>It</b> is fresh out of the oven. |

Table 4: The *it/she* pronoun study: Sample stimulus items

other factors are also relevant for the choice of genitive form. Animacy has similarly been identified as one of several factors that influence relative clause formation, auxiliary contraction, and copula contraction and deletion (McLaughlin 2014). However, compared to languages such as Persian, Mam, and Inari Saami, English does not incorporate animacy as a prominent factor in its grammar.

The most obvious grammatical animacy effect in English grammar is found in the pronominal system. Third person singular personal pronouns make a distinction between the animate (mainly human) forms *he/she* and the inanimate form *it*. Similarly, the interrogative pronoun *who* is animate (human) and *what* is inanimate.

The remainder of this section is devoted to a questionnaire study that investigated the effect of animacy on third person singular pronoun choice in English.<sup>12</sup> For the sake of simplicity, only two pronouns were included, *it* and *she*. We did not test *he* or the gender-neutral *they*. The pronoun *she* is used for female humans and also for some female animals. At least some speakers can also use *she* as an alternative to *he* and *they* to refer to a human of unspecified gender (*anyone has the right to leave whenever she wants*). The pronoun *she* is only very occasionally used for things (e.g., ships) in standard dialects, although there is dialectal variation in whether *he* and *she* can be used for inanimates (Pawley 2002, Wagner 2005). The pronoun *it* is used for things, plants, and animals. When an animal is specified as female, either *she* or *it* can be used. The use of *it* for humans is rare, and would typically be intended and interpreted as an insult.<sup>13</sup>

In the questionnaire study, participants were asked to provide naturalness judgements on passages such as the ones in Table 4. The study included 40 stimulus items: 4 items per animacy level (5 levels)<sup>14</sup> and one version of each stimulus item per pronoun (*she* or *it*). The stimuli were divided into two separate surveys so that no participant would see both members of a minimal pair. As a consequence of this design, each participant saw 60 items (20 stimulus items and 40 fillers). 474 participants were recruited through the SONA system of Carleton University's Cognitive Science Department. Participants that did not complete the survey or were not self-reported native speakers of English were excluded. The analysis presented here includes the responses of the remaining 310 participants. The participants were asked to rate how natural the stimuli sounded on a scale from 1 to 7, where 1 was 'completely unnatural' and 7 was 'completely natural'.

Based on the description of possible referents for *it* and *she* provided above, the ratings of the two pronouns were predicted to be inverted images of each other. The pronoun *it* was expected to sound unproblematic with animals, plants and things, but odd with human referents. The pronoun *she* was

<sup>12</sup>The data were collected with the help of Sebastien Lylyk, and ethics approval was granted by the Carleton University Research Ethics Board.

<sup>13</sup>This description of *she* and *it* is based on conversation with native speakers of English (mostly Canadian English) and a consultation of the Merriam-Webster Dictionary (Merriam-Webster 2025). One speaker that was consulted reported that *it* is currently explored as an alternative to gender-neutral *they*, but this use is not (yet) common.

<sup>14</sup>In addition to what is shown in Table 4, the target nouns included in the study were *student*, *singer*, *server*, *dog*, *cat*, *cow*, *frog*, *worm*, *wasp*, *rose bush*, *orchid*, *tulip*, *mailbox*, *table*, and *ladder*.

|               | <u>she</u>  |        | <u>it</u>   |        |
|---------------|-------------|--------|-------------|--------|
|               | M (SD)      | Median | M (SD)      | Median |
| HUMAN         | 5.22 (1.67) | 6      | 2.12 (1.42) | 2      |
| HIGHER ANIMAL | 4.73 (1.82) | 5      | 4.93 (1.80) | 5      |
| LOWER ANIMAL  | 3.81 (1.91) | 4      | 4.99 (1.86) | 5      |
| PLANT         | 3.41 (1.76) | 3      | 5.63 (1.55) | 6      |
| THING         | 2.68 (1.66) | 2      | 5.67 (1.57) | 6      |

Table 5: Ratings in the *it/she* pronoun study

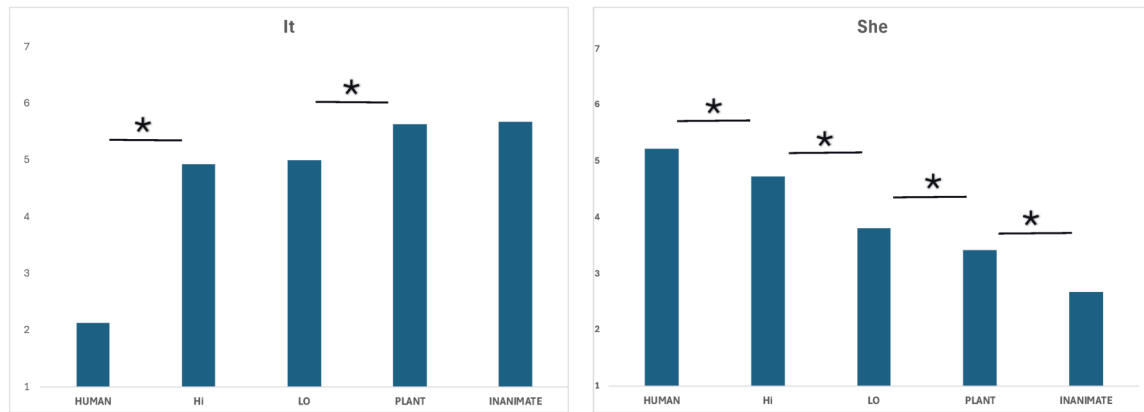


Figure 1: The *it/she* pronoun study: Mean ratings

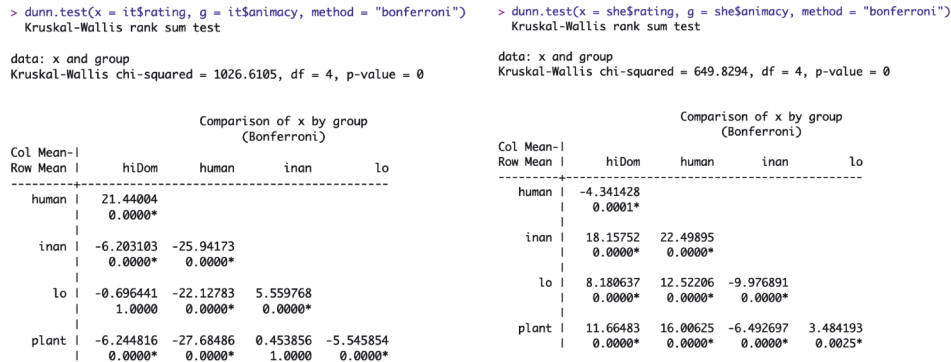


Figure 2: The *it/she* pronoun study: Dunn's tests for *it* (left) and *she* (right)

expected to be natural with humans (and possibly higher animals), but odd with lower animals and, especially, plants and things. The prediction was straightforward, except it was difficult to know how participants would react to *she* with (higher) animals.

A visual representation of the results is provided in Figure 1, and the mean and median ratings are presented in Table 5. Both means and medians are informative: the means are the basis for Figure 1 and they offer some nuanced detail. However, the medians straightforwardly show the main patterns in the data.

Separate Kruskal-Wallis tests were performed for *she* and *it*. Both tests indicated significant differences across the groups (*she*:  $\chi^2 = 649$ ,  $p < .001$ ; *it*:  $\chi^2 = 1026$ ,  $p < .001$ ). Dunn's tests were then used to allow for pair-wise comparisons. The analyses are shown in Figure 2.

The *it* ratings conform to the predictions. The participants gave low ratings to sentences where *it* referred to humans. All other animacy categories were judged to be good referents for *it*. Animals were

rated quite highly, but received lower ratings than plants and inanimate objects. The explanation for this might be that some speakers seem to feel uncomfortable referring to animals with *it*.<sup>15</sup> It is possible that some speakers have grammaticalized *it* as incompatible with animates in general, not just humans.

The *she* rating pattern is not an inverted image of the *it* pattern, contrary to predictions. Instead, the *she* ratings seem to follow the animacy hierarchy quite perfectly. The pronoun *she* is most compatible with nouns that refer to humans, followed by higher animals, then lower animals, then plants, and finally inanimate things, which are least compatible with *she*.

The difference between *she* and *it* ratings can be explained with personification, which was argued in Section 3.1 to be governed by the cognitive construal of animacy rather than grammatical animacy. The pronoun *it* is grammatically specified as [HUMAN –]. This grammatical specification is only very rarely violated in language use, but it might occur for example in insults. The pronoun *she* is grammatically specified as [HUMAN +]. However, personification allows *she* to refer back to entities that are not biologically human. Speakers readily construe animals, and even plants and things, as having characteristics that stereotypically belong to humans: agentivity, emotions, etc. Using the human pronoun *she* to refer to non-humans gives a reason to conceptualize the referent as having these human characteristics. This conceptualization gets gradually harder as we descend down the animacy hierarchy, as the *she* results of this study illustrate.

In sum, I propose that the contrast between the *it* and *she* results can be explained by the fact that the grammatical specifications are directly reflected in the *it* ratings, but when the pronoun is *she*, the grammar can to a certain extent be overridden by personification (the cognitive construal of non-human referents as human or humanlike). This offers a straightforward explanation of the main patterns in the data, and it is compatible with de Hoop & de Swart's (2018) claim that grammatical animacy distinctions are binary<sup>16</sup> and conceptual animacy distinctions are more gradient.

### 3.4 Summary

Animacy is reflected in language. However, it is not exactly clear what 'animacy' is. We cannot directly judge the existence or degree of animacy in others. We do not have a good understanding of which creatures in the world share properties in common with us. We do not know how or whether other animals experience feelings, make decisions, reason, or sense pain. Therefore, linguistic reflexes of animacy cannot directly reflect actual biological animacy as it manifests in entities in the world. Our construal of animacy can be detected as gradual trends and tendencies in our speech. These tendencies can be grammaticalized as categorical effects such as strict assignment of grammatical functions, pronoun choice, and morphology.

Grammatical animacy thus does not *directly* reflect the actual properties of other humans, animals, and things in the world. Our knowledge about the world around us is filtered by our perception and cognitive construal of it. Bayanati & Toivonen (2019) and Trompenaars et al. (2021) have previously pointed out that the three-way distinction between grammar, cognition, and biology is important for understanding animacy, and the difference between grammatical animacy and conceptual animacy has previously been discussed by Frawley (1992), Ormazabal & Romero (2007), McLaughlin (2014), and de Hoop & de Swart (2018). This section has added to that literature.

## 4 Concluding remarks

This paper has been concerned with the mapping between linguistic arguments and conceptual event participants (Section 2) and also the nature of the concept 'animacy' and its role in language (Section 3). I

<sup>15</sup>This claim is based solely on informal discussions with English speakers, in particular young speakers of Canadian English.

<sup>16</sup>It looks like the *it* ratings reflect a ternary distinction, but this might be because some speakers have grammaticalized *it* as [HUMAN –], not [ANIMATE –]. If this is the case, then this would explain why animals are rated slightly lower. The grammatical distinctions are still binary, but different participants have grammaticalized different cutoff points on the animacy hierarchy for *it*. This study was not designed to investigate this question, so it must remain a speculation at this point.

have tried to argue that details and generalizations emerging from the data sets can be naturally understood and analyzed if we recognize the following:

- (39) a. Not all linguistic patterns are governed by the grammar.
- b. There is a distinction between grammar and our cognitive construal of the world.
- c. We don't have access to direct facts about the world. We interpret and talk about real entities and events through the lens of our perception and construal of those entities and events.

This paper has focused on two topics: arguments/core participants and animacy. However, the points in (39) are relevant for other topics as well. The lack of direct mappings between grammar and extralinguistic phenomena has been stressed before, notably by Otto Jespersen (e.g., Jespersen 1924), and also others (e.g., Gehrke 2022, Corbett 2022, Carson 2018, Nenonen & Niemi 2010). TENSE marking has something to do with time. However, the mapping between time and tense is by no means predictable or direct. If it were, all grammatical tense systems would presumably look alike, and they do not. Furthermore, we only have access to time through our conceptualization of it. Grammatical EVIDENTIALITY markers denote *sources of information*, and choices of what evidentiality marking to use in different contexts are in part dictated by *reliability*. However, different languages divide their system of evidentiality marking in different ways, which indicates that evidentiality systems are not directly dictated by real-world classes of information. Also, how evidentiality is marked and what information is deemed reliable has more to do with our conceptualization of information rather than the information itself. Grammatical NUMBER is related to quantity, but not directly, and there are cross-linguistic differences with respect to how many numbers (SG, DU, ETC.) are grammatically marked, whether number is marked on all or only some nouns, etc. Grammatical GENDER is only loosely related to biological sex, which in turn is only loosely related to gender as a construct. Grammatical ASPECT is connected to the distinction between completed and on-going action, but the details are complicated. I suggest that some complications in these research areas will disappear if we keep in mind the tripartite distinction between grammar, cognition, and the world.

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For more than three decades, Miriam Butt and Tracy Holloway King have been among the most influential voices in Lexical Functional Grammar and the Parallel Grammar project. Their friendship and intellectual partnership began when they were graduate students at Stanford and continues to this day. Throughout their careers, Butt and King have pursued an approach to linguistics grounded in rigorous empirical research, formal precision, and computational implementation. Their

work has shown how theoretical insights and computational modeling can inform and strengthen one another, advancing both linguistic theory and practical applications, and inspiring linguists around the world.

This Festschrift brings together contributions from former teachers, classmates, colleagues, students, and friends, reflecting the breadth of their impact — from syntax, morphology, and information structure to grammar engineering, language technology, and cross-linguistic analysis. The volume celebrates their enduring friendship, distinguished careers, and significant contributions to the field.