LEXICAL-FUNCTIONAL SYNTAX

JOAN BRESNAN, ASH ASUDEH, IDA TOIVONEN AND STEPHEN WECHSLER

SECOND EDITION

WILEY Blackwell
Lexical-Functional Syntax
Blackwell Textbooks in Linguistics

The books included in this series provide comprehensive accounts of some of the most central and most rapidly developing areas of research in linguistics. Intended primarily for introductory and post-introductory students, they include exercises, discussion points and suggestions for further reading.

2. Andrew Spencer, *Morphological Theory*
3. Helen Goodluck, *Language Acquisition*
4. Ronald Wardhaugh and Janet M. Fuller, *An Introduction to Sociolinguistics* (Seventh Edition)
5. Martin Atkinson, *Children’s Syntax*
6. Diane Blakemore, *Understanding Utterances*
7. Michael Kenstowicz, *Phonology in Generative Grammar*
8. Deborah Schiffrin, *Approaches to Discourse*
12. Nigel Fabb, *Linguistics and Literature*
13. Irene Heim and Angelika Kratzer, *Semantics in Generative Grammar*
15. Stephen Crain and Diane Lillo-Martin, *An Introduction to Linguistic Theory and Language Acquisition*
23. Bruce Hayes, *Introductory Phonology*
24. Betty J. Birner, *Introduction to Pragmatics*
25. Ronald Wardhaugh and Janet M. Fuller, *An Introduction to Sociolinguistics*
## Contents

Preface to the First Edition xi  
Preface to the Second Edition xv  
Acknowledgments xvii  

I Motivation for the LFG Architecture 1  

1 Nonconfigurationality 3  
   Further reading 10  

2 Movement Paradoxes 11  
   2.1 Theoretical assumptions 15  
   Further reading and discussion 19  

3 Lexicality and Argument Structure 21  
   3.1 Two approaches to passive relation changes 21  
   3.2 The lexicality of relation changes 23  
      3.2.1 English passive verb forms 24  
      3.2.2 Adjectives versus verbs 24  
      3.2.3 Participle–adjective conversion 25  
      3.2.4 Passive participles convert to adjectives 25  
      3.2.5 Differences between adjectival and verbal passives explained 27  
      3.2.6 Differences between adjectival and verbal passives unexplained 28  
      3.2.7 Conclusion: passivization is lexical 32  
   3.3 Passivization with and without movement 32  
   Further reading and discussion 36  

II Formally Modeling the Architecture 39  

4 A Formal Model of Syntactic Structure 41  
   4.1 Design principles 41  
      4.1.1 Principle I: variability 41  
      4.1.2 Principle II: universality 42  
      4.1.3 Principle III: monotonicity 43
Contents

4.2 The definition of f-structures 44
4.3 The description of f-structures 46
4.4 The correspondence between c- and f-structures 48
4.5 The solution algorithm 54
Problems 58
4.6 Defining versus constraining equations 59
4.7 Completeness and coherence 62
Problems 63
4.8 Functional uncertainty 63
4.9 Sets of f-structures 70
4.10 Conclusion 71
Further reading 72

5 Monotonicity and Some of Its Consequences 73
5.1 Monotonicity 73
5.2 Relation changes and monotonicity 76
5.3 Information and form 79
  5.3.1 The fragmentability of language 79
  5.3.2 The nonconfigurationality of language 82
  5.3.3 Apparent information flow through external structure 83
  5.3.4 Noncompositionality 84
5.4 Conclusion 85

III Inflectional Morphology and Phrase Structure Variation 87

6 A Theory of Structure–Function Mappings 89
  6.1 Grammatical functions 94
    6.1.1 Basics of grammatical functions 94
    6.1.2 Classification of grammatical functions 100
  6.2 The organization of c-structure categories 101
    6.2.1 Endocentricity and X’ structures 101
    6.2.2 Endocentric mapping to f-structure 104
Problems 111
6.3 Exocentric categories 112
  6.3.1 Lexocentricity and S 112
  6.3.2 S and endocentricity 115
  6.3.3 Nonprojecting words 116
  6.3.4 Summary of the structure–function principles 117
6.4 Toward a typology 118
6.5 Effects of economy of expression 119
Further reading and discussion 124
Appendix: X’ theory 125
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Endocentricity and Heads</td>
<td>129</td>
</tr>
<tr>
<td>7.1</td>
<td>Head mobility</td>
<td>129</td>
</tr>
<tr>
<td>7.1.1</td>
<td>Verb order in Welsh</td>
<td>130</td>
</tr>
<tr>
<td>7.2</td>
<td>Endocentricity and extended heads</td>
<td>135</td>
</tr>
<tr>
<td>7.3</td>
<td>Distributed exponence</td>
<td>138</td>
</tr>
<tr>
<td>7.3.1</td>
<td>Wambaya c-structure</td>
<td>139</td>
</tr>
<tr>
<td>7.3.2</td>
<td>The Wambaya tense system</td>
<td>144</td>
</tr>
<tr>
<td>7.4</td>
<td>Conclusion</td>
<td>146</td>
</tr>
<tr>
<td>Problems</td>
<td></td>
<td>147</td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td>147</td>
</tr>
<tr>
<td>8</td>
<td>Pronoun Incorporation and Agreement</td>
<td>151</td>
</tr>
<tr>
<td>8.1</td>
<td>Chichewa</td>
<td>157</td>
</tr>
<tr>
<td>8.1.1</td>
<td>Word order</td>
<td>161</td>
</tr>
<tr>
<td>8.1.2</td>
<td>Independent pronouns</td>
<td>162</td>
</tr>
<tr>
<td>8.1.3</td>
<td>Contrastive focus</td>
<td>164</td>
</tr>
<tr>
<td>8.1.4</td>
<td>Interrogatives and relatives</td>
<td>165</td>
</tr>
<tr>
<td>8.1.5</td>
<td>Other syntactic and phonological differences</td>
<td>166</td>
</tr>
<tr>
<td>8.1.6</td>
<td>Functional ambiguity of subject and topic</td>
<td>167</td>
</tr>
<tr>
<td>8.2</td>
<td>Navajo</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>Exercise 1</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>Exercise 2</td>
<td>180</td>
</tr>
<tr>
<td>8.3</td>
<td>Plains Cree and inverse agreement</td>
<td>182</td>
</tr>
<tr>
<td></td>
<td>Exercise 3</td>
<td>185</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>186</td>
</tr>
<tr>
<td>8.4</td>
<td>Two types of agreement: INDEX and CONCORD</td>
<td>186</td>
</tr>
<tr>
<td></td>
<td>Exercise 4</td>
<td>192</td>
</tr>
<tr>
<td>8.5</td>
<td>Conclusion</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Further reading and discussion</td>
<td>193</td>
</tr>
<tr>
<td>9</td>
<td>Topicalization and Scrambling</td>
<td>196</td>
</tr>
<tr>
<td>9.1</td>
<td>English topicalization</td>
<td>196</td>
</tr>
<tr>
<td>9.2</td>
<td>Russian topicalization</td>
<td>199</td>
</tr>
<tr>
<td>9.3</td>
<td>Economy of expression</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>207</td>
</tr>
<tr>
<td>9.4</td>
<td>Topicalization versus scrambling</td>
<td>207</td>
</tr>
<tr>
<td>9.5</td>
<td>Detecting empty categories</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>223</td>
</tr>
<tr>
<td></td>
<td>Further reading and discussion</td>
<td>223</td>
</tr>
<tr>
<td></td>
<td>The crossover effect</td>
<td>223</td>
</tr>
<tr>
<td></td>
<td>Two types of null pronominals</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td>Generalization to operator complexes</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Other factors</td>
<td>226</td>
</tr>
</tbody>
</table>
IV On Functional Structures: Binding, Predication, and Control

10 Basic Binding Theory 229
   10.1 Basic concepts 229
   10.2 A toy binding theory 231
   10.3 Principle C 239
   Further reading and discussion 246
   10.4 Formalization of the binding constraints 247

11 Types of Bound Anaphors 254
   11.1 Dimensions of anaphoric binding 254
   11.2 Icelandic: subjective and anti-subjective pronouns 256
   11.3 Norwegian: subjective/nuclear pronouns 259
   11.4 Logophoricity versus subjectivity 261
   Further reading and discussion 273
   11.5 The typology of reflexives and the origins of nuclearity 275
   Further reading and discussion 283
   11.6 Formalization 284

12 Predication Relations 286
   12.1 Predicate complements versus adjuncts 286
   12.2 F-structures of XCOMPS 289
   Exercise 1 295
   Exercise 2 295
   12.3 F-structure of PP complements 295
   12.4 C-structure of predicate complements 301
   12.5 Raising 304
   Further reading and discussion 307

13 Anaphoric Control 309
   13.1 Gerundive versus participial VPs in English 309
   13.2 Structure of gerundive VPs 311
   13.3 Anaphoric control versus functional control 319
   13.4 Conclusion 323
   Problems 323
   Further reading and discussion 323

14 From Argument Structure to Functional Structure 324
   14.1 What is argument structure? 326
   14.2 The theory of a-structures 329
   14.3 Mapping a-structures to syntactic functions 333
   14.4 Examples and consequences 334
      14.4.1 Unaccusatives 334
      14.4.2 Resultatives 336
      14.4.3 “Fake” reflexives and “nonsubcategorized objects” 336
      14.4.4 Word order of internal/external arguments 337
Contents

14.4.5 Ditransitives 337
14.4.6 Interactions of passive and raising 340
14.4.7 Morphology that adds or suppresses a-structure roles 341

Problems 344
Further reading and discussion 344

Problem Sets and Solutions 349
Problem Set 1 351
Problem Set 2 354
Problem Set 3 370
Problem Set 4 375
Problem Set 5 391
Problem Set 6 417
Solutions to Selected Problems 436
References for the Problems 461
References 464
Language Index 501
Subject Index 503
Preface to the First Edition

What is LFG?

LFG (lexical-functional grammar) is a theory of grammar which has a powerful, flexible, and mathematically well-defined grammar formalism designed for typologically diverse languages. LFG has provided the framework for a substantial amount of descriptive and theoretical research on many languages, including those in Australia (Warlpiri and Wambaya), America (Navajo, Plains Cree, Greenlandic), Europe (Welsh, Irish, English, German, Dutch, West Flemish, Icelandic, Norwegian, Finnish, Russian, Serbian/Croatian), Africa (Chichewa, Ewe, Moroccan Arabic), South Asia (Malayalam, Hindi), and East Asia (Japanese) which are discussed and analyzed in the text and problem sets of this book.

How is it different?

LFG is closely attuned to the overt perceptible expressions of language, and to the abstract relational information that they directly express. LFG has a constraint-based, parallel correspondence architecture; it has no serial derivations (unlike transformational grammar); there are no “deep structures” or “initial structures.” Abstract relations are locally distributed as partial information across words and overt fragments of structure, and may be monotonically synthesized in any order or in parallel. Being designed for a wide range of nonconfigurational and configurational language types, LFG departs radically from most other grammar formalisms in one striking way: it is noncompositional, allowing the “content” of a constituent to vary depending on its context.

These descriptions may sound mysterious to the newcomer, but LFG is simple. Field linguists doing primary research on languages have found it easy to use. And because LFG is mathematically well defined and simple, it is also easy to implement. It has been employed in many computational systems, ranging from
state-of-the-art industrial wide-coverage grammars used for machine translation and processing to pedagogical systems implemented on personal computers.

LFG is being used as a representational basis in the new crop of data-driven approaches to language, including Optimality Theoretic syntax and probabilistic analysis of natural language. There is an International Lexical-Functional Grammar Association (ILFGA), and there are various websites for LFG resources, the main one being:

http://www.essex.ac.uk/linguistics/external/LFG/

What is in this book?

This book provides both an introduction to LFG and a synthesis of major theoretical developments in lexical-functional syntax since the mid to late 1980s. It can be used both as a textbook for students and as a reference text for researchers. Many references to current work are given, but the only background required is some familiarity with elementary formal constructs such as the definition of functions and relations, and an understanding of the basic syntactic concepts of constituent structure and X’ theory (such as in the short paper by Bresnan 1977). The problem sets provide a hands-on way of learning to use the formalism, analytic concepts, and variety of linguistic ideas that can be expressed.

What is not in this book?

Research in LFG is the cooperative effort of an international community of diverse researchers, of which the first author of this book – though one of the original developers of the theory – is just one. The goal of presenting a coherent and accessible view of the major developments in lexical-functional syntax has inevitably led to some neglect of important topics and alternatives. The deliberate omissions are these. We have omitted coverage of Optimality Theoretic syntax based on LFG (sometimes called “OT-LFG”); references can be found in Bresnan (2000, 2001a,b) and Sells (2001a), among others, but this area has grown rapidly since the publication of the first edition. We have also omitted any account of probabilistic analysis of language using LFG, such as Data-Oriented Parsing (“DOP-LFG”); see Bod and Kaplan (1998), Johnson et al. (1999), and Bod (1999) for several different approaches. This book is devoted to lexical-functional syntax and makes no attempt to cover current research in semantics within the LFG framework. (See Dalrymple 1999 for one recent line of research in semantics for LFG.) Constructive
Morphology is also not covered. (See Nordlinger 1998a, Barron 1998, Sadler 1998, Sells 1999, Lee 1999a,b, and Sharma 1999). New developments in coordination and feature resolution also had to be omitted because of time and space constraints (Dalrymple and Kaplan 1997, 2000). The history of the development of LFG and its relation to other theories is also omitted and awaits other authors. Despite these omissions, the reader of this book will have no trouble following current research, which can be closely tracked from the website resources mentioned above.

**How to use this book**

In teaching LFG from this text, we do not attempt to teach all of the formalism developed in Part II at once. Instead we break Chapter 4 into three parts:

- Sections 4.1–4.5, followed by Problem Set 1;
- Sections 4.6–4.7, followed by Problem Set 2;
- Sections 4.8–4.9 (read with Chapter 9).
Preface to the Second Edition

The second edition of this book preserves the structure and aims of the first edition, but updates the work by adding expositions of new developments closely related to the topics of the first edition. The latter include new sections on agreement and concord (Chapter 8), on predication (Chapter 12), and on morphology that adds or suppresses argument structure roles (Chapter 14), as well as more explicit analyses of the flow of information in conjoined clauses in Wambaya (Chapter 7) and Russian (Chapter 9). There are also additions to the problem sets, including new in-chapter exercises and many problems based on languages not discussed in the first edition. The range of languages that have attracted research in LFG has been steadily expanding and now also includes substantial work on further varieties of Arabic, Biak, Bulgarian, Cantonese and Mandarin Chinese, Dagaare, Danish, Dargwa, Fijian, Ancient and Modern Greek, Hebrew, Hungarian, Indonesian, Kaqchikel, K’ichee’, Latin, Maltese, Murrinh-Patha, Ossetic, Polish, Brazilian and European Portuguese, Sanskrit, Swedish, Thai, Tigrinya, and Turkish, among many others. The second edition also includes revisions to incorporate the corrections and suggestions of many users of the first edition and to remove difficulties for the reader and student.

Like the first edition, the second edition does not cover all important topics in LFG. Complex predicates and coordination are two examples of omission. In general, readers of this text will be well equipped to venture into the literature. On the topic of coordination in particular, Peterson (2004) provides a very readable introduction, and the reader interested in details of the analysis can read that paper in conjunction with the discussions of coordinate Ss in Wambaya (Chapter 7) and Russian (Chapter 9).

Similarly, like the first edition, the second edition focuses on syntax and sets aside developments in semantics and the syntax–semantics interface in LFG. One major thread of such work concerns glue semantics; see Dalrymple (1999, 2001), Asudeh (2012), and references therein.

The first edition preface notes on how to use this book remain as relevant as before. Note that Parts I and II are concerned with the motivation for functional structure, while the theory of lexical and phrasal categories is developed in Part III. Accordingly, the reader should bear in mind that the choice of particular labels
for nodes of phrase structure diagrams plays very little role in Parts I and II. The traditional notions of “clause” and “nominal” are assumed, but whether a clause is labeled S, IP, or CP and whether a nominal is labeled NP or DP have little consequence, until the theory of phrase structure categories is presented in Part III, Chapter 6. There a distinction is drawn between endocentric (headed) IP clauses in languages such as English, versus exocentric (headless) S clauses found in many other languages.
Acknowledgments

First edition

Joan Bresnan: It is a pleasure to thank the friends and colleagues who gave me detailed comments on earlier drafts of individual chapters or even the entire manuscript of this work: Farrell Ackerman, Avery Andrews, Judith Berman, Chris Culy, Mary Dalrymple, Yehuda Falk, Paul Kroeger, Helge Lodrup, Elaine Malkin and Stella Markantonatou, Chris Manning, Michiko Nakano, Louisa Sadler, and Peter Sells. The original problem sets and solutions were first edited in 1987 by Kristin Hanson, with the assistance of Heinrich Beck, Nick Clements, Mary Dalrymple, Jeffrey Goldberg, Jonni Kanerva, Yo Matsumoto, James McCloskey, Mariko Saiki, Stephen Wechsler, Michael Wescoat, Annie Zaenen, and Draga Zec. Subsequent contributions were made by Rachel Nordlinger and Ida Toivonen, and Ash Asudeh converted the files to \LaTeX. I owe special thanks to Ron Kaplan for answering questions about formal issues with his usual blend of generosity and rigor, and in providing through Xerox PARC some financial assistance in the research and preparation of the manuscript.

For the personal support which made it possible for me to finish writing this book, and for the inspiration of living with a finisher and a champion, I also thank Marianne.

Second edition

All: We thank the following readers of the first edition for specific comments and corrections, which we have tried to address: Judith Berman, George Aaron Broadwell, William Blunk-Fernandez, Mary Dalrymple, Yehuda Falk, Itamar Francez, One-Soon Her, Florian Jaeger, Ron Kaplan, Tracy Holloway King, Paul Kroeger, Tibor Laczkó, Joan Maling, and Peter Sells. We thank Adam Przepiórkowski for comments and corrections on a draft of the second edition. We also thank
the anonymous reviewers of the second edition and our patient editors at Wiley, Danielle Descoteaux and Julia Kirk. Any remaining errors are our own.

We thank students at Carleton University, Oxford University, Stanford University, and UT Austin for their feedback and questions on drafts of the second edition used during teaching. We thank Julian Michael from UT Austin, in particular, for a comprehensive list of notes and errata.

Crystal Bruce, Liz Christie, and Paul Melchín supported preparation of the second edition through research assistantships at Carleton University. We thank Paul in particular for carefully reading drafts, including flagging errors and inconsistencies and raising many interesting questions. Once again, any remaining errors are our own.

For their help with problem sets and data, we would like to thank Alex Alsina and Sam Mchombo (Chichewa problem), Telma Can Pixabaj and Nora England (K’ichee’ problem), and Samu Niskanen (Finnish data).

Ash Asudeh: I acknowledge the support of three grants/awards which contributed to the preparation of this volume: an Early Researcher Award from the Province of Ontario, a Standard Research Grant from the Social Sciences and Humanities Research Council of Canada (#410-2006-1650), and an Individual Discovery Grant from the Natural Sciences and Engineering Research Council of Canada (#371969).

For personal support, I would like to thank Alli Asudeh, Isa Asudeh, Behin Ferguson, George Ferguson, Esra Kaytaz, Shahnaz Khorshidi, Elliott Strikefoot, and Ida Toivonen. Last but most, I thank our kids, Thora, Isak, Alfred, and Harald, for everything. My efforts on this volume are dedicated to them.

Ida Toivonen: I acknowledge the support of a Standard Research Grant from the Social Sciences and Humanities Research Council of Canada (#410-2010-1841). I want to thank my family and friends for all their help and support.

Stephen Wechsler: The writing of this book was supported in part by summer funding from the Alma Madden Cowell Professorship in Linguistics at the University of Texas. I am grateful for that support.
Part I
Motivation for the LFG Architecture

Introduction

The search for a universal design of grammar has long motivated research in linguistic theory. Language is both universal among humans and specific to us. Any child can acquire fluent mastery of any of the thousands of human languages, given sufficient exposure, but no animal has this capacity. These simple facts have suggested to many linguists that there must be a universal design of grammar, a common organizing structure of all languages that underlies their superficial variations in modes of expression. If this universal grammar is a biologically given form of knowledge, as many linguists assume today, then study of the invariants of the structure of human languages may tell us something fundamental about the human mind.

This rationalist, universalist conception of linguistics has a long intellectual tradition, appearing in the works of philosophers and grammarians of the past six centuries. In the past century it has been revived by Noam Chomsky. Chomsky’s great achievement is to couple the universalist conception of language from the tradition of philosophical grammar with a far more precise model of linguistic structure adapted from the mathematics of formal systems developed in the twentieth century. This powerful combination of ideas, called “generative grammar,” has revolutionized linguistic theory. In the methodological paradigm of generative grammar, formal representations of linguistic structures are developed and empirically tested against native speakers’ knowledge of their language. Universal grammar limits the space of formal structures.

Generative grammar holds that language cannot be adequately characterized solely in terms of a formal description of its overt constituents, or “surface
Motivation for the LFG Architecture

A more abstract representation is also needed to represent the implicit linguistic knowledge of speakers. Chomsky has conceived of this abstract representation as a “deep” or initial structure which undergoes sequential serial operations (transformations) to derive the overt perceptible form. It is to explain how these abstract formal structures are acquired by speakers that Chomsky developed his rationalist epistemology: human beings possess an innate faculty specialized for language which enables them to acquire complex human languages despite the poverty of stimulus in their learning environment.

Towards the end of the twentieth century, new formal ideas began to achieve prominence in linguistic theory, making use of parallel rather than serial structures and computations, and comparative evaluation of multiple overt structures rather than serial derivation of individual overt structures. These ideas are embodied in a family of nonderivational, constraint-based linguistic theories and in approaches based on optimization (both statistical and discrete). These newer theories are compatible with different linguistic epistemologies drawing on structuralist and functional/typological ideas which have both predated and coexisted with generative grammar. One such theory is lexical-functional grammar (LFG) (Kaplan and Bresnan 1982), which is the topic of this book.

Part I of this book empirically and informally motivates the LFG architecture by looking at the core linguistic phenomena which inspired it: nonconfigurationality, movement paradoxes, and the lexicality of relation changes such as passivization. Part II shows how the intuitive ideas of Part I can be formally modeled as flexible correspondence mappings between parallel structures (constituent structure and functional structure). Part III presents a theory and typology of structure–function correspondences, together with several case studies of languages in which syntactic functions are created morphologically rather than by constituent structures. Part IV motivates functional structure by showing how invariances of language are captured in functional structures and outlines a theory of how functional structures are projected from argument structures.

---

1 Chomsky’s “poverty of stimulus” argument for universal grammar has attracted criticism (e.g. Van Valin 1994, Pullum 1997, Pullum and Scholz 2002). The most controversial aspect is not the conclusion that humans have innate biological capacities or learning biases that support language – no one doubts that the phonological structure of language is supported by our innate articulatory and perceptual systems – but the assumption that such capacities must be narrowly specialized for acquiring grammatical systems – and grammatical systems of the specific types advocated by Chomsky. It is also true that advances in statistical learning theories permit inferences about nonoccurring data which enrich the informativeness of the stimulus (e.g. Tesař and Smolensky 1998, Boersma and Hayes 2001; for discussion of empirical case studies, see Lidz et al. 2003, Foraker et al. 2009, Reali and Christiansen 2005, Ambridge et al. 2008, and Kam et al. 2008).
One fundamental problem for the design of universal grammar is the great variability in modes of expression of languages. Languages differ radically in the ways in which they form similar ideas into words and phrases. The idea of two small children chasing a dog is expressed in English by means of a phrase structure in which conceptual components of the whole – the concept of the two small children and the concept of the dog being two such components – correspond to single phrases. Phrases are groups of contiguous words that are units for substitutions, remain together as units under stylistic permutations and paraphrases of a sentence, constrain the pronunciation patterns of sentences, and are subject to ordering constraints relative to other words and word groups. The (simplified) phrase structure of an English sentence is illustrated in (1):

\[ S \rightarrow VP \rightarrow NP \]
\[ \text{the two small children} \rightarrow \text{Aux} \rightarrow \text{are} \rightarrow \text{VP} \rightarrow \text{NP} \]
\[ \text{chasing} \rightarrow \text{that dog} \]

For simplicity, the root node in (1) bears the traditional label S (“sentence”), instead of a symbol for a phrasal projection, such as IP (“inflection phrase”). For English, S will be replaced with IP later. More generally, in Parts I and II of this book (Chapters 1–5), the particular categories labeling the nodes of phrase structure diagrams play very little role. The traditional notions of “clause” and “nominal” are assumed, but whether a clause is labeled S, IP, or CP and whether a nominal is labeled NP or DP have little consequence, until the theory of phrase structure categories is presented in Part III, Chapter 6. There a distinction is drawn between endocentric (headed) IP clauses in languages such as English and exocentric (headless) S clauses found in many other languages.
In this structure, the word combinations the two small children and that dog are noun phrases (NPs), in which the words cannot be separated, and there is also a verb phrase (VP). When the phrases are freely broken up, the result is ungrammatical or different in meaning:

(2)  
   a. *The two small are chasing that children dog.  
   b. *The two small are dog chasing children that.  
   c. *Chasing are the two small that dog children.  
   d. *That are children chasing the two small dog.

The simple correspondence between conceptual units and grammatical phrases seems so natural to the English speaker as to appear a necessary feature of language itself – but it is not. Consider Warlpiri, a language of the people who have inhabited Australia since long before the colonization of that continent by English speakers. Example (3) shows the phrase structure of a Warlpiri sentence expressing the same idea as the English sentence (1). But in Warlpiri, every permutation of the words in the sentence is possible, with the same meaning, so long as the auxiliary (Aux) tense marker occurs in the second position. In particular, the word orders of all the bad English examples in (2) are good in Warlpiri.

(3)

\[
\begin{array}{c}
\text{NP} \\
\text{wita-jarra-rlu} \\
\text{small-DUAL-ERG} \\
\text{Aux} \\
\text{ka-pala} \\
\text{pres-3DU.SUBJ} \\
\text{V} \\
\text{wajilipi-nyi} \\
\text{chase-NPAST} \\
\text{NP} \\
\text{yalumpu} \\
\text{that.ABS} \\
\text{NP} \\
\text{kurdu-jarra-rlu} \\
\text{child-DUAL-ERG} \\
\text{NP} \\
\text{maliki} \\
\text{dog.ABS} \\
\text{S} \\
\end{array}
\]

It is not true that Warlpiri lacks phrases altogether: syntactic analysis has shown that some phrases (NPs but not VPs) do optionally occur, and there is evidence for a somewhat more articulated clause structure including a focus position to the left of Aux. What appears to the left of Aux may be a single word, as in (3), or a single multi-word NP, which then allows the nonfinal case-marker to be omitted, as in (4):

(4) Kurdu-jarra(-rlu) wita-jarra-rlu ka-pala maliki wajilipi-nyi.  
child-DUAL(-ERG) small-DUAL-ERG pres-3DU.SUBJ dog.ABS chase-NONPAST  
“The two small children are chasing the dog.”

---


3 Note that the tree structure in (3) is oversimplified for expository purposes. Compare it with the phrase structure typology in Chapter 6 and the analysis of Wambaya in Chapter 7.

4 See Austin and Bresnan (1996) and Simpson (2007) for details.
But crucially, the sole item appearing to the left of Aux cannot be a VP, nor is there any other evidence that VP is ever a phrasal constituent in Warlpiri. The subject of a Warlpiri sentence is not identified by its position in the phrase structure, as it is in English, but rather by the appearance of the ergative case marker -rlu. More generally, phrases are not essential to the expression of conceptual units. The coherence of a conceptual unit in Warlpiri is indicated by means of word shapes rather than word groups: noncontiguous words that form a conceptual unit must share the same formal endings – case and number morphology. In (3) the word for ‘small’ shares the dual and ergative endings -jarra and -rlu with the word for ‘child’ which it modifies, and these endings differ from those of the words for ‘dog’ and ‘that’, which are null. Thus the words kurdu-jarra-rlu (‘child-DUAL-ERG’) and wita-jarra-rlu (‘small-DUAL-ERG’) jointly express the concept of ‘two small children’ and jointly serve as subject of the sentence – regardless of whether those words appear together as a constituent (as in (4)) or not (as in (3)).

This difference between Warlpiri and English exemplifies a broad crosslinguistic generalization observed by many students of linguistic typology: across languages, there often appears to be an inverse relation between the amount of grammatical information expressed by word structure and the amount expressed by phrase structure. Words must appear in a sequence since they cannot be pronounced simultaneously, so the relative order of words is generally available as one means of expressing the grammatical relationships necessary for communication. But some languages lack the rich word structure found in languages such as Warlpiri. Thus languages rich in word structure (morphology) may make more or less use of fixed phrase structure forms (syntax), whereas languages poor in morphology overwhelmingly tend to have more rigid, hierarchical phrase structures. This trade-off between morphology and rigid phrase structure is spectacularly illustrated by some of the radically nonconfigurational languages of Australia, but there is evidence for it also in the other language types we will examine in Part III. We can summarize this generalization with the slogan “Morphology competes with syntax” for the job of expressing the grammatical relations between words.

The idea that words and phrases are alternative means of expressing the same grammatical relations underlies the design of LFG and distinguishes it from other formal syntactic frameworks. In addition, we cannot discount the effect of “configurational bias.” Through historical accident, the resources of modern science and technology have been dominated by states whose national languages happen to be highly configurational. As a result, there has been a vast lack of knowledge of...
typological variation of language within the scientific establishment in computer
science, logic, and philosophy – and even among many theoretical linguists of a
formal bent.

Although Warlpiri lacks English-style phrase structure, and English lacks
Warlpiri-style case and agreement forms of words, there is evidence that they
have a common organization at a deeper level than is apparent from their dif-
fering modes of expression. Similar conceptual units are expressed by the two
languages – objects and their relations and motions, events and their participants,
and human emotions, actions, and aims. And at an appropriate level of abstrac-
tion, similar grammatical constraints emerge. For example, in English, a reflexive
pronoun can be an object coreferring with the subject, but cannot be a subject
coreferring with the object:

\[(5) \quad a. \quad \text{Lucy is hitting herself.} \]
\[b. \quad \ast \text{Herself is hitting Lucy.} \]

The same is true in Warlpiri:

\[(6) \quad a. \quad \text{Napaljarri-rli ka-nyanu paka-rni.} \]
Napaljarri-ERG PRES-REFL hit-NONPAST
“Napaljarri is hitting herself.”
\[b. \quad \ast \text{Napaljarri ka-nyanu paka-rni.} \]
Napaljarri.ABS PRES-REFL hit-NONPAST
“Herself is hitting Napaljarri.”

This constraint holds in Warlpiri whether or not the subject is discontinuous.
Indeed, this grammatical constraint on reflexive pronouns is shared by many lan-
guages (see Chapters 10 and 11 and references).

Thus, while phrase structure does not universally correspond to conceptual
structure, the more abstract grammatical functions it expresses – such as subject
and object – are widely shared by different languages. These grammatical func-
tions represent classes of varying forms of expression that are equivalent under
the correspondence mappings to argument structure (discussed below).

Here is the first choice point in the design of universal grammar: how to cap-
ture the abstraction of grammatical functions, such as subject and object, across
the rather different means of expressing them? The overwhelmingly predominant
tendency in modern linguistic theory – due to Chomsky – has been to define them
as the familiar configurations of English phrase structure: the subject is an NP in
configuration (7a), and the object is an NP in configuration (7b):

\[\text{6 The following illustration is from Simpson (1983a); see also Hale (1973).} \]
Nonconfigurationality

For a language like Warlpiri, this choice amounts to the claim that it does have English-style phrase structure after all – not on the surface, where conditions on word order hold, but at an underlying level of representation at which the grammatical conditions on reflexive pronouns hold. Let us refer to this as the configurational design of universal grammar. It is illustrated in (8)–(9):

Under the assumption of the configurational design of universal grammar, a reflexive pronoun must satisfy the following grammatical condition on the underlying level of structure: the reflexive must be contained in a constituent that

---

7 This hypothesis has taken several forms. One is that the underlying structure is a deep structure, which undergoes transformational “scrambling” rules to derive the modes of expression peculiar to Warlpiri (Hale 1973). But as Hale (1994) points out, the complete absence of movement rules elsewhere in Warlpiri renders this hypothesis unattractive. Another is that the underlying structure is a “lexical structure” which is not transformationally related to the surface forms but represents the universal component of Warlpiri grammar in the phrasal forms of English (Hale 1983). This view has been criticized by Speas (1990) for adopting different theories of grammar for different language types, and has subsequently been abandoned by Hale (1994). A third and more recent form of the hypothesis, based on work by Jelinek (1984) and Baker (1991), assumes that overt NPs are not arguments but adjuncts to incorporated pronouns; see Austin and Bresnan (1996), Nordlinger (1998a), and Croft (1997) for criticism of the latter hypothesis.
contains the verb also but not the antecedent of that pronoun; that constituent is the VP. Using the graphic representation of the tree diagram, this means that the antecedent must be “higher” in the tree than the pronoun that it binds. Hence a subject can bind an object but an object cannot bind a subject, whether in English or Warlpiri, as we saw in (5) and (6). This is one approach to capturing the similarity between the two languages – but is it the right approach?

Now it might be true that all languages do have an abstract level of grammatical structure which closely matches the surface organization of the grammars of English and other European languages. (Perhaps it just happens that the biologically based universal design of grammar really does have the form of the language of the colonizers.) But there is no evidence of this; for example, none of the properties of phrases that we mentioned – contiguity under permutation, grouping for pronunciation, ordering relative to other elements, and substitutability – supports the existence of a VP in Warlpiri, and what evidence there is for phrases in Warlpiri shows clearly that there is no VP in our original sense (as discussed in the references previously mentioned: Simpson 1983a, 1991, 2007, Austin and Bresnan 1996, and Nordlinger 1998a). Moreover, there is evidence that the constraints on reflexive pronouns depend not directly on phrase structure configurations but on factors such as predication relations, which are at best only partially reflected in phrase structure configurations (see Kroeger 1993, Manning 1996, Wechsler and Arka 1998, and Part IV of this book). Therefore the “deep” or underlying VP that must be postulated in (9) is devoid of the original constituency properties of VPs.

Hence, an alternative taken in the development of LFG is to choose a more abstract representation of the grammatical functions subject and object, one which is neutral between the differing modes of expression of languages. On this alternative, grammatical functions are not reducible to phrase structure configurations as in (7); they are classes of differing formal expressions that are mapped into argument structure in equivalent ways. Thus we have a differing picture of the grammatical structures of English and Warlpiri:

(10) English:

```
chase ⟨ agent patient ⟩
```

```
PRED SUBJ OBJ
```

```
S
```

```
NP VP
```

```
... Aux VP
```

```
V NP
```

```
...```

Nonconfigurationality

In this design, the grammatical functions subject and object are equivalence classes that serve as the relators, or “links,” between two formally different, parallel structures: (i) the argument structure, which includes the participants in events and situations, and the relations between those participants, that are grammatically expressed; and (ii) the expression structure, which consists of the modes of expression of the language, represented as a constituent structure (tree). Returning to our example of the reflexive pronouns, the grammatical conditions are now stated directly in terms of those grammatical functions: whether in English or Warlpiri, the subject (subj) can bind the reflexive object (obj) but not vice versa. The languages differ, however, in the way those grammatical functions are expressed. While phrase structure configurations distinguish the subject and object functions in English, the case inflections – erg(ative) and abs(olutive) – distinguish the same functions in Warlpiri. These functions differ overtly, as we have seen, but they show a similar system of correspondences to the argument structure. The system of functions that relates these two structures has been mathematically modeled by the functional structures of LFG (Chapter 4). Let us refer to this as the relational design of universal grammar.

Does this choice of representations for grammatical functions make any difference, or are they just notational variants? In fact, there are interesting empirical consequences of the choice of design. The configurational design implies that specific elements of phrase structure – NPs, VPs, and their relations – appear not only in representing the modes of expression of English and similar European languages, but also in representing deeper aspects of grammatical organization – the abstract syntactic functions and the semantic predicate argument structures of all languages. The relational design, in contrast, implies that it is the distinctive structure of predicators and arguments and their grammatical functions that are relevant at the deeper levels. In the course of this book, we will see many cases where these two designs lead to divergent expectations about the grammars of human languages.

In conclusion, an important source of empirical motivation for the relational design of universal grammar adopted by LFG is the existence of phrase structure nonconfigurationality. Although various degrees of nonconfigurationality occur...
across languages, as we will see in Part III, a number of the Australian lan-
guages are among the best exemplars of the phenomenon (Simpson 1991, 2007; 
Austin and Bresnan 1996; Nordlinger 1998a). This nonconfigurationality is pos-
sible because the same grammatical information can be specified by word *shapes*
 as by word *groups*; the functional structure of LFG characterizes this grammat-
ical information in an abstract, neutral way, without configurational bias. Thus
in “lexical-functional grammar” the term “lexical” refers to the fundamental fact
that words, or lexical elements, are as important as syntactic elements in express-
ing grammatical information, and the term “functional” refers to the fact that
this grammatical information is not identified with particular structural forms
of expression, but is viewed as a system of abstract relators of expressions to
 eventualities.

**Further reading**

For further readings that examine the evidence and issues of nonconfigurational-
ity in more detail, Austin and Bresnan (1996), Nordlinger (1998a), and Simpson
(2007) are recommended as particularly accessible.
2 Movement Paradoxes

If typological considerations such as nonconfigurationality motivate a relational design of universal grammar, it is natural to ask how the evidence for syntactic transformations that we see in English and related languages can be accounted for within the same design of grammar. In these familiar languages, we see overt evidence that phrase structure constituents can be displaced from one position to another. The evidence takes the form of extraction configurations. An extraction configuration is illustrated by the set of sentences in (1):

(1)  a. We talked about that problem for days.
    b. That problem, we talked about __ for days.
    c. *We talked about for days.

In an extraction configuration, a displaced constituent is identified with a lexically empty position. Thus in (1b) the initial NP that problem appears to have been displaced from the usual position of a prepositional object, shown in (1a), to its sentence-initial position. The sign of displacement is the presence of a lexically empty position or gap in the clausal residue, which would be ill-formed on its own, as shown in (1c). An extraction configuration motivates the idea that the sentence-initial constituent in (1b) is moved from an underlying position where it is required:

(2)  [That problem] we talked about __ for days.

Such extraction configurations seem to be direct evidence of the existence of syntactic transformations – structure-dependent operations that map underlying phrase structures representing grammatical relations onto the transformed structures that represent the surface forms of expression of language. If such movements are needed in English, it has been argued, then theoretical considerations
of simplicity, universality, and learnability in principle of language require them in all languages. This conclusion would support the configurational design of grammar.

In fact, we will see below that such apparent movements arise in the LFG architecture from the interaction of general principles of structure–function correspondence, and can be explained without any loss of generality. Even more interestingly, it turns out that certain “movement paradoxes” favor this architecture over the movement transformations of the configurational design. We can conclude that the same theoretical considerations of simplicity, universality, and learnability in principle require the relational design of grammar for all languages.

A movement paradox is illustrated in (3). Note that there is a mismatch in category type between a seemingly moved phrase, the initial that complement in (3a), and the position it is supposed to be moved from, as illustrated in (3b). In (3) the moved phrase cannot appear in the position from which it is supposed to be moved, because it is of the wrong type of syntactic category for that position:

(3)  
\[ \text{That he was sick, we talked about for days.} \]  

\[ \text{We talked about [that he was sick] for days.} \]  

\[ \text{c. cf. We talked about [the fact that he was sick] for days.} \]

The complex noun phrase in (3c) is fine as a complement to about. This preposition requires an NP complement, which is why (3b) is not grammatical (though it is perfectly interpretable).¹

A related example of a movement paradox involves passivization of sentential complements. It is commonly assumed that the subject of a passive verb is moved from an underlying object position, as in (4):

(4)  
\[ \text{This theory captures that fact.} \]  

\[ \text{[That fact] is captured by this theory.} \]

But with sentential complements, this assumption breaks down with certain verbs for many speakers. The passive example (5a) is a grammatically well-formed sentence with a sentential subject, but the corresponding active (5b) is ill-formed for

---

¹ English differs in this respect from some other Germanic languages, such as Swedish. See Berman (1997) for a different analysis of similar facts in German within LFG. Note also that even in English, interrogative clauses are more nominal in character, appearing as prepositional complements: We talked about whether you should be the one to go. Also, in some dialects of English examples like (3b) do occur.
many speakers for whom the verb *capture* (like the preposition *about*) requires an NP object, as in (5c):

(5)  
   a.  \[That languages are learnable\]|S is captured__ by this theory. 
   
   b.  *This theory captures \[that languages are learnable\]|S. 
   
   c.  cf. This theory captures \[the fact that languages are learnable\]|NP.

How then could the sentential subject in (5a) have been moved from the object position in (5b)?

Another movement paradox occurs with VP preposing. In VP preposing, a topical VP complement to an auxiliary is shifted to the front of the sentence to emphasize the auxiliary, as in (6b). The specific verb form of the fronted phrase depends on the requirements of the auxiliary, as shown by the contrasts between (6a–c):

(6)  
   CONTEXT: I said I would meet you,…
   
   a.  …and \[meet you\] I WILL __!
   
   b.  *…and \[met you\] I WILL __!
   
   c.  *…and \[meeting you\] I WILL __!

A movement approach requires that the moved constituent be identical to the constituent in its original position. The grammaticality or ungrammaticality of (6a–c) follows directly from that of the corresponding sources of movement shown in (7a–c), respectively:

(7)  
   a.  I will \[meet you\].
   
   b.  *I will \[met you\].
   
   c.  *I will \[meeting you\].

With the perfect auxiliary, however, there can be a mismatch between the fronted verb form (8a) and the *in situ* verb form (8b) (Andrews 1994, p. 218):

(8)  
   a.  She said she would meet me, and \[meet me\] she HAS __!
   
   b.  *…and she HAS \[meet me\] __!
   
   c.  …and she HAS \[met me\] __!

How then could the VP in (8a) be moved from a postauxiliary position where it can never occur, as in (8b)? The perfect auxiliary *have* in English requires that its complement verb be a past participle, as the contrast between (8b) and (8c) illustrates. Paradoxically, then, an infinitive VP cannot in fact appear in the source
position from which it is assumed to have been moved. Nevertheless, it is quite natural in English for the infinitive form of the verb to appear in the fronted position, creating another movement paradox.

Subject–auxiliary inversion provides yet another kind of movement paradox. The contracted negative present-tense auxiliary *be* in Standard English has a gap in its person–number paradigm, shown in (9):

\[
\begin{array}{c|c|c}
  & \text{sg.} & \text{pl.} \\
1 & \text{aren't} & \\
2 & \text{aren't} & \text{aren't} \\
3 & \text{isn't} & \text{aren't} \\
\end{array}
\]

A form exists for every combination of person and number except for first-person singular. Although nonstandard dialects have forms such as *ain’t* or *amn’t* which fill this gap, the Standard dialect does not make use of these forms:

\[
\begin{align*}
(10) & \quad \text{a. I am not your friend.} \\
      & \quad \text{b. *I ain’t/amn’t your friend.}
\end{align*}
\]

Under subject–auxiliary inversion, many speakers of the Standard dialect find that it is natural to use the form *aren’t* (Langendoen 1970; Hudson 1977; Dixon 1982; Gazdar et al. 1982; Kim and Sag 1996; Bresnan 2000, 2001b; Bresnan et al. 2007):

\[
\begin{align*}
(11) & \quad \text{a. Am I \underline{not} your friend? (stilted or very formal)} \\
      & \quad \text{b. Aren’t I \underline{not} your friend?}
\end{align*}
\]

If the inverted auxiliary in (11a) is derived by movement from an underlying postsubject position, where is it moved from? The form *aren’t* cannot appear in the postsubject position:

\[
(12) \quad *I \text{ aren’t your friend.}
\]

Movement paradoxes are problematic for two basic architectural assumptions of transformational theories: the representational assumption that the inner or underlying structure of language has the formal categorial properties of phrase structure (the configurational design of grammar), and the derivational assumption that the surface configurations of phrase structure categories are derived by transformational operations (movements) from basic syntactic representations of the same type.²

² For some of these problems, various proposals have been put forward within the movement frameworks, but none of them is completely satisfactory and there is little agreement on the solutions. See the
2.1 Theoretical assumptions

The kinds of category mismatches we see in the movement paradoxes are expected in the relational architecture of LFG, for the simple reason that the correspondence between structure and function is not perfect: there can be mismatches between the functional structure attributes of an element and the constituent structure positions it can appear in. Functional structure (f-structure) is a feature structure that represents, among other things, grammatical functions. Constituent, or categorial, structure (c-structure) is a tree structure that contains categorial information; see Chapter 4 for more on f-structure and c-structure. We consider here just one example, in order to illustrate the principle. The diagram in (13) again informally depicts the architecture illustrated in (10) and (11) of Chapter 1:

(13) Parallel structures (LFG):

Each structure models a different dimension of grammatical substance: role, function, or category. Roles correspond to the grammatically expressible participants of eventualities (modeled by a-structure), syntactic functions belong to the abstract system of relators of roles to expressions (modeled by f-structure), and phrase structure categories belong to the overt structure of forms of expression (modeled by c-structure). The structures are associated by principles of functional correspondence (also called “linking” or “mapping” principles; see Chapters 6 and 14).

“Further reading and discussion” section for references. The movement paradoxes with VP preposing and auxiliary inversion have generally been ignored within the movement approaches. The former is analyzed by Andrews (1994) within LFG and the latter by Bresnan (2000, 2001b).
Let us take example (5a) by way of illustration. The surface constituent structure can be depicted as in (14): 

\[
\begin{array}{c}
\text{IP} \\
\downarrow \\
\text{CP} \\
\hspace{1cm} \text{that languages are learnable} \\
\end{array}
\]

Observe that the \textit{that} complement is base-generated in topocalized position as a sentential complement (CP) adjoined to the sentence (IP) in the c-structure. The evidence for a subject-external position of the CP in English includes the observation that auxiliary inversion with the CP is not possible (Koster 1978):

\[
\begin{array}{l}
\text{(15) a. That he’ll be late is quite likely.} \\
\text{b. *Is that he’ll be late likely?} \\
\text{c. *How likely is that he’ll be late?} \\
\end{array}
\]

General principles of structure–function correspondence for configurational structures (to be discussed in Chapter 6) define the position of the adjoined CP as that of a topic (TOP), focus (FOC), or adjunct (ADJ) function, and tell us that the entire sentence corresponds to a single functional structure nucleus. Because the CP is a non-nominal category, it cannot occupy the subject NP position as sister of I’. This follows from the constraint on structure–function association shown in (16) (Bresnan 1994b, ex. 88):

\[
\begin{array}{c}
\text{IP} \\
\downarrow \\
\text{I} \\
\text{is} \\
\text{V} \\
\text{PP} \\
\end{array} \quad \text{The canonical structural realization of subject and object functions is nominal.}
\]

Although the CP cannot appear in the usual structural position of the subject, which is an NP position by (16), general principles of the theory nevertheless link the function of the topocalized phrase with the subject function in f-structure,

---

3 Grimshaw (1982a) sketches the essential outlines of the solution adopted here.
4 We use the X’-theoretic functional category I and its projections, I’ and IP. IP can be read as S and I as Aux, if this is preferred.
5 – corresponding to what Grimshaw (1991) calls an “extended projection.”
as shown in (17). (The phrases in double quotation marks abbreviate the actual f-structure contents where they are not relevant to the discussion.) The first principle is simply that the subject is the default topic of its sentence, which we formalize (in Section 6.2.1) by optionally identifying subj with top:

\[(17) \text{Correspondences between c- and f-structures of (5a):}\]

\[
\begin{array}{c}
\text{TOP} \\
\text{SUBJ} \\
\text{PRED} \quad \text{"that ..."} \\
\text{OBL}_\theta \quad \text{"by this theory"}
\end{array}
\]

As we will see in Chapter 4, the general principle of completeness requires that the verbal a-structure requirements, including the demand for a subject, be met; so something must fill the subj function in f-structure. Coherence requires that the grammaticalized discourse functions (TOP) and (FOC) be identified with a syntactic function such as subj or obj; so the topicalized CP must fill some other function in the clause. Uniqueness prevents identifying the top with a syntactic function borne by a lexically filled constituent in c-structure, as we will see in Chapter 4; so there must be an unfilled function – a gap – for the topic to fill. The gap is represented as the omission of the subject NP from its normal c-structure position as sister of \( I' \). In this way the typical elements of an extraction configuration – namely, the identification of a displaced constituent with a lexically empty position – arise nonderivationally from general principles.

Finally, the passive relation follows not from NP movement but from principles of a-structure to f-structure correspondence provided by the lexical mapping theory. This part of the theory will be discussed in later chapters, but we briefly illustrate the main point in (18). The passive a-structure is morpholexically associated with the passive participle of capture; it differs from the active in that the agent role (the \( x \) argument in diagram (13)) is suppressed, and may be associated with an optional by-phrase (OBL\( \_\theta \)).

6 The formal mechanism of functional identification of displaced constituents with other functions is discussed in Chapters 4, 6, and 9.
7 It may be preferable to instead analyze the by-phrase as an ADJUNCT, but that would not substantively affect the point at hand; see Needham and Toivonen (2011) for further discussion.
depending on context. It is the suppression of the agent that allows the theme role to correspond to the SUBJ function in this case:

\[(18)\] Morpholexical correspondences between a- and f-structures of (5a):

\[
\begin{align*}
\text{a-structure:} & \quad \text{capture} \langle x \ y \ \emptyset \ \rangle \\
\text{f-structure:} & \quad \begin{array}{c}
\text{PRED} \\
\text{SUBJ} \quad \text{\ldots} \\
\text{OBL}_\theta \quad \text{\ldots}
\end{array}
\end{align*}
\]

Thus, the reason there can be a mismatch between the topicalized category CP and the object position of the verb *capture* is that the topicalized *that* complement is flexibly mapped to its argument role by the correspondence theory; it is not linked to its argument role by a series of transformational movements from an underlying object position in phrase structure. And the reason for *this* is that the logical roles of phrases are not uniformly represented in phrase structure form. Role, function, and category are independent dimensions of linguistic substance. Within the constraints on their correspondences, mismatches are possible.

Why then is the active form (5b) *This theory captures that languages are learnable* ill-formed? The answer is simply that *capture* takes only objects as its complements and by (16) the canonical structural realization of objects is a nominal category, not a *that* complement CP. When English verbs take *that* complements, these complements are not objects, and the verbs are syntactically intransitive in this construction. The verb *care* is an example of the latter type:

\[(19)\]  
\[\begin{align*}
a. & \quad \text{I don’t care that languages are learnable.} \\
b. & \quad *\text{I don’t care that.} \\
c. & \quad *\text{That languages are learnable isn’t cared.}
\end{align*}\]

Observe that this architecture leads us to expect nonuniformities of syntactic categorization of parallel semantic categories across languages: if English sentential complement CPs can have the grammatical functions of subject and object in f-structure, as proposed here, and if subject and object are canonically realized as NPs in c-structure, as we have also hypothesized, then we should expect to find languages in which there are sentential complement NPs in c-structure. In fact, Bresnan (1995a) argues that Chichewa has nominal *kūti* (*that*) complements,

\[\text{\textsuperscript{8}}\] Some verbs, such as *believe*, share properties of both *capture* and *care*. Like *capture*, *believe* takes an object which alternates with a passive subject. But like *care*, *believe* allows a nonobject sentential complement. See Grimshaw (1982a) and Bresnan (1995a) for further discussion of this analysis.
and there is evidence that this is true also for Dutch (Hoekstra 1984) and Spanish (Plann 1986; Luján 1994), to give just a few relevant instances.⁹

In conclusion, we have seen in principle how both the typologically “exotic” property of nonconfigurationality and the category mismatches in extraction configurations found in English are comprehended by the same relational architecture of universal grammar. Chapters 4 and 5 present an explicit model of parallel structures and their correspondence mappings to make these linguistic ideas precise. The next chapter discusses our third motivation for the relational architecture, based on the lexicality of passivization and other changes in argument structure realization.

Further reading and discussion


Quite intricate argumentation is involved in evaluating the various movement approaches. For that-clause topicalization, analyses have been proposed which involve: (i) movement and deletion of an underlying resumptive pronoun (e.g. Koster 1978) or extraction of the topicalized complement, leaving “an invisible resumptive pronoun” which is in turn extracted (Postal 1994); (ii) movement of a null operator (Chomsky 1977); and (iii) movements that can change category type (Stowell 1981; Pesetsky 1982; Webelhuth 1992). For criticisms and alternative analyses to the approaches in (iii) see Bresnan (1991, 1994b, 1995a), Hoekstra (1984), Plann (1986), Luján (1994), and Neidle (1982b, 1988). For criticisms and alternatives to (ii) see Baltin (1982), Grimshaw (1993), Lasnik and Stowell (1991), Maling and Zaenen (1977), and Müller and Sternefeld (1993). The problem with (i) is that in general, the kinds of phrases that can be topicalized do not coincide with the kinds of phrases that can bind resumptive pronouns. Quantifier phrases are one example discussed by Rizzi (1986), Rizzi and Roberts (1989, n. 1), Bresnan and Mchombo (1986, p. 279), Jelinek (1995), and Baker (1995), as illustrated by the Italian examples in (20):

(20) a. *Nessuno, lo conosco in questa città.
   Lit.: “Nobody, I know him in this city.”

b. nessuno, conosco in questa città.
   “Nobody do I know in this city.”

⁹ Also see Dalrymple and Lødrup (2000) for discussion of variation in the grammatical function associated with that complements: obj versus comp.
There are other types of topicalized phrases which cannot bind resumptive definite pronouns (pace Postal 1994, pp. 67–68), as we see in English:

\[(21)\]  
\[\begin{array}{ll}
\text{a.} & \text{An idiot he called me! Can you believe it?} \\
\text{b.} & \ast \text{An idiot he called me it! Can you believe it?}
\end{array}\]

\[(22)\]  
\[\begin{array}{ll}
\text{a.} & \text{Last month I brought home a bold little kitten. rosie I named her.} \\
\text{b.} & \ast \text{rosie, I named her it.}
\end{array}\]

It is true that a demonstrative pronoun can sometimes appear in these contexts, for example, \textit{Rosie} – \textit{I named her that}, but it requires a very different phrasing from examples (21) and (22): there must be a pause between the initial NP and the sentence, each having its own intonational contour. In (21) and (22), in contrast, there is a single intonational contour for both the initial NP and the clause remnant, and the pitch on the NP is the prominence peak for the entire sentence. These facts suggest a different syntactic relation between the NP and the clause in the two cases. Lastly, English in general lacks resumptive pronouns in its grammar (Chao and Sells 1983; Sells 1984; Asudeh 2012), such that any resumption in \textit{that}-clause topicalization would be quite special and would have to be very carefully motivated. See Asudeh (2012) for further discussion, including certain cases of topicalization which are argued not to involve grammatical resumption per se. Thus the resumptive pronoun solution to the category mismatch problem with topicalized \textit{that} clauses lacks independent motivation and does not fit well with other facts of English grammar.
3 Lexicality and Argument Structure

Briefly illustrated in the previous chapters, the lexicality of passivization and other relation-changing processes has been one of the fundamental motivations for the distinctive architecture of LFG from its beginnings (Bresnan 1978, 1980, 1982c; Mchombo 1978; Kaplan and Bresnan 1982). In this chapter we consider evidence for the lexicality of the passive.

3.1 Two approaches to passive relation changes

In a generic transitive active clause, the agent (or actor) argument of the verb is expressed as the subject and the patient (or undergoer) argument as the object. In (1), for example, *the child* is the subject and *the cats* the object of the active verb *kisses*:

(1)  The child kisses the cats at every opportunity.

In the passive voice, the mappings from semantic roles to grammatical functions differ, the undergoer now being expressed by the subject (with which the verb agrees in (2)) and the actor by an optional prepositional phrase. The core (subject or object) arguments of the passive verb have been reduced by one, rendering a transitive verb intransitive:

(2)  The cats are kissed by the child at every opportunity.

In the configurational model of universal grammar, this remapping of roles to functions is effected in part by a syntactic transformation that maps one sentence structure onto another, moving an NP from an underlying transitive tree
structure (3), where it receives the undergoer semantic role, to an external position as subject:

(3)  

\[
\begin{array}{c}
\text{NP} \\
\text{VP} \\
\text{V} \\
\text{NP}
\end{array}
\]

For example, the passive sentence in (2) would have an underlying structure like the following, where the subject position, indicated by a blank, is available as a landing site for the moved NP the cats:

(4)  _ are kissed the cats by the child at every opportunity.

On that theory, the verb in this passive structure assigns the undergoer or “kissee” semantic role to its object, the NP the cats, just as it does in the active sentence in (1). This NP moves to the subject position, producing (2). Call this the syntactic analysis of the passive.

In the relational model of universal grammar, in contrast, the remapping of semantic roles to their expression in the sentence takes place in the lexicon, altering the lexical entry of the verb. This remapping is characterized abstractly as an alternation between lexical predicate argument structures in (5):

(5)  

\[
\begin{array}{c}
\text{active} \quad \text{passive} \\
R \langle x, y \rangle & R \langle x, y \rangle \\
S \quad O & (OBL) \quad S
\end{array}
\]

Here the active and passive verb forms share the same predicate argument structure (with roles indicated by the variables x and y in (5)), and the roles are lexically associated with, or mapped to, alternative sets of grammatical functions, s (subject), o (object), and an optional obl (oblique).2 This characterization abstracts away from the language particular realizations of subject, object, and oblique relations, which may be configurational or nonconfigurational. This is illustrated in

---

1 In early LFG (Bresnan 1982b), passivization is regarded as a lexical redundancy rule; more currently, lexical mapping theory (Chapter 14) provides general principles from which these alternations follow. See Bresnan (1990) for arguments against the lexical rule approach.

2 In some LFG literature, the overt realization of the suppressed argument – e.g. the English passive by-phrase – is treated as an ADJUNCT rather than an OBLIQUE. This is also implicit in the lexical mapping theory analysis in Chapter 14. See Needham and Toivonen (2011) for discussion of the grammatical function of the by-phrase and references.
Section 3.3 below, where English is compared with Malayalam. In English, the subject and object are realized as positions in the (category)-structure, and the oblique function is realized as a by-phrase; in Malayalam, the same three functions are realized as NPs in nominative, accusative, and instrumental case, respectively. Call this the 

lexical analysis 

of the passive.

Now let us contrast the syntactic and lexical analyses of the passive voice alternation, and seek evidence for choosing between them. It is important to note that even the syntactic analysis is partly lexical, in the sense that the active and passive forms of the verb must be specified differently in order to trigger different syntactic effects. (Otherwise one would wrongly predict that the active and passive forms could be interchanged without affecting grammaticality, leaving unexplained the unacceptability of *The child is kissed the cats at every opportunity.* For example, on one common version of the syntactic analysis, the passive morphology on the verb has two effects on the verb’s lexical representation. First, it suppresses the (VP-)external thematic role, that is, the role that would have been assigned to the subject of the active verb. That role can instead be optionally expressed by a by-phrase, assumed to be an adjunct (Grimshaw 1990). Suppression of the external thematic role also makes the subject position available as a landing site for movement (see (4) above). Second, passive morphology removes the verb’s ability to assign “abstract case” to its object, where case is necessary to license each DP/NP. This forces the object to move to a position where it receives case, namely the vacant subject position.

A careful comparison of the above account with the lexical analysis in (5) reveals a crucial difference centering on the passive verb’s subject. Under the syntactic analysis, the identity of the subject’s thematic role is altered by the syntactic derivation, whereas under the lexical analysis, the link between thematic role and subject is already specified in the lexicon prior to insertion into the syntactic structure. The next section presents an argument for the lexical analysis based upon a demonstration that the subject argument is already specified in the verb’s lexical entry.

3.2 The lexicality of relation changes

In English there is evidence that passivization is a lexical relation change, not involving syntactic transformations, in that it can feed lexical processes of derivational morphology (Bresnan 1978). The argument is quite straightforward. We make the initial assumption – a standard assumption in morphology – that word

---

3 The following analysis is based on Bresnan (1982c) and Levin and Rappaport (1986). See these works and Ackerman and Goldberg (1996) for fuller references.
formation processes such as derivation, compounding, and conversion are morpholexical and not syntactic, and that the inputs to these processes are also morpholexical and not syntactic.\textsuperscript{4} Then we observe that in many languages passivization, causativization, and other relation-changing processes are inputs to lexical processes of derivational morphology such as nominalization, adjective formation, and compounding. It is not just the verb forms that are inputs to the lexical processes, but all of their attendant syntactic effects such as changes in transitivity. To maintain the syntactic derivation of passives or causatives by transformational movements, one must either duplicate these processes in the lexicon, an undesirable loss of generalization (as Bresnan 1982c argues), or else reconstruct lexical morphology in the syntax, contrary to our initial assumption.\textsuperscript{5} We will work through this argument step by step, starting with the forms of passive verbs and the basic distinction between adjectives and verbs; then we explain how, in the conversion of the participle forms of verbs to adjectives, the arguments of the verb being converted remain the same. This suggests that the passive form’s argument structure is present within the lexicon before insertion into the syntax.

\subsection{3.2.1 English passive verb forms}

The passive verb form in English is the past participle. Only the active verb stem can be inflected for tense, since participles are tenseless verb forms. This morphological peculiarity entails that in tensed constructions, passivized verbs will occur only with tense-bearing verbs that can take participial complements, such as get (John just got handed a can of worms), have (We had the agents sent phony passports), keep (She keeps her library painted a dark burgundy color), or be (John was handed a book). The participle predictably appears without an auxiliary verb in tenseless constructions, such as relative adjuncts (Anyone handed a can of worms should drop it) or clausal adjuncts (Handed a can of worms, John dropped it).

\subsection{3.2.2 Adjectives versus verbs}

First, English has verbs and adjectives as distinct categories, which display different morphological and syntactic properties. For example, adjectives but not verbs can be negated by \textit{un-} prefixation (see (6a)). (There is a separate verbal prefix \textit{un-} in \textit{untie}, \textit{unlock}, which reverses the action denoted by the base verb, rather than simply negating it.) Adjectives but not verbs can be prenominal modifiers

\textsuperscript{4} This assumption is a weak version of the lexicalist hypothesis, which is discussed further in Chapter 6.

\textsuperscript{5} This is indeed the move taken by distributed morphology, which does not share the morphological assumption noted above. Distributed morphology assumes that all morphological processes are syntactic, or at least nonlexical, since the theory postulates that there is no lexicon (Halle and Marantz 1993; Marantz 1997; Embick and Noyer 2007; Siddiqi 2009).
Lexicality and Argument Structure

(see (6b)). Adjectives but not (transitive) verbs resist direct NP complements (see (6c)). Adjectives but not verbs can head concessional relative phrases beginning with however (see (6d)).

(6) a. un- prefixation: happy/unhappy, clear/unclear, *untouch, *ungo
b. prenominal modifiers – A N vs *V N: my supportive mother vs *my support mother
c. *[A NP]_AP vs [V NP]_VP: *supportive my daughter vs support my daughter
d. however AP vs *however VP: however supportive of her daughter she may have been vs *however supporting her daughter she may have been

3.2.3 Participle–adjective conversion

Second, English has a general morphological process of participle–adjective conversion, which enables all types of verbal participles to be used as adjectives:

(7) a. present participles: a smiling child, a breathing woman, the boring story
b. perfect participles: a fallen leaf, an escaped convict, wilted lettuce
c. passives: a considered statement, the spared prisoners, an opened can

By the tests in (6), these converted participles are adjectives and not verbs. They appear prenominally, as in (7), and show other evidence of being adjectives:

(8) an unconsidered statement, however considered her statement may be been, unwilted lettuce, unbreathing

See Bresnan (1982c) for discussion and analysis of more complex examples such as rummaged around in.

3.2.4 Passive participles convert to adjectives

Third, passive verb forms, being verbal participles, also undergo conversion to adjectives, as in (7c). As evidence for this conversion, the adjectival passives

---

6 Maling (1983) gives a very useful critical discussion of the criteria for syntactically categorizing adjectives. She shows that some ostensibly syntactic criteria depend on semantics or syntactic functions, and that “transitive” adjectives having direct NP complements are extremely rare in modern English, but do occur as a vestige of historical changes.
show the full range of passive participle morphology that we find with passive verbs:

(9) | Verb | Participle | Adjectival passive  
--- | --- | ---  
sing | sung | an unsung hero  
fight | fought | hard-fought battles  
write | written | a well-written novel  
give | given | a recently given talk  
consider | considered | an unconsidered action  
inhabit | inhabited | an uninhabited island  
break | broken | my broken heart  
split | split | split wood  

It may be thought that, rather than having participles convert to adjectives, there is a two-step process whereby the active verbs change to adjectives and then the adjectives passivize. However, if there were a separate morphological rule of “adjectival passivization” alongside verbal passivization, these morphological parallels would be an unexplained accident. Further evidence comes from the fact that complex passives consisting of a passive verb and a following preposition may also undergo conversion:

(10)  
|  |  
--- | ---  
a. After the tornado, the fields had a marched through look.  
b. Each unpaid for item will be returned.  
c. You can ignore any recently gone over accounts.  
d. His was not a well-looked on profession.  
e. They shared an unspoken, unheard of passion for chocolates.  
f. Filled with candy wrappers and crumpled bills, her bag always had a rummaged around in appearance.  

But exceptions to complex passivization are also exceptions to the adjectival passive:

(11)  
|  |  
--- | ---  
a. *The twin is looked like by his brother.  
b. *a looked-like twin (cf. like-minded)  

(12)  
|  |  
--- | ---  
a. *No reason was left for.  
b. *The left-for reason (cf. each unpaid-for item)  

Again, this fact would remain unexplained if there were a separate rule of adjectival passivization alongside verbal passivization. For more detailed discussion of prepositional passives and their treatment in LFG, see Bresnan (1982c), Lødrup (1991), Alsina (2009), and Findlay (2014).

---

7 A few adjectives such as drunken reflect conversions of older participial forms not in current use.
3.2.5 Differences between adjectival and verbal passives explained

Certain differences between adjectival and verbal passives have a natural explanation on this theory. As noted above, English adjectives cannot take NP complements, but require a mediating preposition (see (6c): *she is supportive her daughter, but she is supportive of her daughter). Therefore, adjectival passives of ditransitive verbs are more restricted than verbal passives. When one of two NP objects is expressed as the passive subject of a verb, the other can remain as a complement of the verb as in (13b), but as a bare NP it cannot be the complement of the converted adjective, as shown in (14b). Hence, when the NP complement is required by the passivized verb, the corresponding adjectival passive will be ill-formed. This observation explains the contrasts in (13) and (14): 8

(13) a. The car was recently sold (to the first customer). V PP
    b. The first customer was recently sold *(the car). V DP

(14) a. The car remained unsold (to the customer). A PP
    b. *The customer remained unsold (the car). *A DP

Bresnan (1982c) originally attributed this contrast to the theme subject condition – the subject of predication of an adjective must be a theme – but in fact it already follows from the LFG principle of completeness discussed in Chapter 4.

Furthermore, when the passivized ditransitive verb does not require an NP complement, the adjectival passive is allowed:

(15) a. New skills were taught (to the children).
    b. The children were taught (new skills).
    c. The prisoners were spared (execution).

(16) a. untaught skills
    b. untaught children
    c. the spared prisoners

This generalization was observed by Levin and Rappaport (1986, p. 631) and dubbed the “sole complement constraint” (SCC): 9

---

8 The notation “*(...)*” indicates that the parenthesized material cannot be omitted, while “*(...)*” means that the parenthesized material cannot be present.
9 Their formulation is: “An argument that may stand as a sole NP complement to a verb can be externalized by APF [Adjectival Passive Formation].”
Lexicality and Argument Structure

The sole complement constraint:
Only an argument that may stand as a sole NP complement to a verb can become the subject of predication of an adjectival passive.

The SCC already follows from the conversion analysis of Bresnan (1982c), without any extra condition.

Finally, when the passivized verb requires a PP complement, the adjectival passive may be well-formed, but it cannot occur in prenominal position because of the generalization that nominals and the heads of their modifiers must be adjacent (Maling 1983) – a yellow book, *a yellow with age book, a book yellow with age: 10

(18) a. The pillows were being stuffed (with feathers).
    b. The feathers were being stuffed ??(into their pillows).

(19) a. stuffed pillows
    b. ?? stuffed feathers
    c. feathers [still unstuffed into their pillows] Ap

A context in which the last example (19c) might be used naturally is the following:
I walked into the room looking for my sister, who works as a freelance pillow-stuffer. She was nowhere in sight, but there were pillows on the floor, half-stuffed pillows on the tabletop, and on a long counter I beheld heaps of feathers still unstuffed into their pillows. The generalization underlying these facts (which is observed by Hoekstra 1984 and Levin and Rappaport 1986) is that the absence of a required syntactic complement leads to a violation. This follows from the completeness principle of LFG, which states that lexical argument specifications must be satisfied (see Section 4.7).

Thus, there is no need to postulate a separate rule of adjectival passivization in addition to verb passivization to explain the above differences between adjectival and verbal passives: the differences as well as the similarities follow directly from the lexical morphological process of participle–adjective conversion together with general syntactic properties of adjectives and verbs in English. We need only assume that passivized verbs are available lexically to be converted.

3.2.6 Differences between adjectival and verbal passives unexplained

However, the present account is not sufficient. There are further differences between the verbal participles and converted adjectives that are not yet explained

10 Recall from footnote 8 that the notation “??(...)” means that the sentence is ill-formed or very questionable when the parenthesized material is omitted.
Lexicality and Argument Structure

(Wasow 1977; Bresnan 1982c). First, verbal passives can be formed from idiom chunks, but adjectival passives cannot:

(20) a. Advantage was not taken of my presence. (idiomatic)
    b. *untaken advantage (cf. untaken seats) (not idiomatic)

Second, some verbs such as thank have a verbal passive but no adjectival passive:

(21) a. We were thanked by our friends.
    b. *a thanked person

Third, intransitive verbs have past participles which undergo adjective conversion only in some cases:

(22) a. wilted lettuce lettuce that has wilted
    elapsed time time that has elapsed
    an escaped convict a convict who has escaped
    b. *the run child the child who has run
    *an exercised athlete an athlete who has exercised
    *a flown pilot a pilot who has flown
    *a recently left woman a woman who has left recently

Nothing in the above account explains this.

These further restrictions suggest that we must take into account the semantics of adjective conversion. It is clear that adjective conversion in general denotes a state derived from the semantics of the base verb. In the case of the past participles, the early LFG attempt to characterize the semantics was the theme subject condition (Bresnan 1982c): the participles that do convert, as in (22a), have a theme subject, while those that do not, as in (22b), have an agent subject. This explanation is problematic in that it is not obviously applicable to examples like (16a,b) untaught skills/children, where two distinct arguments must then be analyzed as themes (as pointed out by Levin and Rappaport 1986). It may appear that the acceptable examples in (23a) involve unaccusative verbs, while the unacceptable ones in (22b) involve unergative verbs (as suggested by Levin and Rappaport 1986, 1989). But we will see presently that that generalization is not accurate.

11 Intransitive verbs are often classified into “unaccusative” or “unergative” depending on whether their subjects share properties of transitive objects or transitive subjects. In Levin and Rappaport’s (1986) terms, “unaccusative” verbs have only an internal theta role to assign, while “unergative” verbs have only an external theta role to assign. The latter can be distinguished by their ability to occur in the -way-construction (e.g. Fred danced his way into the kitchen, with unergative dance, but *Fred arrived his way into the kitchen, with unaccusative arrive). See Bresnan and Zaenen (1990) and Chapter 14 for analysis of this classification in LFG.
Instead, a more adequate semantic account is readily available. Developing that semantic account will allow us to simplify the syntactic part of the account. The state denoted by the adjective appears to be the result state of the eventual-ity denoted by the past participle (Langacker 1991, pp. 202–203; Parsons 1990, p. 236; Levin and Rappaport 1989). The change of state can be involuntary, as with wilting, but even highly volitional eventualities, such as having escaped, can entail result states, such as freedom. Because the activity of running lacks an inherent result state, it is strange to say a run child. But when the goal is supplied to the activity, a result state is defined, and now conversion is possible (a run-away child). Similarly with other activities, such as exercising, flying, or traveling: when a goal or limit of some sort is supplied, a result state is defined and conversion is possible. Thus, the converted adjectives of the following past participles are all possible:

(23)  a run-away slave  a slave who has run away
      an over-exercised athlete  an athlete who has exercised overly
      a flown-away bird  a bird that has flown away
      the widely-traveled correspondent  the correspondent who has traveled widely

Verbal meanings having such an end-point or result state are often called “telic,” and are identifiable by a variety of tests such as the ability to take bounding temporal adverbs such as in an hour (Vendler 1967; Dowty 1979).

The same semantic generalization suggests that *a thanked person will be ill-formed, because there is no salient result state defined by the process of thanking. Similarly, the complex predicates consisting of verb and noun combinations like take advantage of do not define a result state of the internal noun (e.g. advantage) which forms part of the idiom. Following are more examples showing that agentive unergative verbs can be sources for such adjectives, as long as the semantic conditions are satisfied:

(24)  a well-prepared teacher  a teacher who has prepared well
      a confessed killer  a killer who has confessed
      a recanted behaviorist  a behaviorist who has recanted
      (un)declared juniors  juniors who have (not) declared [majors]
      a practiced liar  a liar who has practiced
      an unbuilt architect  an architect who has not built [buildings]

Verbs like confess, recant, and declare designate verbal actions that change one’s moral, legal, or administrative status. These are strongly unergative verbs by tests proposed by Levin and Rappaport Hovav (1995) (see footnote 11):

(25)  a. He confessed his way out of trouble.
       b. He recanted his way into acceptance by the functionalists.
       c. She declared her way from science into art.
Build is another verb that results in a change of status (e.g. for an architect): He built his way to fame.12

Note finally that it is important not just that the adjectival passive’s verbal base be telic (that is, have an end-point or result state), but that it predicate a result state of its subject. Give up, for example, is telic, to judge by the typical aspectual tests using bounding temporal adverbs proposed by Vendler (1967) and Dowty (1979):

(26) I gave up in a minute/for an hour.

Yet the end-point state of giving up – being relinquished – is not predicated of the subject in (26); it applies only to what is given up, the unspecified object. Hence the adjectival passive of given up has only the passive reading in (27a), not the perfect intransitive reading in (27b):

(27) a. *given up students
b. given up hopes for success

The semantic concept of result state thus suffices to explain some of the restrictions on adjectival passives that have been observed; but it is not the only condition: Ackerman and Goldberg (1996) show that there is a general pragmatic condition of informativeness at work as well. The following examples (from Adele Goldberg, personal communication) are adjectival passives based on atelic verbs, both activities as in (28) and states as in (29):

(28) long anticipated event
    much hoped for consequences
    much talked about idea
    strongly backed candidate

(29) much-loved doctor
    much-feared consequence
    communally owned property
    despised politician
    highly acclaimed actor
    well-known performer

Most of these examples require adverbial modification to be felicitous (cf. a talked about idea, a backed candidate, owned property). The adverbial modification increases the informativeness of the attribute and thus its acceptability.

12 Caroline Heycock (personal communication) has suggested that an unbuilt architect might be used analogously to an unplayed composer, where the person is substituted metonymously for the works of the person. Certainly, They never play that composer any more involves this transfer, but the parallel They never built that architect sounds somewhat odd. That architect has never built (anything) is easily interpreted as meaning that he has never had his designs built; this would be the hypothesized source of the perfect intransitive.
Pragmatic informativeness and the semantic result-state condition are members of what may be a family of sufficient (but not necessary) conditions on the use of adjectives.

In sum, both present and past participles in English undergo conversion to adjectives (recall the examples in (7)). The past participles may be active or passive, unaccusative or unergative, so long as they satisfy the complement restrictions on adjectives (no DP complements) and the semantic/pragmatic conditions on adjectival states. There is no morphological rule of “adjectival passive” alongside a syntactic passive. There is only the verbal passive, a lexical relation change which may feed the general lexical morphological process of participle–adjective conversion. A simple generalization applies to all participle–adjective conversion: the adjective preserves the subject of predication of its verbal base.

### 3.2.7 Conclusion: passivization is lexical

Now let us return to the argument for the lexical analysis of the passive, introduced in Section 3.1 above. Recall the crucial difference between the lexical and syntactic analyses of passive: only in the lexical analysis is the subject of the passive verb identified in the verb’s lexical form (see (5) above). In the syntactic analysis, the subject of the passive verb is an underlying object; hence the lexical entry specifies this semantic role as expressed by the verb’s object. The point of the syntactic analysis is to derive that argument’s subjecthood through an operation in the syntax. But we just saw that the subject of the passive verb is preserved under conversion to an adjective. Since participle–adjective conversion is a lexical process, it follows that the subject must already be identified in the lexical information associated with the passive verb form, thus providing strong support for the lexical analysis.

The hypothesis, then, is that English adjectival passives are just morphological conversions of lexically passivized verbs subject to the additional syntactic and semantic restrictions of adjectives. Not only may passive verbs be converted to adjectives, but so may other intransitive verb participles that meet the same conditions, as we saw in (7). The conversion analysis therefore has greater explanatory value than the earlier idea that there are distinct syntactic and adjectival rules of passivization in English (see Wasow 1977 for an early articulation of such a dual passive analysis). The conclusion that passivization itself must be a lexical process has now been widely adopted in lexicalist constraint-based theories. (See Bresnan 1978 and Mchombo 1978 for early lexicalist statements of this argument.)

### 3.3 Passivization with and without movement

In LFG, relation changes are thus lexical alternations in predicate–function mappings. How can such lexical alternations bring about syntactic movements? In
Lexicality and Argument Structure

LFG, relation changes induce syntactic changes in forms of expression through the general principles of completeness and coherence, which require that the functions required by each predicate match those instantiated in the c(ategorial)-structure (Chapter 4). To see informally how lexical relation changes can induce syntactic changes, let us compare the passive in Malayalam (a Dravidian language spoken in southern India) with that in English.¹³

Malayalam has both active and passive verb forms, which show the relation change given in (5). The passive verb form consists of a verb stem together with the suffix -appet. Both the active and passive verb stems undergo further inflection for tense. Mohanan (1982b) gives a variety of arguments that the Malayalam simple sentence has a nonconfigurational structure, lacking a VP, and that the noun phrases can occur in any order before the verb or, with marked intonation, after the verb. Malayalam uses case morphology to specify grammatical functions. For example, a nominative case-marked NP can be either a subject or an inanimate object; an accusative case-marked NP must be an animate object.

The principles of completeness and coherence ensure that both the active and passive verb forms occur with NPs of the required cases (in any order). Compared with an active sentence, a passive sentence will show changes in transivity and the cases of the NPs satisfying the argument roles of the verb, but no changes in the possible structural positions of these NPs. This is illustrated in (30) and (31). The order of NPs in the Malayalam sentences of these examples is freely interchangeable: only the case-marking of the NPs and the suffixation of -appet to the verb mark the passive construction:¹⁴

(30) PRED ‘worship (<f SUBJ) (<f OBJ)>’
      SUBJ
      OBJ
      ...
      PRED ‘child’
      CASE NOM +
      ANIM +
      ...
      PRED ‘elephant’
      CASE ACC +
      ANIM +
      ...
      S
      NP
      NP
      V

child.NOM aanaye aaɾaɾadiccu

“The child worshipped the elephant”

¹³ The analysis of Malayalam presented here is based on Mohanan (1982b).
¹⁴ See Section 4.6 for further discussion of the specification of PRED values.
In Malayalam, then, the syntactic effects of the passive are found in case alternations rather than word order differences. These effects follow from the syntactic typology of the language (nonconfigurational dependent-marking; see Chapter 6) together with the universal principles of completeness and coherence. There is no syntactic derivation of the passive from the active.

The English simple sentence has a more hierarchical structure and rigid word order than that of Malayalam, and the grammatical functions are largely determined by the endocentric principles of Chapter 6. In English the subject NP is usually preverbal, while the object NP is postverbal within the VP. The oblique functions of English are expressed by prepositional phrases, whose prepositions can be used analogously to case markers in certain instances. In particular, the preposition by carries a case feature associated with the obl

Given the configurational typology and directionality parameters of English phrase structure, the same principles of completeness and coherence will induce rather different syntactic effects from the same lexical active/passive alternation that we saw in Malayalam. Compared with an active sentence, a passive sentence will show changes in the position of the NPs associated with the argument roles of the verb. In particular, the argument role that is associated with the object function in the active lexical form of the verb will be associated with the subject function in the passive lexical form of the verb. Since the object NP follows the verb and the subject NP precedes the verb, the NP expressing this role will appear to shift positions from the active to the passive. In addition, in a tensed sentence, the passive participle must appear as the complement to another verb such as be that can carry the necessary tense feature. These structural differences are illustrated in (32) and (33). Example (32) shows the c- and f-structures for an English active sentence corresponding to the Malayalam active example (30):
The careful reader may note that the English f-structure arguments differ from those of Malayalam in the attributes illustrated: the Malayalam arguments shown in (30) and (31) have case and anim features, for example. In general we will illustrate only those f-structure features which are both marked in the language and relevant to the point discussed in the text. Example (33) shows the c- and f-structures for an English passive sentence corresponding to the Malayalam passive example (31):
Thus, the apparent syntactic movement in English passivization is induced by the c-structure typology of English interacting with the principles of completeness and coherence. The lexical active–passive alternation preserves the syntactic patterns of structural form in English just as in Malayalam. There is no syntactic derivation of passives to change the grammatical functions of the arguments. The idea that passivization involves a syntactic transformation moving an NP (or a DP) in a sentence from the object position to the subject position is (from the vantage of LFG) an illusion, an epiphenomenon of the lexical alternation.

Further reading and discussion

The same argument that Bresnan (1978) made from English evidence is made from Bantu evidence by Mchombo (1978) and Alsina (1990, 1999): passivization is a lexical relation change, not a syntactic transformation, and as such it can feed lexical processes of derivational morphology – in this case, deverbal nominalizations. See also Alsina and Mchombo (1990), Alsina (1992), Bresnan and Mchombo (1995), and Mugane (1996).

If the general analysis given above is correct, then we can tell what must be involved in the relation change of passivization. It cannot involve the syntactic movement of an NP from an underlying transitive tree structure (3), where it receives an “internal” theta role, to an external position as subject, as assumed by Levin and Rappaport (1986). Because the adjectival passive is a lexical formation of derivational morphology, and not a transformational derivative of syntax, its internal role cannot be “externalized” by such a movement. Levin and Rappaport (1986, p. 654) propose that adjective conversion itself externalizes an internal role of the base verb. But this lexical process of adjectival externalization (or relation change) simply duplicates the effect of the syntactic externalization with passive verbs – precisely the analysis of adjectival passives that were originally shown to lose generalizations (Bresnan 1982c). To solve this problem, Levin and Rappaport (1986) propose that the externalization of the internal role required by adjectival passives can be derived from a single general fact about adjectives: all adjectives must assign an external role. This is independently motivated by examples like (20) *untaken advantage.

Now if all that is required is that an adjective assign an external theta role, then the “unergative” verbal argument structures that deverbal adjectives may inherit should be fine (as in (24)). These verbal argument structures have an external role as their only role. But what then happens when an “unaccusative” or passive verbal argument structure is inherited by a deverbal adjective? By Levin and Rappaport’s (1986) framework of assumptions, these verbs have only an internal role and no external role to assign. By hypothesis, these verbs project direct object NPs (or DPs) at a level of underlying syntactic structure prior to
Lexicality and Argument Structure

movement. If their internal arguments remain unexternalized inside the adjective, then the result will be ruled out by the general syntactic principles assumed by Levin and Rappaport (the theta criterion, the projection principle, case theory). So if all that is required were that adjectives assign an external theta role, we might well expect that adjective conversion could apply only to unergative perfect participles of verbs, and that adjectives based on passives and unaccusatives would be ungrammatical, contrary to fact.\(^\text{16}\)

To solve this problem, we could propose that it is a general property of adjectives not just that they assign an external role, but that they externalize an internal role – i.e. that they are all unaccusative. This is obviously false for converted present participles. (The language of invective is rich with them, e.g. *a lying, cheating, thieving coward.*) But even if we restricted the externalization proposal to just the past participles (the passives and perfects), we still could not explain the unergative examples in (24).

Yet another transformational approach would be to posit NP movement in parallel for both adjectives and verbs. That is, suppose that unergative subjects of adjectives are base-generated in the subject position, while unaccusatives and passives are base-generated as complements of the adjective and move to the subject position, exactly paralleling verbal structures. This would require a trigger for movement that applies across the two categories (for example, this movement may be forced by the need for a surface subject; cf. the extended projection principle). But even assuming that such a trigger can be motivated, this transformational account runs into empirical problems with noun–participle compounding. Synthetic noun–participial–adjective compounds such as *man-eating* and *home-grown* are conditioned by a constraint that the compounded noun cannot fill the subject role of the participle (Roeper and Siegel 1978; Bresnan 1982c, p. 32ff.). Thus, in the compound *book-chewing*, the noun *book* fills the object role of *chewing*: a *book-chewing dog* is a dog that chews books. The noun *snow* in *snow-covered* fills an oblique role: a *snow-covered mountain* is a mountain that is covered by snow (or with snow). But *snow-fallen mountain* violates this condition, since the noun *snow* would be the subject of the corresponding sentence, *Snow has fallen on the mountain*. This constraint applies to adjectives derived from actives (such as *chewing*) and passives (such as *covered*) alike. Assuming that compounds are formed in the lexicon, this anti-subject condition must apply to the adjectival stem prior to compounding, showing again that the subject role is already specified in the lexical entry, and not derived through movement in the syntax.

Thus, the idea that argument structure projects or can be identified with an initial level of syntactic tree structure, to which argument-moving transformations apply, inevitably leads to losses of generalization. At that level, the subjects of

---

16 Levin and Rappaport (1986) actually rule out the possibility of grammatical examples like (24) by analyzing the adjectival perfect participles as being derived by the passive morpheme, which must suppress an external argument.
unergatives and the underlying objects of passives and unaccusatives have nothing in common. So it is not the process of adjective conversion but the base passive or unaccusative verb itself that must “externalize” its argument role, allowing it to be associated with the subject of predication. But this means that the relation change involved in passivization must itself be lexically available to processes of derivational morphology. It cannot be the result of syntactic movements on underlying tree structures.
Part II

Formally Modeling the Architecture

Introduction

Part I provided empirical motivation for the relational architecture of universal grammar incorporated in the design of LFG. This design hypothesizes formally distinct types of parallel structures flexibly related by correspondence mappings. In Part II these intuitive ideas are made precise through the presentation of a mathematical model of the LFG architecture (Dalrymple et al. 1995).

All formal models require a certain simplicity to be both mathematically expressible and understandable, and for this reason they are inevitably crude and oversimplified (“idealized” is the term of choice) compared with the empirical reality they model. Nevertheless, a formal model offers to both the descriptive and the theoretical linguist the advantages of amplifying, extending, and clarifying the analytic imagination. The radically different formal architecture of LFG provides a true alternative perspective on syntactic theory and the nature of universal grammar.

Note, however, that the formal model of LFG is not a syntactic theory in the linguistic sense. Rather, it is an architecture for syntactic theory. Within this architecture there is a wide range of possible syntactic theories and subtheories, some of which closely resemble syntactic theories within alternative architectures, and others of which differ radically from familiar approaches. Specific (sub)theories to be discussed in subsequent chapters include extended X’ theory, the lexical mapping theory, pronominal binding and control theories, and a theory of agreement.

The reader who is not interested in the formal system may wish to skip Part II, but the theorist who wishes to gain a deeper understanding of the LFG
architecture – and the kinds of relations, analyses, and information flow expressible within it – is encouraged to study Chapter 4 at least through Section 4.7. (Sections 4.8 and 4.9 can be returned to when required, as formal background for Chapter 9.) At the end of this and other parts of the book, the reader is directed to solve specific problem sets. These all presuppose knowledge of the formal model and the syntactic calculus.
4 A Formal Model of Syntactic Structure

In this chapter the original c-structure to f-structure correspondence of LFG is defined. Argument structure, which was subsequently integrated into the mathematical model, is deferred until Chapter 14.

4.1 Design principles

The formal model of LFG embodies three general design principles: variability, universality, and monotonicity.

4.1.1 Principle I: variability

The modes of expression of a language have a structure which we have called the “expression structure” or external structure. This is the structure that is organized for expression, its form determined by generalizations about the order, pronunciation, and form of words and their grouping into phrases of the language. The principle of variability states that external structures vary across languages. The formal model of external structure in LFG is the c-structure, which stands for “constituent structure” or “categorial structure.” Sentences and phrases have constituent parts that can be ordered by precedence, dominance, and structural type; that is, they have c-structures. Fully inflected words are the terminal elements of the c-structures of sentences, and every word belongs to exactly one node (i.e. there is an injection from words to c-structure nodes). This restricted relation between c-structure and word structure, often referred to as lexical integrity, in fact gives rise to much of the variability of c-structures across languages, as we will see in Part III.
A commonly used representation of c-structure is the context-free phrase structure tree, defined by context-free phrase structure rules augmented by regular expressions.\(^1\) Examples are \(S \rightarrow \text{NP VP}\) (for English) and \(S \rightarrow X \text{ Aux } X^*\) (for Warlpiri), where “\(X\)” stands for any constituent type. This representation is mathematically and computationally well understood, and for these reasons has been incorporated within the simple formal model. More sophisticated and principled theories of c-structure based on extended X’ theory, with its projections of both lexical (XP) and functional (FP) categories, have been adopted elsewhere in LFG (Part III). From a formal point of view, however, these serve merely to restrict the class of possible c-structures. Hence nothing is lost for present purposes in presenting the formally simplest model.

### 4.1.2 Principle II: universality

The internal structure of a language is where the grammatical relations are represented, how syntactic functions are associated with semantic predicate argument relations. Syntactic functions are equivalence classes of forms of expression that behave alike under the mappings to argument structure. The internal structure is reflected in phenomena such as case government, pronominal binding, and agreement relations among the predicants and arguments of a sentence. The principle of universality states that **internal structures are largely invariant across languages.** The formal model of internal structure in LFG is the f-structure, which stands for “functional structure.” The concepts of “subject” (subj), “object” (obj), “predicant” (pred), etc. appear at this level, because unlike NP, VP, V, etc. they abstract away from expression in terms of external order and category by taking as equivalent all those expressions that behave alike under the mappings to argument structure.

**Note:** In addition to c-structure and f-structure, LFG postulates an a-structure, as discussed in previous chapters and Part IV, and other dimensions of grammatical structure such as prosodic structure\(^2\) and semantic structure\(^3\). The external structure and the internal structure are different but parallel syntactic structures. It has been observed empirically that the units postulated for each structure do not in general converge. There are mismatches in category and configuration, as

---

\(^1\) Regular expressions are formed with the boolean operators (AND, OR, and NOT), together with the Kleene star operator \(S^*\), which forms the set of all strings created by concatenation of elements of \(S\), including the empty string, and the Kleene plus operator \(S^+\), which forms the set of all strings created by concatenation of elements of \(S\), but excluding the empty string.


\(^3\) Semantic structure was first introduced in detail in Dalrymple (1993). Subsequent work on semantic structure in LFG has primarily been within the glue semantics framework; see Dalrymple (1999, 2001), Dalrymple and Nikolaeva (2011), Asudeh (2004, 2005a,b, 2006, 2012), and references therein.
discussed in previous chapters and the references cited there. For this reason we do not label these units within a common vocabulary such as NP, VP, V, etc. In LF\(G\) the internal structures are formalized as f-structures, which express universal grammatical relations in a theoretical vocabulary disjoint from that of external structures. The f-structure features of case, pers, num, and the like are also disjoint from the expressions that mark these features (which are often morphological but may be syntactic, as in case clitics or number particles). Thus \([\text{case acc}]\) is an abstract feature quite distinct from an accusative case marker, and there need not be a one-to-one correspondence between the two, as discussed in Wierzbicka (1981).

### 4.1.3 Principle III: monotonicity

There is a very appealing idea that the internal structures of language should somehow be “transparent” in the external structures of language. This idea has been motivated by the \textit{a priori} problem of language acquisition: how could children acquire human languages otherwise? The most obvious conception of transparency is the idea that the internal and external structures must have the same form, which is embraced by the configurational design of universal grammar. Of course, this condition is not \textit{necessary} to solve the problem of language acquisition, for any sufficiently predictable relation between the internal and external structures could provide just as plausible (or implausible) a solution. But it is this condition that has led (in the configurational design of universal grammar) to the attenuation of the classical properties of constituency (order, substitutability, relation to pronunciation) and to the concomitant adoption of increasingly abstract surface structures, which serve as a disambiguated representation of the meaningful internal grammatical relations. The semantically relevant information contained in the representations of internal structures is projected into the structural form of the representations of external structures. The problem is that, given principle II, this conception of transparency implies that the form of external structures is universal across languages, contradicting principle I. Constituent structure form is simply not the same in all languages; some make breathtakingly little use of it, compared to English. In LF\(G\) the correspondence mapping between internal and external structures does not preserve sameness of form. Instead, \textbf{it is designed to preserve inclusion relations between the information expressed by the external structure and the content of the internal structure}. In a sense to be made precise in Chapter 5, it has the mathematical property of monotonicity. As we will see, partial information about the abstract internal structure is locally distributed across the expression structure in such a way that the global internal structure can be inferred from the parts of the expression in any order. This property relies on the fact that the correspondence between c-structures and f-structures in LF\(G\) is a piecewise monotonic function. This property is very simple to understand once the basic concept of f-structures and their formal relation to c-structures have been developed.
4.2 The definition of f-structures

An example f-structure is given in (1). For the moment, we omit the internal structure of the preds:

(1)  **F-structure of** ‘Lions live in the dark, scary forest’

```
[ PRED 'live(...)' ]
[ TENSE PRES ]
[ SUBJ [ PRED 'lion' ]
  [ NUM PL ]
  [ PRED 'in(...)']
  [ CASE LOC ]
[ OBL_loc [ PRED 'forest' ]
  [ OBJ [ DEF +
    [ ADJ [ PRED 'dark'], [ PRED 'scary'] ] ] ]]
```

Mathematically, an f-structure is a finite set of pairs of attributes and values:

(2) \[
\begin{array}{c}
\text{attribute}_1 & \text{value}_1 \\
\text{attribute}_2 & \text{value}_2 \\
\vdots & \vdots \\
\text{attribute}_n & \text{value}_n \\
\end{array}
\]

Hence, the order of f-structure elements is not important, and the axioms of set identity apply. The elements are defined as follows:

- An attribute is a symbol, e.g. **SUBJ**, **TENSE**, **NUM**, **PRED**.
- A value can be
  - a symbol (e.g. **PL**), or
  - a semantic form (a complex symbol in single quotes, e.g. ‘lion’), or
  - an f-structure (e.g. the value for **SUBJ** in (1)), or
  - a set of f-structures (e.g. the value for **ADJ** in (1)).

Note that symbols are simply strings of alphanumeric characters unbroken by spaces. The formal architecture allows for complete freedom of choice of symbols: instead of **SUBJ** and **OBJ**, for example, one might prefer **SPEC** and **COMP**, or **A**, **S**, and
o (for transitive subject, intransitive subject, and object, respectively). The choice of symbols and their relations is a substantive issue belonging not to the formal grammars but to a particular linguistic theory of these grammars.

Terminology: A symbol-valued attribute–value pair is called a feature. An f-structure-valued attribute–value pair is called a (grammatical) function. In (1) we see that num, def, case, and tense are feature attributes, while subj, obj, and obj_loc are (grammatical) function attributes. We can refer to an attribute whose value is a semantic form as a semantic feature.

Semantic features have a special property distinguishing them from other features: each instantiation or token of a semantic feature has a unique value. For example, two occurrences of the word lions in the same sentence will have different values of the pred feature, call them ‘lion_i’ and ‘lion_j’. (Ordinarily we suppress the unique indices of semantic forms in our illustrations.)

Thus, f-structures contain (grammatical) functions, and that suggests a reason for the name “functional” structure. But there is another source for the name: an f-structure is a function in the mathematical sense. This follows from the uniqueness condition on f-structures:

(3) **Uniqueness condition:**

Every attribute has a unique value.

Note that different attributes may have the same value. Lines connecting two different attributes to the same value are often used to represent this identity graphically, as in the f-structures in (11b) and (77) below. What the uniqueness condition rules out is a single attribute having nonidentical values:

(4)

\[
\begin{array}{ccc}
\text{att}_1 & \text{val}_1 \\
\text{att}_2 & \text{val}_2 \\
\end{array}
\]

Because an f-structure is a finite function, we can enumerate its arguments and values in tabular form. The boxed graph representation we employ for f-structures reflects this table format. One might prefer a tree representation of f-structures, taking the values as daughters of the attributes:

(5)

```
SUBJ
  |  TENSE  |  PRED
  |  PRED  |  |  |
  |  NUM   |  |  |
  |  ‘lion’|  PL |
```

---

4 A set-valued attribute may also be a grammatical function, e.g. adjunct.
But trees have certain formal properties different from f-structures. For example, their branches are not supposed to join together. Every daughter node in a tree has a unique mother node:

(6) 

\[ S \xrightarrow{\ast} \text{VP} \xrightarrow{\ast} \text{NP} \]

In f-structures the same value may be shared by different attributes, a relation for which trees are not the natural representation. \(^5\)

## 4.3 The description of f-structures

Viewing our example f-structure (1) as a function, we can fully describe it by specifying the value it associates with each argument (attribute): \(^6\)

(7) 

\[
\begin{align*}
 f_1 (\text{subj}) &= f_2 \\
 f_1 (\text{tense}) &= \text{pres} \\
 f_1 (\text{pred}) &= \text{'live (\ldots)'} \\
 f_1 (\text{obl}_{loc}) &= f_3 \\
 f_2 (\text{num}) &= \text{pl} \\
 f_5 &\in f_4 (\text{adj}) \\
 f_6 &\in f_4 (\text{adj}) \\
 \text{etc.}
\end{align*}
\]

The notation for function application in LFG differs slightly from the above, however. For standard mathematical \(f(a) = v\), we write instead \((fa) = v\), moving the left parenthesis outside the function:

(8) 

\[
\begin{align*}
 (f_1 \text{ subj}) &= f_2 \\
 (f_1 \text{ tense}) &= \text{pres} \\
 (f_1 \text{ pred}) &= \text{'live (\ldots)'} \\
 (f_1 \text{ obl}_{loc}) &= f_3 \\
\end{align*}
\]


\(^6\) The last two substantive lines in each of (7) and (8) contain notation for specifying the membership of a set-valued attribute; we return to set-valued attributes in Section 4.9.
Thus \((f_1 \text{ subj}) = f_2\) simply means that the function \(f_1\), applied to the subj argument, has the value \(f_2\). For reasons that will become clear shortly, this alternative notation is easier to interpret.

In general, for any f-structure \(f\), \((fa) = v\) if and only if the attribute–value pair \(\langle av \rangle\) is a member of \(f\). Since an f-structure is a finite set of attribute–value pairs, any f-structure can be completely described by a finite set of functional equations of this form, called a functional description (f-description). It is straightforward to reconstruct a functional structure from its functional description by forming the minimal set of attribute–value pairs that satisfy the functional description.

The language of functional descriptions is based on this underlying mathematical conception of f-structures as functions. For example, since the value of an attribute for a given function \(f_1\) can be another function \(f_2\), we can write (9b) for (9a):

\[
\begin{align*}
(9) & \quad \text{a. } (f_1 \text{ subj}) = f_2 \\
& \quad (f_2 \text{ num}) = \text{PL} \\
& \quad \text{b. } ((f_1 \text{ subj}) \text{ num}) = \text{PL}
\end{align*}
\]

For a chain of such function applications \(((f_1 a_1) a_2) a_3 = v\), we write \((f_1 a_1 a_2 a_3) = v\), omitting the inner parentheses.

Since in any functional equation \((fa) = v\), \(f\) must be a function, \(a\) must be a symbol, and \(v\) must be a symbol, semantic form, f-structure, or set, we can use function-valued descriptions in place of \(f\), symbol-valued descriptions in place of \(a\), and symbol-, semantic-form-, f-structure-, or set-valued descriptions in place of \(v\). Thus the following functional equations are all meaningful, and describe the f-structures given in (11 a–c), respectively:

\[
\begin{align*}
(10) & \quad \text{a. } (f_1 \text{ subj num}) = \text{SG} \\
& \quad (f_1 \text{ subj}) = (f_1 \text{ xcomp subj}) \\
& \quad (f_2 (f_5 \text{ case})) = f_5, \quad (f_5 \text{ case}) = \text{obl}_g
\end{align*}
\]

---

7 This equation is read “\(f_i\)’s subj equals \(f_2\).”

8 In (10a) the equation \((f_1 \text{ subj num}) = \text{SG}\) is read “\(f_i\)’s subj’s num equals SG.” Example (10c) may look like a formal oddity: why would we want to identify an attribute with a value? This formal possibility was invented for the situation in which one might wish to test for the presence of an attribute within a phrase (say a PP), which then can be used to name the whole phrase. For example, the function of a PP might depend upon the type of preposition within it.

9 The function \text{XCOMP} is used for predicate complements; see Section 6.1.
The correspondence between c- and f-structures

The correspondence between a c-structure and f-structure for the sentence *Lions live in the forest* is illustrated in (12). This is a simplified version of the sentence in (1), setting aside the set-valued *ADJUNCT* grammatical function; we return to sets of f-structures in Section 4.9. Note that we simplify matters here by using the category S for the root node; see Chapter 1, footnote 1.

Observe that the correspondence between the nodes of the c-structure and the f-structure is many-to-one. Different c-structure nodes – for example, S, VP, and V – may correspond to the same f-structure. Observe also that the mapping is a piecewise correspondence, in that each node of the c-structure is mapped into an f-structure or subsidiary f-structure.

The mapping shown in (12) is definable by local *codescription* of partial structures, where codescription just means the simultaneous description of more than one structure (Kaplan 1987, 1989). In other words, a description of each piece of the c-structure can be directly associated with a description of part of the f-structure, and conversely. Consider the top piece of the c-structure in (12) and the portions of f-structure corresponding to it, shown in (13):
Let us replace the mapping arrows connecting pieces of the two structures by indices:

\[(14)\]

\[
\begin{array}{c}
S_{f_1} \\
NP_{f_2} \quad VP_{f_3}
\end{array}
\]

The local mother–daughter and sister relations of this partial tree structure can be described in familiar context-free phrase structure rule notation, which can be interpreted as tree admissibility conditions (McCawley 1968). Assuming that each node of that piece of c-structure corresponds to some initially undetermined f-structure, as in (15) –

\[(15)\]

\[
S \rightarrow NP \quad VP
\]

\[f_1 \quad f_2 \quad f_3
\]

– we can describe the effect of the mapping in (14) by means of the functional equations in (16):

\[(16)\]

\[
S \rightarrow NP \quad VP
\]

\[f_1 \quad f_2 \quad f_3
\]

\[(f_1 \text{ SUBJ}) = f_2 \quad f_1 = f_3
\]

(16) is a codescription of the partial c-structure and partial f-structure shown in (14).

Or consider the correspondence between the parts of the initial NP in (14):

\[(17)\]

\[
NP \rightarrow [ ]
\]

Replacing the arrow with the indexed representation, we obtain (18):

\[(18)\]

\[
NP_{f_2} \quad f_2, f_4: [ ]
\]

\[N_{f_4}
\]

Again, we can describe the relation of the partial f-structure to the partial c-structure by assuming the node-to-f-structure correspondences shown in (19) –
– and then specifying the f-structure by means of the functional equation in (20):

\[
\begin{align*}
N \rightarrow N \\
f_2 & \rightarrow f_4 \\
f_2 = f_4
\end{align*}
\]

Again, what we have in (20) is a codescription of two partial structures.

Or again consider the top piece of the VP in the c-structure (12), which corresponds to the partial f-structure shown in (21):

\[
\begin{align*}
\text{(21)} & \\
\text{VP} & \rightarrow \\
V & \rightarrow \\
PP & \rightarrow \\
\text{OBL} & \rightarrow [1]
\end{align*}
\]

The indexed representation is (22):

\[
\begin{align*}
\text{(22)} & \\
\text{VP}_{f_3} & \rightarrow \\
V_{f_5} & \rightarrow \\
PP_{f_6} & \rightarrow \\
f_3, f_5: \text{OBL}_{loc} & \rightarrow [1]
\end{align*}
\]

Once again, assuming the correspondence between the partial c-structure and the initially undetermined f-structures given in (23) –

\[
\begin{align*}
\text{(23)} & \\
\text{VP} & \rightarrow \\
V & \rightarrow \\
PP & \rightarrow \\
f_3 & \rightarrow \\
f_5 & \rightarrow \\
f_6 & \rightarrow \\
f_3 = f_5 & \rightarrow \text{OBL}_{loc} = f_6
\end{align*}
\]

Note on terminology: In each of the examples just given, two c-structure nodes, one of which dominates the other, are mapped into the same f-structure; this is true of V and VP in (21), N and NP in (17), and VP and S in (13). In this situation we
speak of the dominated node as the **functional (f-structure) head** of the dominating node. The f-structure head is a category whose f-structure will be equated with that of its mother category. Functional heads are not always the same as structural heads; for example, two sister categories may be f-structure coheads, while only one of them is a c-structure head, as discussed in Chapter 6.

Notice that phrase structure rules abstract away from the nodes of particular phrase structure trees to give general patterns for describing any tree. Thus, the rule \( S \to NP \ VP \) refers to any node that is labeled \( S \) and asserts that such a node may dominate nodes labeled \( NP \) and \( VP \), the former preceding the latter. But our functional descriptions so far are relative to particular f-structures. Thus, the f-structure names \( f_1, f_2 \), etc. that we used in our examples of codescriptions refer to particular f-structures associated with the nodes of a particular phrase structure tree. In order to use our codescriptions as general mapping rules for the language, however, we need to be able to refer to “whatever f-structure corresponds to this node” (“this node” being any node labeled by one of the symbols on the right-hand side of the c-structure rule), for which we use the symbol \( \downarrow \), and “whatever f-structure corresponds to the mother of this node” (“the mother” being any node described by the left-hand side of the c-structure rule), for which we use the symbol \( \uparrow \).

The symbols \( \uparrow \) and \( \downarrow \) are called **metavariables**, since they are variables over f-structure variables such as \( f_1, f_2 \), etc. So for the three examples of codescription given above, we can now write (25)–(27) below.\(^{10}\)

The equations (\( \uparrow \ \text{subj} \) = \( \downarrow \) and \( \uparrow \) = \( \downarrow \)) are read “up’s subj equals down” and “up equals down,” respectively. Here “up” refers to the f-structure of the mother node, and “down” refers to the f-structure of the annotated node. If we imagine ourselves in the position of the annotated node, looking “up” at its “mother” in the tree, the equations can be given an intuitive interpretation: “the f-structure of my mother’s node has a subj attribute whose value is identified with the f-structure of me” and “the f-structure of my mother’s node is identified with the f-structure of me.” (For now, we assume Det to be the category of “determiners” – definite and indefinite articles and demonstratives; see Chapter 1, footnote 1):

\[
(25) \quad (\uparrow \ \text{subj}) = \downarrow \quad \uparrow = \downarrow
\]

\[
(26) \quad (\uparrow = \downarrow) \quad \uparrow = \downarrow
\]

\(^{10}\) The parentheses around the nodes in (26) and (27) abbreviate two alternative structures, one with the node in parentheses and the other without it.
Representing the rules of codeescription two-dimensionally, as in (25)–(27), gives an intuitive picture of their meaning, with the arrows positioned so as to point to the functionally related nodes. However, the constraints of typography have led to linear representations of the c-structure rules, with the functional schemata placed below the category symbols as in (28)–(30):

(28) \[ S \rightarrow NP \quad (↑ subj) = ↓ \quad ↑ = ↓ \]

(29) \[ NP \rightarrow \left( \begin{array}{c} \text{Det} \\ ↑ = ↓ \end{array} \right) N \quad ↑ = ↓ \]

(30) \[ VP \rightarrow V \quad ↑ = ↓ \quad \left( \begin{array}{c} PP \\ ↑ obl_{loc} \end{array} = ↓ \end{array} \right) \]

Nevertheless, these two types of representations have the same meaning: they codescribe a partial c-structure and a partial f-structure. They are properly viewed as local constraints which hold in parallel of pairs of c- and f-structures. Functional equations written with ↑ and ↓ are called functional schemata.

Recall now that fully inflected words are the leaves of the c-structure tree, in accordance with the integrity of the structural formation of words. However, words may carry the same types of functional information as phrases. A simple illustration of the fact that the words that constitute the leaves of c-structure trees carry functional descriptions of the same type as phrases is given in (31). Here the noun lion and its plural inflection -s each carry functional schemata as part of their lexical entries:

(31) \[ \text{lion} \quad (↑ pred) = 'lion' \]
\[ -s \quad (↑ num) = \text{pl} \]

The rules of English inflectional morphology combine this information when the inflected noun lions is formed. When the inflected noun appears in the c-structure, it gives rise to the correspondence shown in (32):

(32) \[ \text{lions} \]

\[ \left[ \begin{array}{ll} \text{NUM} & \text{PL} \\ \text{PRED} & \text{lion}_4 \end{array} \right] \]

---

11 The ↑ arrows in these lexical entries are taken to refer to the (f-structure of the) preterminal node (N in the case of (31)). The ↓ arrows then refer to the (f-structure of the) terminal node.

12 On the index of the pred value, see the discussion of semantic features in Section 4.2. We adopt here the convention of choosing as pred index the unique f-structure index of the mother node; see the index 4 in (33) for an example.
We can see how this correspondence arises by means of the following indexed representation\(^\text{13}\) –

\[
\begin{array}{c}
\text{N}_{f_4} \\
\text{lions}
\end{array}
\]

\[
(f_4 \text{ NUM}) = \text{PL} \\
(f_4 \text{ PRED}) = '\text{lion}_{4}'
\]

– which describes the structural relations in (34):

\[
\begin{array}{c}
\text{N}_{f_4} \\
 f_4: \begin{bmatrix}
\text{NUM} & \text{PL} \\
\text{PRED} & '\text{lion}_{4}'
\end{bmatrix}
\end{array}
\text{lions}
\]

Similarly, the verb live and its inflection -s both carry functional schemata in their lexical entries, as shown in (35). Note that the third-person singular morpheme -s is analyzed here as having an f-structure which is identified with the subj value of the f-structure of its mother, the preterminal category V. The three equations given are equivalent to the pair of equations \((\uparrow \text{SUBJ PERS}) = 3\) and \((\uparrow \text{SUBJ NUM}) = \text{SG}\):

\[
\begin{array}{c}
\text{live} \\
\text{-s}
\end{array}
\]

\[
\begin{array}{c}
(\uparrow \text{PRED}) = '\text{live } (\ldots )' \\
(\uparrow \text{TENSE}) = \text{PRES} \\
(\uparrow \text{SUBJ}) = \downarrow \\
(\downarrow \text{PERS}) = 3 \\
(\downarrow \text{NUM}) = \text{SG}
\end{array}
\]

The subj equations are further discussed below (44).

The rules of English inflectional morphology combine this information when the inflected verb is formed. When the inflected verb is inserted into the c-structure, these schemata generate a functional description as illustrated in (36):

\[
\begin{array}{c}
\text{V}_{f_5} \\
\text{live } s_{f_7}
\end{array}
\]

\[
\begin{align*}
(f_5 \text{ PRED}) &= '\text{live } (\ldots )_s' \\
(f_5 \text{ TENSE}) &= \text{PRES} \\
(f_5 \text{ SUBJ}) &= f_7 \\
(f_7 \text{ PERS}) &= 3 \\
(f_7 \text{ NUM}) &= \text{SG}
\end{align*}
\]

\(^\text{13}\) Annotations of terminal nodes (words) are written below the word rather than above it, dropping a parallelism to annotations of nonterminal nodes, which are written above the node.
This functional description defines the structural relations shown in (37):

(37) \[ V_{}\] \[ live\ s_{}\] \[ f_{}: \] \[ \begin{array}{c}
\text{SUBJ} \\
\text{TENSE} \\
\text{PRED}
\end{array}
\begin{array}{c}
\text{NUM} \text{ SG} \\
\text{PERS} 3 \\
\text{‘live \langle \ldots \rangle s’}
\end{array}\]

And (37) is graphically represented as in (38):

(38) \[ V \] \[ \begin{array}{c}
\text{SUBJ} \\
\text{TENSE} \\
\text{PRED}
\end{array}
\begin{array}{c}
\text{NUM} \text{ SG} \\
\text{PERS} 3 \\
\text{‘live \langle \ldots \rangle s’}
\end{array}\]

Observe that the graphic mapping arrows which link c-structures to f-structures depart from each c-structure element that bears a ↓ and arrive at the f-structure specified by that ↓. Thus there is no arrow pointing to the tense feature or value in (38), because, referring to (35), we see that the ↓ arrows associated with the tense inflection designate the value of the subj attribute alone.

We have now seen that the mapping between c-structures and f-structures is defined codescriptively by the grammar of the language. The grammar does not prescribe a particular computational process for deriving f-structures from c-structures (or the reverse). However, there is an algorithm for deriving an f-structure from a c-structure, given a set of c-structure rules and words, both annotated with functional schemata – the solution algorithm.

### 4.5 The solution algorithm

Given a lexical-functional grammar and lexicon for a language \( \mathcal{L} \), there is an algorithm for deriving the c-structure and f-structure of any sentence of \( \mathcal{L} \). The mapping of a string of words into a c-structure can be done via any of a class of familiar context-free phrase structure parsing algorithms. (Ambiguous sentences may have multiple c- and f-structures.) We will therefore focus here on the derivation of an f-structure from a c-structure.

---

14 In fact, the grammaticality of any string of words of \( \mathcal{L} \) is decidable (Kaplan and Bresnan 1982).
15 See, for example, Winograd (1983) or Jurafsky and Martin (2009) for a pedagogical introduction.
Let us take as our example the ill-formed sentence *Lions lives, whose c-structure is given in (39):

![Syntax Tree]

We assume as given the fragment of English grammar and lexicon shown in (40)–(44):

(40) \[ S \rightarrow NP \uparrow = \downarrow \text{(subj)} = \downarrow \text{VP} \uparrow = \downarrow \]

(41) \[ NP \rightarrow \left( \text{Det} \uparrow = \downarrow \right) N \uparrow = \downarrow \]

(42) \[ VP \rightarrow V \uparrow = \downarrow \left( PP \uparrow \text{obl} \downarrow \text{loc} = \downarrow \right) \]

(43) \[ \text{lion: N} \quad (\uparrow \text{pred}) = \text{‘lion’} \]
\[ -s: \text{infl}_n \quad (\uparrow \text{num}) = \text{PL} \]

(44) \[ \text{live: V} \quad (\uparrow \text{pred}) = \text{‘live (…)’} \]
\[ -s: \text{infl}_v \quad (\uparrow \text{tense}) = \text{pres} \]
\[ (\uparrow \text{subj}) = \downarrow \]
\[ (\downarrow \text{pers}) = 3 \]
\[ (\downarrow \text{num}) = \text{SG} \]

Note that in (44) the indentation of the equations representing information carried by the verbal inflection has no formal significance; it is merely typographically set off to group related information visually. The use of the \( \downarrow \) arrow here is formally well defined: the word itself (specifically the inflectional part of it) is mapped to an f-structure distinct from that of the mother node. The \( \downarrow \) arrow refers to the f-structure of the terminal node.

The method of solution proceeds in three steps: first, we annotate the c-structure tree with the appropriate functional schemata; second, we instantiate the schemata to generate a functional description; and third, we solve the simultaneous equations of the functional description by constructing the minimal f-structure that satisfies them.
Step 1 is illustrated by (45), an annotated c-structure tree for *Lions lives:

![c-structure tree diagram]

Note that both the lexical annotations and the c-structure rule annotations are added.

Step 2, instantiation, proceeds by first assigning a distinct index to the root node of the tree and to each node that bears an annotation containing ↓. Each index represents the unknown f-structure that corresponds to that c-structure node:

![instantiation diagram]

The second part of instantiation is to uniformly substitute the index of each node for every ↑ in the schemata of its daughter nodes and for every ↓ in the schemata of that node itself, as illustrated in (47):
Recall that a unique index is provided to each semantic feature value whenever it is instantiated. By convention, this is the same index that is assigned to the f-structure which contains the semantic feature. These instantiated functional equations are conjoined together into the functional description. Step 2 thus generates a functional description for the sentence.

Step 3 is to construct the minimal f-structure that satisfies the functional description generated by Step 2. This is a straightforward process of hypothesizing an f-structure that makes each equation in the conjunction of all equations true, preserving functional uniqueness. It can be done in any order whatsoever, but for convenience we will proceed from the top of the tree down, and from left to right. From the NP node in (47), we know that \((f_1 \text{ SUBJ}) = f_2\); that is, \(f_1\) has a \text{SUBJ} attribute whose value is \(f_2\). Hence we construct the f-structure (48), and discard the equation we used to make it:

\[
(48) \quad f_1: [\text{SUBJ} \ f_2]
\]

From the VP node in (47), we know that \(f_1 = f_3\); that is, \(f_1\) is the same f-structure as \(f_3\). We therefore add this information to (48), and discard the equation:

\[
(49) \quad f_1, f_3: [\text{SUBJ} \ f_2]
\]

From the N node we next learn that \(f_2 = f_4\); that is, \(f_2\) is one and the same as \(f_4\), so we add this information, discarding the equation:

\[
(50) \quad f_1, f_3: [\text{SUBJ} \ f_2, f_4]
\]
From the V node we have $f_3 = f_5$, so we add that information, following the same process:

$$f_1, f_3, f_5: \left[ \begin{array}{c} \text{subj} \\ f_2, f_4 \end{array} \right]$$

Now from the leaves of the tree we gather much more information. From *lions* we have $(f_4 \text{ num}) = \text{pl}$ and $(f_4 \text{ pred}) = \text{lion}_4$, so we now know that $f_4$ is an f-structure with two attribute–value pairs, and we add this information as shown in (52), and then discard the equations:

$$f_1, f_3, f_5: \left[ \begin{array}{c} \text{subj} \\ f_2, f_4; \left[ \begin{array}{c} \text{pred} \text{ ‘lion}_4’ \\ \text{num} \text{ pl} \end{array} \right] \end{array} \right]$$

Likewise, from *lives* we have $(f_5 \text{ pred}) = \text{live} (\ldots)$, $(f_5 \text{ tense}) = \text{pres}$, $(f_5 \text{ subj}) = f_6$, $(f_6 \text{ pers}) = 3$, and $(f_6 \text{ num}) = \text{sg}$. Adding the information from the first four equations, we have (53):

$$f_1, f_3, f_5: \left[ \begin{array}{c} \text{subj} \\ f_2, f_4, f_6; \left[ \begin{array}{c} \text{pred} \text{ ‘lion}_4’ \\ \text{num} \text{ pl} \\ \text{pers} \text{ 3} \end{array} \right] \\ \text{tense} \text{ pres} \\ \text{pred} \text{ ‘live} (\ldots)_5’ \end{array} \right]$$

But the last equation, $(f_6 \text{ num}) = \text{sg}$, is inconsistent with what we already know about $f_6$ – namely, that it has a num attribute whose value is pl. Because every attribute must have a unique value, there is no f-structure solution to the functional description of (47). The sentence is ungrammatical. If instead we replaced *lives* with the present non-third-person-singular form *live*, the inconsistency would disappear, because the latter inflected form would carry the information that $f_6$ does not have the features of third-person singular. (Negation and other boolean operations on functional schemata are taken up in the next section.)

Note that if there is one f-structure that satisfies an f-description, there are arbitrarily many other f-structures that satisfy the same description; such f-structures have additional attribute–value pairs that are not mentioned in the f-description, though they have in common all the pairs that do satisfy the f-description. Therefore, to determine a unique solution to a consistent f-description, we must take the minimal f-structure that satisfies the description, eliminating superfluous attribute–value pairs. It is important to observe that in Step 3 we have constructed the minimal f-structure that satisfies the f-description generated by Step 2.

**Problems**

The reader can now undertake Problem Set 1, which illustrates several linguistically interesting properties of the formal system developed so far.
4.6 Defining versus constraining equations

The construction of an f-structure that satisfies a functional description has a “make it so” character: whatever f-structure elements are identified by an equation are made to exist in the f-structure model. The equations of the functional description define the model, and so are called defining equations. However, it is often useful to identify some value of an attribute, without thereby making it exist.

Consider two types of verbal agreement morphology: one type requires the presence of a subject NP constituent having the specified agreement features; the other type is compatible with the presence or absence of a subject NP (as in “pro-drop” languages; see Chapter 8). In the pro-drop type, verbal agreement morphology may specify the properties of the subject by defining equations. The inflected verb itself thus creates the f-structure attribute–value pairs of the subj, and any subject constituent NP that may be present must of course have consistent features, but need not be present to provide them. In the other type, verbal agreement morphology is not sufficient to define the attributes of the subject; a subject NP constituent is necessary. For such purposes we might use constraining equations based on the constrained equality relation \( =_c \). With the pro-drop morphology, \( (↑\text{subj num}) = \text{sg} \) defines the number assigned by a verb. With the non-pro-drop agreement morphology, the constraining equation \( (↑\text{subj num}) =_c \text{sg} \) would require that there be a \([\text{num sg}]\) feature in the f-structure; it does not create such a feature. Its effect is to require the presence of a subject constituent to provide the number feature.\(^{16}\)

Constraining equations are interpreted as follows. When constraining equations are conjoined with defining equations, the solution algorithm simply sets aside all constraining equations until the minimal f-structure satisfying all of the defining equations has been constructed; at that point, the constraining equations are tested for truth. Thus, defining equations apply before minimization, and constraining equations after minimization.

It is clear that the logic of functional descriptions can be extended to boolean combinations of equations involving disjunctions \( (\lor) \): the disjunction of two f-descriptions defines a set of alternative f-structures. Likewise, optionality parentheses around an equation define two alternative f-structures, one formed with the equation and the other formed without it. The solution algorithm applies to functional descriptions containing disjunctions in the following way. When a functional schema \( F \) consists of a disjunction of two schemata \( F_1 \) and \( F_2 \), then every other schema \( G \) conjoined with \( F \) is distributed over the disjuncts: \( G \land (F_1 \lor F_2) = (G \land F_1) \lor (G \land F_2) \). Because disjunction has wide scope in this way, a functional description containing disjunctions is equivalent to a set of alternative functional descriptions containing only conjunctions. The solution algorithm finds

\(^{16}\) Berman’s (1999) analysis of expletive subjects in several Germanic languages uses the difference between constraining and defining equations as a formal model of “weak” versus “strong” agreement.
the minimal f-structure that satisfies each of these alternative functional descriptions. When the alternatives contain constraining equations, the latter are applied to the minimal solution satisfying the defining equations in that particular alternative functional description. (Note that disjunction here is the normal inclusive disjunction: both disjuncts can be true of an ambiguous sentence.)

A boolean negation operator ¬ on equations can be defined via constraining equations. For example, ¬(f tense) = pres, also written (f tense) ≠ pres, is a negative constraining equation, which is tested for truth after the minimal f-structure satisfying all the defining equations has been constructed; it is true only if (f tense) =pres is false.

The notation (f a) is used as an existential constraint, meaning that f is constrained to have some value for the a attribute. The concept of existential constraint allows us to explain the meaning of the notation commonly used for the contents of semantic forms, illustrated in (54):

\[(54) \ (\uparrow \text{pred}) = \text{`live (\uparrow \text{subj} (\uparrow \text{obl} \text{loc})`)}\]

Both (\uparrow \text{subj}) and (\uparrow \text{obl loc}) are interpreted as existential constraints required by the first and second arguments of `live`, respectively. All of the ↑s in schema (54) are uniformly instantiated together.

With these boolean operators on equations, it is possible to define conditional equations, which are useful in testing for the presence of a feature as a condition for functional specification. For example, Malayalam determines the functions of NPs on the basis of their case attributes, according to Mohanan (1982b). In Malayalam, a nominative case-marked NP can be either a subject or (if inanimate) an object; animate objects are accusative. A simple way of describing this kind of generalization is by using the ⇒ conditional, as in (55), where we use square brackets, [ and ], to indicate the scope of the connective ∧ (conjunction):

\[(55) \ a. \ (\downarrow \text{case}) = \text{nom} \Rightarrow (\uparrow \text{subj}) = \downarrow \\
\quad b. \ [(\downarrow \text{case}) = \text{acc} \land (\downarrow \text{anim}) = +] \Rightarrow (\uparrow \text{obj}) = \downarrow \\
\quad c. \ [(\downarrow \text{case}) = \text{nom} \land (\downarrow \text{anim}) = -] \Rightarrow (\uparrow \text{obj}) = \downarrow \]

Intuitively, the conditional A ⇒ B checks whether A is true of an f-structure, and if it is, then it defines B to hold of that f-structure. Thus (55c) checks whether [case nom] and [anim − ] are present in an f-structure ↓; if so, ↓ can be the value of the obj attribute.

There is an interesting problem in the meaning of the conditional. If we interpret the ⇒ simply as a standard conditional denoting material implication, then A ⇒ B means ¬A ∨ B. But this interpretation of (55a–c) does not have the effect

---

17 A material implication A → B is false if and only if the antecedent A is true and the consequent B is false. A disjunction ¬A ∨ B is similarly false if and only if A is true and B is false. Therefore, A → B is equivalent to ¬A ∨ B.
we want: it can be satisfied if either disjunct is true; hence we can make \( B \) true regardless of whether \( A \) is true. In the case of (55a), an accusative NP could be defined by the equation as a subject! To solve this problem, we define the conditional as follows:\(^{18}\)

\[
A \Rightarrow B \equiv_{df} \neg A \lor (A_c \land B)
\]

According to this definition, \( A \Rightarrow B \) says that either the constraint \( A \) does not apply or, in the minimal f-structure in which \( B \) holds as a defining equation, \( A \) must be true as a constraining equation.\(^{19}\) \( A_c \) is in fact an existential constraint, which is not normally subscripted with \( c \), but the subscript is added here to clarify that this equation, like all existential constraints, must be satisfied by the minimal f-structure. The first disjunct allows an accusative object to satisfy (55a) vacuously. In this case the constraint (55a) is true but has no defining effect. The second disjunct requires the presence of nominative case in order for the equation to be able to define a subject: it says that in order for \( (\uparrow \text{subj}) = \downarrow \) to have a defining effect, the constraint \( (\uparrow \text{case}) =_c \text{nom} \) must be true. Under this definition, (55a) would exclude accusative subjects, because nominative case would be required of a subject by the conditional for it to define a subject.

In Chapters 6 and 9 we will illustrate the use of conditionals in modeling case licensing and the morphological licensing of grammatical functions, but subsequent developments in case theory in LFG (e.g. Nordlinger 1998a) suggest an alternative approach. We will not present the new theory here, but the reader of this chapter will be equipped to pursue this literature.

We summarize the schemata which involve constraining equations in the following table:

\[
\begin{align*}
\text{(57) Constraining equations:} & \\
A & \Rightarrow B & \text{positive} \\
\neg(A = B), & A \neq B & \text{negative} \\
(fa) & & \text{existential} \\
A & \Rightarrow B & \text{conditional (also defining)}
\end{align*}
\]

The conditional \( A \Rightarrow B \) contains \( B \) as a defining equation and the implicit constraining equations \( \neg A \) and \( A_c \), as explained in our discussion of (56).

---

\(^{18}\) This definition is given in Andrews and Manning (1999).

\(^{19}\) To understand more precisely how this definition is interpreted, suppose that \( D \) is a purely conjunctive functional description containing no constraining equations, to which the conditional \( A \Rightarrow B \) is added, giving \( D \land (A \Rightarrow B) \). By (56), this is equivalent to \( D \land (\neg A \lor (A_c \land B)) \), which is in turn equivalent to \( (D \land \neg A) \lor (D \land A_c \land B) \). This is a disjunction of two conjunctive f-descriptions, which are solved in the usual way to give us alternative f-structures. In particular, we construct the minimal f-structure satisfying the defining equations of the left disjunct (namely, \( D \)), and then apply the constraining equation \( \neg A \) to it; hence \( A \) must be false of this f-structure. Similarly, we construct the minimal f-structure satisfying the defining equations of the right disjunction \( (D \land B) \) and subject the result to the constraining equation \( A_c \); \( A \) must therefore be true of the alternative f-structure.
4.7 Completeness and coherence

Completeness and coherence are general well-formedness conditions on f-structures; these conditions are applied after the minimal f-structure has been constructed from the defining equations and any constraining equations have been satisfied. Completeness and coherence enforce an appropriate match-up, or linking, between the pred feature and the surrounding syntactic functions of the f-structure. Completeness requires that every function designated by a pred be present in the f-structure of that pred. Completeness also requires a further matching between preds and their f-structure functions: if a designator (↑gf) is associated with a semantic role by the pred, the f-structure element satisfying the designator must itself contain a semantic feature [pred v]. The class of functions that are designated by pred elements is referred to as the argument functions. As we will see in Chapter 6, argument functions include (among others) subject, object, and complement, but exclude adjunct, focus, and topic. Violation of completeness is the source of the ill-formedness of the clausal residue of the extraction configuration of (1c) in Chapter 2:

(58) *We talked about __ for days.

The pred for (talk) about requires an obj. Even if we assume the presence of an empty category at the __ position to provide the prepositional object f-structure, that f-structure will lack the required semantic feature (a pred value), and completeness will still not be satisfied.

Conversely, coherence requires that the value of every argument function in an f-structure be designated by a pred. Furthermore, any function that has a semantic feature must match up with a designator associated with a semantic role by its pred. It is for this reason that (59) is ill-formed:

(59) *We talked that problem for days.

The pred of the intransitive verb talk has no obj designator. As a result, the NP that problem in object position in the VP of (59) cannot be matched to an appropriate function designator in the pred. The f-structure of this example thus violates the coherence condition.

The extended coherence condition applies not just to argument functions but to all syntactic functions, requiring that they be integrated appropriately into the
f-structure (Fassi Fehri 1984; Zaenen 1985; Bresnan and Mchombo 1987). Argument functions are integrated into the f-structure when they are designated by a \textsc{pred} as above (i.e. if they satisfy normal coherence). Nonargument functions are integrated if they bear an appropriate relation to a \textsc{pred}. An \textsc{adjunct} is integrated if the f-structure that contains the \textsc{adjunct} has a \textsc{pred} feature. A \textsc{topic} or \textsc{focus} function is integrated whenever it is identified with, or anaphorically linked to, an integrated function. Examples are discussed in the next section.

Problems

The reader is now equipped to solve Problem Set 2.

4.8 Functional uncertainty\textsuperscript{23}

Functional uncertainty is a means of extending functional descriptions to allow for variable chains of attributes that define possible paths through f-structures which may be unknown to us in advance (Kaplan and Zaenen 1989b; Kaplan and Maxwell 1988a). We have already seen that for a chain of function applications such as \(((f_1 \ a_1) \ a_2) \ a_3) = \nu$, we write \((f_1 \ a_1 \ a_2 \ a_3) = \nu$, omitting the inner parentheses. Here the string \(a_1 \ a_2 \ a_3\) represents a fixed chain of attributes. Functional uncertainty extends functional descriptions to allow variable strings of attributes. Recall that for equations not involving functional uncertainty, we have the following fundamental relation between our descriptive constraint equation language and the f-structure objects of which they hold:\textsuperscript{24}

\begin{equation}
(f \ a) = \nu \text{ holds if and only if } f \text{ is an f-structure, } a \text{ is an attribute, and the pair } \langle av \rangle \in f.
\end{equation}

The standard equation notation is extended in functional uncertainty from attributes \(a\) to strings \(x\) of attributes:\textsuperscript{25}

\begin{equation}
\text{For strings } x \text{ of attributes: } (f \ e) = f, \text{ where } e \text{ is the empty string, and } (f \ a \ x) = ((f \ a) \ x), \text{ where } a \text{ is an attribute and } x \text{ a possibly empty string of attributes.}
\end{equation}

\textsuperscript{23} Sections 4.8 and 4.9 should be read with Chapter 9; see \textit{How to use this book} in the preface to the first edition.

\textsuperscript{24} This development of functional uncertainty follows Dalrymple (1993).

\textsuperscript{25} The set membership symbol, \(\in\) (see Section 4.9), can also be used as an attribute (see Dalrymple 2001, p. 154ff.), and therefore uncertainty is also well defined with respect to set-valued attributes.
In other words, an f-structure \( f \) as a mathematical function can be applied to any string \( x \) of attribute names by splitting off the first symbol \( a_1 \) of the string, taking the value of \((f \ a_1)\) and applying it as a function to the sub-string of \( x \) left after splitting off \( a_1 \). When no more attributes are left in the string, the value of the whole chain of function applications is the value obtained by the last function application. Now functional uncertainty is defined as follows:

\[
\text{(62) Functional uncertainty:}
\]

For \( \alpha \) any set of strings of attributes, \((f \ \alpha) = v\) holds if and only if for some \( x \) in the set of strings \( \alpha, (f \ x) = v \).

An equivalent, generalized definition (taken from Kaplan and Zaenen 1989b, equation (29)) is as follows:

\[
\text{(63) } (f \alpha) = v \text{ holds if and only if } ((fs) \text{ Suff}(s, \alpha)) = v \text{ for some symbol } s,
\]

where \( \text{Suff}(s, \alpha) \) is the set of suffix strings \( y \) such that \( sy \in \alpha \).

Although we will not make use of this additional expressive power here, note that functional uncertainty is defined by Kaplan and Maxwell (1988a) for any strings that can be generated by regular expressions over attributes (that is, expressions involving the boolean operators and the Kleene * and + operators). When functional descriptions are extended by (63), both the problem of determining whether a functional description is true of a given f-structure and the problem of constructing a solution to a given functional description are decidable (Kaplan and Maxwell 1988a).

It is possible to impose various constraints on the variable strings \( x \) which limit the search space of f-structure paths. These off-path constraints play an important role in restricting the search space for an antecedent starting from an anaphor (Dalrymple 1993), and we will make use of them in Chapters 10 and 11. We give here the formal definition (Dalrymple 2001); see Chapters 10 and 11 for illustrations and further discussion.

An off-path constraint \( \phi \) is a combination of ordinary LFG schemata, except that it can contain the metavariables \( \leftarrow \) and \( \rightarrow \) in addition to \( \uparrow \) and \( \downarrow \). Off-path constraints are paired with symbols in the regular languages of functional uncertainty; that is, the more primitive notion of functional uncertainty assigns an interpretation to expressions of the form \((f \ \alpha)\) where \( \alpha \) denotes a regular language over attribute symbols. With off-path constraints, \( \alpha \) denotes a regular language over attribute : constraint pairs; that is, each element of the alphabet is either an attribute symbol as before or a pair of the form \( s : \phi \), where \( s \) is an attribute symbol and \( \phi \) is an off-path constraint. (A symbol without a constraint can be interpreted as a pair \( s : \text{True} \)).

The \( \leftarrow \) and \( \rightarrow \) arrows are instantiated with different values at each level of the f-structure that an uncertainty path runs through. Thus, the formal definition
of off-path constraints must be provided by an extension to the basic recursive specification of ordinary uncertainty shown in (63). Here is the extended version (with \( \alpha \) ranging over symbol : constraint pairs):

\[
\text{(64) Functional uncertainty with off-path constraints:}
\]
\[
(f \alpha) = v \text{ holds if and only if }\]
\[
((f s) \text{ Suff}(s, \alpha)) = v \land \phi_{f/\leftarrow, (f s)/\rightarrow} \text{ for some pair } s : \phi,\]
where \( \text{Suff}(s : \phi, \alpha) \) is the set of suffix strings \( y \) such that \( s : \phi y \in \alpha \).

In this definition, \( \phi_{f/\leftarrow, (f s)/\rightarrow} \) is the formula that results from substituting \( f \) for \( \leftarrow \) and \( (f s) \) for \( \rightarrow \) everywhere in \( \phi \).

For example, consider the f-structure in (65) and the functional schemata in (66) and (67):

\[
\text{(65) } f : \begin{bmatrix}
\text{PRED} & \text{‘laugh(...’}
\
\text{SUBJ} & \begin{bmatrix}
\text{PRED} & \text{‘Hilary’}
\
\text{NUM} & \text{SG}
\end{bmatrix}
\
\text{TENSE} & \text{PAST}
\end{bmatrix}
\]

\[
\text{(66) } (f \text{ SUBJ }) \leftarrow \text{TENSE} = \text{PAST}
\]

\[
\text{(67) } (f \text{ SUBJ }) \neg(\rightarrow \text{NUM})
\]

The \( \leftarrow \) arrow in (66) is read as “the f-structure that has SUBJ as an attribute.” The \( \rightarrow \) arrow in (67) is read as “the f-structure that is the value of the SUBJ attribute.”

These functional schemata are not meant to capture actual grammatical constraints of English; they are merely intended to exemplify the interpretation of off-path constraints. The off-path constraint in (66) states that the f-structure which contains SUBJ as an attribute, in this case \( f \), contains the attribute TENSE with value PAST, i.e. the off-path constraint states that \( f \) contains the feature [TENSE PAST].

This is consistent with the information in the f-structure (65), and the functional schema (66) is therefore satisfied. In contrast, the off-path constraint in (67) is not satisfied. This off-path constraint states that the value of the SUBJ attribute must not contain the attribute NUM, but SUBJ in (65) in fact does contain NUM. Off-path constraints are a key part of LFG’s binding theory (Dalrymple 1993) and are discussed further in Section 10.4.

---

26 The off-path constraint in (66) is a defining equation, so even if no other part of the functional description for the f-structure had specified the feature [TENSE PAST], the off-path constraint would result in an f-structure that contains the feature. In contrast, if the equality in the off-path equation had been the constraining equality, \( = \), the off-path constraint would only be satisfied if the f-structure independently contained the feature, as is the case with f-structure (65).
We will also make use of inside-out functional uncertainty (Halvorsen and Kaplan 1988; Dalrymple 1993). First we define inside-out function application in (68). This definition lets us look out one level to the next outer f-structure containing \( f' \), just as \( (f a) \) lets us look in one level to the next inner f-structure:

\[
\text{(68) Inside-out function application:}
\]
\[
\text{For any f-structure } f' \text{ and attribute } a, \quad (a f') \text{ designates some f-structure } f \text{ such that } (f a) = f'.
\]

\[
\text{(69) Inside-out functional uncertainty:}
\]
\[
\text{For any f-structure } f', \text{ attribute } a, \text{ and string of attributes } x, \quad (e f') = f' \text{ (where } e \text{ is the empty string) and } (x a f') = (x (a f')).
\]
\[
\text{For any set of strings of attributes, } (a f) = v \text{ holds if and only if for some } x \text{ in the set of strings } a, (x f) = v.
\]

With the addition of (69), we can now either start from a higher f-structure \( f \) and follow a path of attributes down to a lower f-structure \( f' \), or start from the lower f-structure \( f' \) and follow a path of attributes upward to the higher f-structure \( f \). In the latter case, the notation \( (x f') \) designates the higher f-structure, call it \( f \), for which there exists a path of attributes represented by \( x \) such that \( (fx) = f' \).

Consider now the following inside-out functional uncertainty equation:

\[
\text{(70) } (\text{TOP} f') = f'
\]

By the definition in (69), \( (x f') \) designates some f-structure \( f_x \) such that \( (f_x x) = f' \). Thus we can unpack (70) as in (71):

\[
\text{(71) } (f_x x) = f'
\]
\[
(f_x \text{ TOP}) = f'
\]

This tells us, first, that there must be some f-structure \( f_x \) from which we can follow a path \( x \) of attributes leading to the f-structure \( f' \) and, second, that the higher f-structure has a TOP attribute whose value is to be identified with the f-structure \( f' \). Inspecting the structure (72), we can see that the outermost f-structure, \( f \), has a TOP attribute, and that the string COMP OBJ leads from this f-structure to \( f' \):

\[
\text{(72) } f: \begin{bmatrix}
\text{TOP} & b: ["Ann"] \\
\text{SUBJ} & ["I"] \\
\text{PRED} & \text{‘think((f\text{SUBJ})(f\text{COMP}))’} \\
\text{COMP} & g: \begin{bmatrix}
\text{SUBJ} & ["he"] \\
\text{PRED} & \text{‘like((g\text{SUBJ})(g\text{OBJ}))’} \\
\text{OBJ} & f'
\end{bmatrix}
\end{bmatrix}
\]
A Formal Model of Syntactic Structure

(The phrases in double quotation marks abbreviate the actual f-structure contents where they are not relevant to the discussion.) Hence, the f-structure (72) satisfies the functional description in (71) provided that we set $f_x = f$ and $x = \text{COMP OBJ}$:

$$
\begin{align*}
(f \text{ COMP OBJ}) &= f' \\
(f \text{ TOP}) &= f'
\end{align*}
$$

The functional description in (70) thus adds to (72) the information needed to identify the complement object function with the topic function:

$$
\begin{bmatrix}
\text{TOP} & h, f': ["Ann"] \\
\text{SUBJ} & ["I"] \\
\text{PRED} & \text{think}(\langle f \text{SUBJ} \rangle(f \text{COMP})))' \\
\text{COMP} & g: \\
\text{OBJ} & f'
\end{bmatrix}
$$

Functional uncertainty has been used in modeling anaphoric binding relations (Dalrymple 1993; Asudeh 2005b), extractions (Kaplan and Zaenen 1989b; Kroeger 1993; Falk 2001; Berman 2003; Asudeh 2004, 2005b, 2012), and a type of scrambling or extraposition of complements (Matsumoto 1992, 1996a). We employ it to model extraction and binding in this work.

The formal model of extraction presented here makes use of inside-out functional uncertainty by stating simply that the f-structure of a gap in the c-structure is identified with the value of a higher nonargument function $DF$ (which stands for “discourse function” and here refers to TOP or FOC):\(^{27}\)

$$
\text{Annotate XP} \rightarrow e \text{ with } ((x \uparrow) \text{ DF}) = \uparrow.
$$

Older models of extraction in LFG employed constituent control metavariables (Kaplan and Bresnan 1982). Other current models of extraction use outside-in functional uncertainty (see Kaplan and Zaenen 1989b; Dalrymple 2001; Asudeh 2012).\(^{28}\)

---

27 The symbol $e$ here refers to the empty string, which may also be written $\varepsilon$ as in some of the definitions above; $e$ is used to indicate the absence of a terminal symbol. It should not be taken to be a specific terminal symbol in itself.

28 Kaplan and Zaenen’s (1989b) model of extraction assumes that there is no c-structure gap; a functional uncertainty chain associated with the topic constituent would identify it in initial position as also bearing its within-clause function. This is appealing because it eliminates c-structure gaps and rules such as (75) from the theory (see also Dalrymple et al. 2001, 2007). However, since CPs and locative PPs can be topicalized as well as DPs (Bresnan 1994b, 1995a), their approach violates the principle of canonical structural realization of functions (Section 2.1), which states that subject and
To see how (75) applies to an example of topicalization in English, consider (76):

(76)

The functional schema associated with the gap NP in (76) comes from (75). By uniformly instantiating this schema in the same way as all the other functional schemata of English (omitted here for simplicity) and solving the identity as outlined above, we arrive at the f-structure in (77):

(77)

The f-structure in (77) is derived by assuming the standard annotation of functions to X’ structures for English (Chapter 6): the NP sister to S is annotated with \(\uparrow \top = \downarrow\), the NP sister to VP with \(\uparrow \text{SUBJ} = \downarrow\), the S sister to V with \(\uparrow \text{COMP} = \downarrow\), the NP sister to V with \(\uparrow \text{OBJ} = \downarrow\), and all other categories with \(\uparrow = \downarrow\). The reader may find it a useful exercise to derive the f-description from (76) and solve it, comparing the result to (77).

Observe that a single f-structure \(h\) in (77) is the same value of two different attributes, the \(\top\) and the \(\text{OBJ}\). These are the two functions whose values are identified by the schema in (75). This identity is represented graphically by a line object functions are realized as nominals, and is not adopted here. Some empirical consequences of the difference are discussed in Bresnan (1998).
connecting the two values. This example illustrates how a single constituent, in this case the NP Ann, can simultaneously have two different syntactic functions in the f-structure, here the syntactic topic and the object functions. In this case, the two functions correspond to two distinct phrase structure positions, but functions are not always expressed by c-structure positions, as we will see in Part III. Without the identification of top and obj provided by the functional uncertainty equation, the f-structure would be incomplete and incoherent: incomplete because the value of the obj attribute would lack a pred, and incoherent because the top function would not be integrated into the f-structure, which would be a violation of the extended coherence condition.

There are, however, alternative ways to satisfy the extended coherence condition, without employing functional uncertainty. One is to use anaphoric linking to connect the df to another function. This alternative is illustrated by the example in (78):

(78) Ann, I think he likes her.

In this example there is no extraction configuration: although Ann is in a clause-initial, “displaced” position, the remaining portion of the sentence I think he likes her is fully complete and coherent on its own. What allows Ann to satisfy the extended coherence condition is that the following clause is understood to be about Ann, the topic. This type of topic is sometimes referred to as a dislocated topic, or “external topic” (Aissen 1992; King 1995), to distinguish it from the (internal) topic of the preceding example. When dislocated topics are anaphorically linked to a pronominal element within the clause, what is identified is not the f-structure value of the df and clause-internal function (which would cause a functional uniqueness violation) but the referential index of the two functions. This linkage too can be formally modeled using inside-out functional uncertainty, as developed by Dalrymple (1993). Even anaphoric linking is not required in cases where the dislocated or external topic is simultaneously an adjunct:

(79) As for Ann, I don’t think Roger likes women.

In this case, the clause-initial phrase appears simultaneously to be both an adjunct to the following clause and its topic. Bearing the double functions of adjunct and topic allows the phrase to satisfy extended coherence without either anaphoric linking or a functional uncertainty chain. Another possible approach to external topics is to assume that they need not be syntactically integrated into the clause, but are related by looser constraints of discourse coherence.

29 Recall from the definition of the extended coherence condition in Section 4.7 that “a top or foc function is integrated whenever it is identified with, or anaphorically linked to, an integrated function.”

30 Another possible approach to external topics is to assume that they need not be syntactically integrated into the clause, but are related by looser constraints of discourse coherence.
contributed by *think*. The *adjunct* is therefore integrated, and the *top* is integrated by virtue of being identified with the *adjunct*.

### 4.9 Sets of f-structures

The nonargument functions *topic*, *focus*, and *adjunct* all allow multiple instances without violating functional uniqueness (Bresnan 1980; Bresnan and Mchombo 1987; Simpson 1991; King 1995; Dalrymple and Nikolaeva 2011). There are various ways of accounting for this property, but a simple formal device that has been employed since the earliest LFG work is the membership connective $\in: f_1 \in f_2$ means that the f-structure $f_1$ is an element of the set of f-structures $f_2$. For example, the schema $\downarrow \in (\uparrow \text{adj})$ means that $\downarrow$ is an element of a set of f-structures which is the value of adj. We have already seen this exemplified implicitly in Section 4.2 and particularly in description (8) of Section 4.3. As a second example, the schema $\downarrow \in (\uparrow \text{top})$ means that $\downarrow$ is an element of a set of f-structures which is the value of top. Sets of f-structures are discussed in detail in Kaplan and Maxwell (1988b), Dalrymple (2001), and Dalrymple and Kaplan (2000).

An example of a set-valued topic is provided by Russian topicalization (Chapter 9). The annotated c-structure shown in (80), augmented with the case conditionals shown in (81) and the morpholexical information given in (82), yields the f-structure shown in (83). The case conditionals are assumed to be freely annotated to c-structure nodes:

(80)

```
I
\downarrow \in (\uparrow \text{TOP})
NP
staruju lodku
old.ACC boat.ACC

\uparrow = \downarrow
IP
```

```
prodali
PERF.sell.PST.PL
```

```
we.NOM
my
```

```
I
\uparrow = \downarrow
```

```
I’
```

```
\uparrow = \downarrow
```

```
\downarrow \in (\uparrow \text{TOP})
NP
```

```
\downarrow \in (\uparrow \text{TOP})
NP
```

---

31 We follow King (1995) and use IP (“inflectional phrase”) instead of S for the Russian structure. IPs will be discussed in Chapter 6.
To verify the f-structure, assume that the case conditionals (81) are annotated to all NPs in the c-structure (80). It is a useful exercise to derive the functional description and solve it, observing how functional uniqueness is satisfied.

4.10 Conclusion

We have now examined the basic formal architecture of LFG. The reader of this chapter is equipped to begin to exploit LFG ideas in the analysis and solution of syntactic problems, such as those in Problem Set 2, and to advance to most of the theoretical ideas built upon this framework in Parts III and IV. A formal architecture is also of interest for its epistemological implications—the way in which it models linguistic knowledge. Some epistemological aspects of the design principles of LFG are discussed in the next chapter.
Further reading

5 Monotonicity and Some of Its Consequences

As we have seen in Chapters 1–4, the design principles for a formal model of universal grammar are motivated in part by a theory of linguistic knowledge: to explain in theory how knowledge of language can be acquired, the relation between the crosslinguistically invariant internal structures of language and the highly variable external structures must somehow be “transparent.” Transparency is often taken to be sameness of form, entailing a configurational design of universal grammar in which transformational operations derive the external forms from the internal form. We have rejected this view as typologically unsound, adopting instead a principle of monotonicity. In this chapter we will examine more carefully what is meant by monotonicity and discuss some of its general consequences for our formal model of linguistic knowledge.

5.1 Monotonicity

In mapping from a c-structure to an f-structure, we accumulate local functional descriptions from parts of the c-structure to get a functional structure for the whole. As we add new functional equations to the functional description, the resulting f-structures that satisfy these descriptions become increasingly specific; they have more attributes. Intuitively, the mapping from c-structure to f-structure increases monotonically.¹

Let us try to make this intuition a little more precise. What does it mean for one f-structure to be “more specific” than another? Intuitively, the more specific

¹ A function \( f : A \rightarrow B \) increases monotonically if \( A \) and \( B \) are partially ordered by relations \( \leq_A \) and \( \leq_B \) and whenever \( a \leq_A a' \), \( f(a) \leq_B f(a') \).
f-structure contains the same attribute–value pairs as the less specific one – and then some. Thus in (1), \( f_2 \) and \( f_3 \) are each more specific than \( f_1 \), and \( f_4 \) is more specific than all three.

\[
\begin{align*}
(1) & \quad f_4: & a & b \\
& & c & d \\
& & e & f \\
\vdots & \quad \vdots \\
\end{align*}
\[
\begin{align*}
f_2: & \quad \begin{bmatrix} a & b \\ c & d \end{bmatrix} \\
& \quad \left\downarrow \right. \\
& \quad \left\downarrow \right. \\
f_3: & \quad \begin{bmatrix} a & b \\ e & f \end{bmatrix} \\
& \quad \left\downarrow \right. \\
f_1: & \quad \begin{bmatrix} a & b \end{bmatrix} \\
\end{align*}
\]

But we also have the intuition that \( g \) in (2b) is more specific than \( f \) in (2a) –

\[
(2) \quad \begin{align*}
a. & \quad f: \quad \begin{bmatrix} a & b \\ c & [e & f] \end{bmatrix} \\
b. & \quad g: \quad \begin{bmatrix} a & b \\ c & [e & f] \\ d & h \end{bmatrix}
\end{align*}
\]

– even though the pair \((c, [e f])\) in \( f \) is not also a member of \( g \). In this case, however, \((g \ c)\) is more specific than \((f \ c)\). This suggests the following recursive definition: \( g \) is at least as specific as \( f \) if for every attribute \( a \) in \( f \), either \((g \ a) = (f \ a)\) or \((g \ a)\) is at least as specific as \((f \ a)\). We will use the notation \( g \supseteq f \) or \( f \subseteq g \) to mean that \( g \) is at least as specific as \( f \). We will also continue informally to use the term “more specific than” to refer to this relation (as in “\( g \) is more specific than \( f \)”), understanding that it does not exclude identity. The relation \( \subseteq \) is also called subsumption (Dalrymple, 2001, pp. 160–161), and \( f \subseteq g \) can be read as “\( f \) subsumes \( g \).”

For each (consistent) functional description \( d \), there are infinitely many functional structures that satisfy it – namely, the smallest one \( f \) that satisfies \( d \), and all the \( f \)-structures that are more specific than \( f \). We define \( \varphi(d) \) to be the smallest \( f \) that satisfies \( d \). This gives us a mapping \( \varphi \) from functional descriptions \( D \) to functional structures \( F \).

This mapping \( \varphi \) has the following property: as functional descriptions \( d_1 \), \( d_2 \), … get larger and larger, the functional structures \( f_1 \), \( f_2 \), … that satisfy them get more and more specific. In other words, \( \varphi : D \to F \) has the property that if \( d \subseteq d' \) then \( \varphi(d) \subseteq \varphi(d') \). We say that \( \varphi \) increases monotonically.

Notice that the smallest \( f \)-structure that is more specific than two \( f \)-structures \( f_1 \) and \( f_2 \) corresponds under \( \varphi \) to the smallest functional description that contains the respective functional descriptions \( d_1 \) and \( d_2 \) for \( f_1 \) and \( f_2 \). This smallest
functional description is just \( d_1 \cup d_2 \), and \( \varphi(d_1 \cup d_2) \) is called the unification of \( \varphi(d_1) \) and \( \varphi(d_2) \), denoted by \( \varphi(d_1) \cup \varphi(d_2) \). Just as \( d_1 \subseteq (d_1 \cup d_2) \), so \( f_1 \subseteq (f_1 \cup f_2) \).

There is also an intersection operation on f-structures that corresponds under \( \varphi \) to the intersection of functional descriptions. Thus there is a lattice of f-structures ordered under specificity corresponding to the lattice of functional descriptions ordered under set inclusion.

Of course, it may happen that the union of two functional descriptions \( d_1 \cup d_2 \) contains an inconsistency not found in either \( d_1 \) or \( d_2 \):

\[
(3) \quad d_1 \cup d_2 \begin{cases} (f a) = b \\ (f a) = c \end{cases}
\]

\[
d_1 \{ (f a) = b \} \quad d_2 \{ (f a) = c \}
\]

Here \( d_1 \cup d_2 \) corresponds to \( f^* \) in (4); \( f^* \) is a set of attribute–value pairs that is not itself an f-structure because it violates the uniqueness condition.

\[
(4) \quad f^*: \begin{bmatrix} a & b \\ a & c \end{bmatrix}
\]

\[
f_1: \begin{bmatrix} a & b \end{bmatrix} \quad f_2: \begin{bmatrix} a & c \end{bmatrix}
\]

Whenever we have an inconsistent f-description \( d_* \) in the domain of f-descriptions \( D \), we can set \( \varphi(d_*) \) for any inconsistent f-description \( d_* \) to be some designated element added to the ordered set of all f-structures. Then \( \varphi \) will be defined over all descriptions, inconsistent or not. But an inconsistent functional description \( d_* \) has the peculiar property that for any description \( d \), \( d \cup d_* \) is also inconsistent. Hence \( \varphi(d_*) = \varphi(d \cup d_*) = \varphi(d) \cup \varphi(d_*) \). Since for any f-description \( d \), \( \varphi(d) \subseteq (\varphi(d) \cup \varphi(d_*)) = \varphi(d_*), \) this means that \( \varphi(d_*) \) must be more specific than any f-structure; it must be the “top” of the lattice of f-structures. This definition preserves the monotonicity of our mapping.

It may also happen that a functional description \( d \) contains finite disjunctions of functional equations. This arises in cases of ambiguity. In such cases, \( \varphi(d) \) will be a set of f-structures that satisfy the alternatives in the description. If in such a case \( d \) is contained in a larger description \( d' \), then we can still say that \( \varphi(d') \) is more specific than \( \varphi(d) \) if for each f-structure in \( \varphi(d) \) there is a more specific f-structure in \( \varphi(d') \). Our mapping \( \varphi \) has this property. When we add a new description to a disjunction of descriptions, we logically conjoin the new statement to the disjunction; the result is equivalent to distributing the new statement over the disjuncts, creating a disjunction of larger descriptions, each of which describes a more specific f-structure than the original.
Finally, let us observe that our grammatical theory also provides us with a mapping \( \pi \) from the set \( S \) of strings of words into functional descriptions.\(^2\) As the length of a string of words increases, so does the size of the functional description; therefore \( \pi \) is also monotonic. Now because of the fundamental relation between functional descriptions and f-structures given in Chapter 4 (i.e. \((f, a) = v\) if and only if \(\langle a, v \rangle \in f\)), the content of the f-structure in terms of attribute–value pairs increases or stays the same as the size of the functional description increases. Hence the composite mapping \( \phi \circ \pi : S \to F \) is also monotonic. All of this is by way of clarifying the following property of our grammars: they are designed so that as you increase the length of a string of words, you monotonically increase the information about the f-structure of the string.

What is the linguistic significance of this formal property of monotonicity? F-structures are formal models of the internal structures of language, and these reflect meaningful grammatical relations – how words are mapped into semantic arguments. Thus the monotonicity of our mapping from strings to f-structures implies that the grammatical relations of parts are preserved in the whole. Our mapping cannot destroy or change these grammatical relations, and this is the sense in which the mapping between internal and external structures in our formal model is transparent. What is preserved in the external structure is not the form of the internal structure but the specification of its contents.

### 5.2 Relation changes and monotonicity

There is an apparent problem with this model of syntactic structure: in natural languages there are certain cases where grammatical relations do appear to change, cases where the initial mapping of words into semantic arguments appears not to be preserved in the external structure. For example, the subject Mary of the passive sentence (5b) seems to bear the underlying grammatical relations of the object of the active sentence (5a):

\[
\begin{align*}
(5) & \quad a. \quad \text{Mary kissed the child.} \\
 & \quad b. \quad \text{Mary was kissed by the child.}
\end{align*}
\]

Note that the verb be is not essential to this remapping:

\[
\begin{align*}
(6) & \quad a. \quad \text{I imagined Mary kissed the child.} \\
 & \quad b. \quad \text{I imagined Mary kissed by the child.}
\end{align*}
\]

In many theories of grammar this phenomenon has been viewed as a remapping of grammatical relations in the syntax; for example, the external structure of the passive sentence might be mapped onto an internal structure similar to that of the corresponding active sentence. But our theory excludes such an analysis, for in

---

\(^2\) This is the c-structure parsing algorithm together with the instantiation procedure.
our theory grammatical relations cannot be destroyed or changed by the syntactic mapping $\varphi \circ \pi$, which can only add information.

How, then, can we solve the problem posed by (5) and (6)? In early LFG it was assumed that grammatical relations cannot be changed by the syntactic mapping between sentences and internal structures, but that they can be remapped in the lexicon, by creating alternative lexical predicates for active and passive verbs. As we have seen above, the existence of finite disjunctions in our functional descriptions does not alter the monotonicity of the syntactic mapping. The following was thus adopted as a postulate of LFG:

(7) **The principle of direct syntactic encoding:**
All grammatical relation changes are lexical.

Thus early LFG (Bresnan, 1982b) achieved monotonicity by removing all relation changes from syntax into the lexical component, where they could be expressed by alternative lexical forms. This move is possible just because relation changes are lexically governed: they affect only lexically related arguments and so are local in their syntactic effects.

This idea requires that active and passive verb forms (and those of other relation changes) be lexically available, related by lexical redundancy rules (Bresnan, 1980, 1982c). This idea was discussed informally in Chapter 3, where the same underlying predicate argument structure is lexically associated with, or mapped to, alternative sets of grammatical functions:

(8) \[ R \langle \text{active} \rangle x \ y \rangle \iff R \langle \text{passive} \rangle y \ x \langle \text{OBJ} \rangle \langle \text{SUBJ} \rangle \]

In the notation used for semantic forms, the argument role positions are filled by function designators, so (8) is written as in (9):

(9) ‘live (↑ subj) (↑ obj)’ $\iff$ ‘live (↑ obla\(_g\)) (↑ subj)’

In essence, the grammar is factored into relation-changing lexical regularities like (9) and relation-preserving syntactic regularities. The latter consist of word order alternations (such as we see in verb movement, scrambling, topicalization, and the other phenomena discussed in Part III) and principles for associating surface structures with syntactic functions. All of these syntactic regularities are monotonic in the sense defined above.

Although relation changes are lexical alternations, they induce syntactic alternations in forms of expression through the principles of completeness and

---

3 Optionality of the oblique agent function is indicated by parentheses. As mentioned in Chapter 3, footnote 2, the passive by-phrase is sometimes treated as an ADJUNCT. This is a consequence of the standard lexical mapping theory analysis (see Chapter 14) and is discussed further by Needham and Toivonen (2011), who also provide further references.
coherence. For example, the verb *kissed* has the alternative semantic forms given in (10): (10a) for the active past-tense verb, (10b) for the passive participle:

(10)  
(a. *kissed*: \( \text{kiss} \langle \uparrow \text{subj} \rangle \langle \uparrow \text{obj} \rangle \)’

   b. *kissed*: \( \text{kiss} \langle \langle \uparrow \text{obl}_{ag} \rangle \rangle \langle \uparrow \text{subj} \rangle \rangle \)’

In syntactic contexts where (10b) is chosen, completeness will require a \text{subj} and optionally an \text{obl}_{ag}, and coherence will exclude an \text{obj}. Where (10a) is chosen, completeness will require a \text{subj} and an \text{obj} and coherence will exclude an \text{obl}_{ag}. Thus different c-structures will be required to support the alternative semantic forms, as illustrated in (11) for the active and (12) for the passive:

(11)  
(12)  
(An auxiliary verb is required with the passive in (12) because the past participle is not a finite verb form.)

A strong point of the early LFG theory of relation changes was that it captured the undeniable lexicality of these processes (Chapter 3).\(^4\) However, this theory has

\(^4\) This idea was subsequently adopted within other frameworks to a greater or lesser degree. The previous transformational view was that passivization is a purely structure-dependent syntactic operation
been replaced by a new, monotonic theory of relation changes known as “lexical mapping theory.” That theory and some of its implications are discussed in Part IV.

5.3 Information and form

We now observe several other very general consequences of the design features built into the formal architecture of LFG.

5.3.1 The fragmentability of language

Because information about the functional structure is locally distributed throughout the word and phrase structure under these principles, it is easy to explain the “fragmentability of language” – the fact that we can infer the internal structural relations of arbitrary sentence fragments as easily as we can those of complete sentences, and the supporting fact that sentence fragments are so extensively used in actual discourse contexts.\(^5\)

Fragments give partial, or incomplete, specifications of f-structures. For example, the verb *seem* in the following fragment gives the partially specified f-structure shown in (14).\(^6\)

\[(13) \quad \ldots \text{seems to} \ldots\]

\[(14) \quad \text{F-structure of fragment } (13)\]

\[
\begin{align*}
\text{SUBJ} & \quad \text{PRED} & \quad \text{TENSE} & \quad \text{XCOMP} \\
\text{NUM} & \quad \text{ safeguards} & \quad \text{FOG} & \quad \text{FIN} & \quad \text{SUBJ}
\end{align*}
\]

on phrase markers, considered to be insensitive to the lexical relation between the verb and the NP to be moved (e.g. Chomsky, 1973, p. 233).

\(^5\) It has been a controversial point in the linguistics and philosophy literature whether fragments are further filled out syntactically before semantic interpretation or are somehow directly interpreted, perhaps according to primarily pragmatic principles; see Culicover and Jackendoff (2005) and Asudeh (2012) for discussion from a linguistic perspective and Stainton (2006) for discussion from a philosophical perspective.

\(^6\) In fact, there is a set of f-structures for this fragment, arising from its ambiguity. For example, *to* could be the infinitival marker, as in *… seems to V …*, or it could be the preposition marking an experiencer, as in *… seems to NP …*. The f-structure in (14) arises from the former analysis.
The f-structure in (14) satisfies the partial functional specifications provided in the c-structure fragment (15). Note how the functional information is localized in individual words and pieces of c-structure.⁷

(15)  Annotated c-structure and lexicon of fragment (13)

```
  a. ...
      VP
         ↑ = ↓ (↑ XCOMP) = ↓
         V
         ↑ VP
         seem
         to ...
```

b.  seem

(↑ PRED) = ‘seem((↑ XCOMP)(↑ SUBJ)’
(↑ SUBJ) = (↑ XCOMP SUBJ)

-s
(↑ TENSE) = PRES
(↑ SUBJ) = ↓
(↓ PERS) = 3
(↓ NUM) = SG

to
(↑ FIN) = –

Although (15) depicts only a fragment of structure, and one that is not even a complete constituent, observe that it determines the skeletal function–argument relations of a full clause and embedded complement construction as shown in (14). Compare with this fragment the c- and f-structures for the full sentence (16) given in (17) and (18).

(16)  He seems to agree.
(17)  Annotated c-structure and lexicon of (16)

```
a. S
  ↑ SUBJ) = ↓
  NP
  he
         VP
         ↑ = ↓ (↑ XCOMP) = ↓
         V
         ↑ VP
         seem
         to
         ↑ VP
         ↑ = ↓
         V
         agree
```

⁷ The line connecting the SUBJ of the outermost f-structure in (18) to the SUBJ of the XCOMP represents identity of two f-structures (sometimes referred to as “structure-sharing”); see Section 4.5.
b. *he*  
\[
\begin{array}{l}
\uparrow \text{PRED} = \text{‘pro’} \\
\uparrow \text{NUM} = \text{SG} \\
\uparrow \text{PERS} = 3 \\
\uparrow \text{GEND} = \text{MASC}
\end{array}
\]

*seem*  
(as in (15b))

*-s*  
(as in (15b))

to  
(as in (15b))

*agree*  
(\(\uparrow \text{PRED} = \text{‘agree(\(\uparrow \text{SUBJ}\))’}\))

\[(18) \quad \text{F-structure of (16)} \]

\[
\begin{array}{l}
\text{f}_2: \\
\text{SUBJ} \\
\text{TENSE} \\
\text{PRED} \\
\text{XCOMP}
\end{array}
\begin{array}{l}
\begin{array}{l}
\text{PRED} \quad \text{‘pro’} \\
\text{NUM} \quad \text{SG} \\
\text{GEND} \quad \text{MASC} \\
\text{PERS} \quad 3
\end{array} \\
\text{PRED} \quad \text{‘seem((f XCOMP))(f SUBJ)’} \\
\text{FIN} \quad - \\
\text{PRED} \quad \text{‘agree((f SUBJ))’}
\end{array}
\]

Observe the relation between the fragment f-structure (14) and the full f-structure (18). The c-structure context in which the fragment is embedded simply adds further information about the subject and the complement of *seems*. In actual discourse contexts this information may be redundant, and can easily be eliminated:

\[(19) \quad [\text{Speaker A:}] \text{And he agrees?} \\
[\text{Speaker B:}] \quad \text{— seems to.} \]

A fragment containing a word which is the main predicator of its phrasal context (that is, a word which is the “head”) will specify, in skeletal form, an f-structure for that entire phrasal context. Thus a verb such as *seem* carries a great deal of information about the global f-structures of the sentences it can be used in. However, not all fragments are as informative about the possible internal relations of their syntactic contexts, as the following example illustrates:

\[(20) \quad \ldots \text{to by for} \ldots \]

This fragment occurs embedded in the English sentence (21):

\[(21) \quad \text{The one he should be spoken to by, for God’s sake, is his mother.} \]
The three prepositions are not grammatically related to each other in the internal structure of this sentence. What we can infer from them in (20) is just three unrelated f-structures containing the lexical features of each preposition. Thus fragmentability does not mean that arbitrary sentence fragments are easy to understand; it means that the internal structures of fragments can be inferred as easily as those of sentences. The inferred internal structures of fragments may cohere to a greater or lesser degree, depending on how closely related are the words of the fragment in their syntactic context.

### 5.3.2 The nonconfigurationality of language

Another pervasive property which these principles support is the nonconfigurationality of language – the fact that the functions and arguments of internal structures are not canonically externalized in phrase structure configurations across languages. The reason is that the same kinds of functional descriptions can be carried by word structure as by phrase structure, and languages may differ typologically in the extent to which they localize information about internal structures in morphology or in phrasal syntax.

Within a language, too, functional specifications of the same elements of internal structure may be carried by the morphology of words, by the phrasal syntax, or by both together. For example, although English is relatively poor in the amount of functional information carried in its morphology, we can see even in English that a functional specification of the subject is carried by the verbal inflection in (22) and by the surface constituent configuration shown in (23).

(22) -s  (↑ TENSE) = pres  
(↑ SUBJ) = ↓  
(↓ PERS) = 3  
(↓ NUM) = sg

(23)  S  
(↑ SUBJ) = ↓  
NP

It follows that the functional information carried by word structure and by phrase structure can interact, even though the internal constituency of words and phrases is relatively independent, or modular. As we will see in later chapters, this consequence enables us to explain the existence of syntactic “bracketing paradoxes” in natural languages – cases where the f-structure bracketing of a sentence does not correspond to the c-structure bracketing.

On our theory, the existence of both nonconfigurationality and syntactic bracketing paradoxes arises from the fact that f-structure is a parallel, copresent structure that corresponds imperfectly to c-structure.
5.3.3 Apparent information flow through external structure

The third general property of language explained by these principles is the apparent flow of information through external structure. In (24), for example, information about the singular number of the boy seems to flow between the subject NP and the V:

\[(24)\]

In general, syntactic features seem to propagate across nodes of the phrase structure and morphology. Most linguistic theories have recognized this phenomenon and incorporated it into explicit conventions of feature propagation. These theories provide various mechanisms for describing this flow of information, but they do not explain it: \textit{why} do features propagate in external structures?

The design principles of our theory provide an explanation: the mapping between external structure and internal structure is not an isomorphism but a many-to-one relation. Thus in (24), a single functional constituent, the \textit{subj} the boy, corresponds to information given in two different c-structure positions, as shown in (25) – that of the verbal inflection and that of the initial NP:

\[(25)\]

The initial NP carries information about the subject, as shown in the annotated c-structure in (23); and the verbal tense inflection -s also carries information about
the subject, as shown in the morphological entry in (22). By functional uniqueness, this information must agree.

In general, the locality relations on f-structure are not identical to the locality relations on c-structure. Hence, information projected from the f-structure onto the c-structure will often be discontinuous. This imperfect correspondence between the two parallel structures is what gives rise to the illusion of feature propagation and movement.

5.3.4 Noncompositionality

Finally, observe that LFGs are noncompositional, in the sense that the f-structure of a constituent is not solely a function of the f-structures of its immediate daughter constituents. To see this, consider the f-structure \( f \) of the VP in (26). (It happens that \( f \) is an incomplete f-structure, because it lacks the SUBJ required by the PRED ‘kiss …’.)

Given that every c-structure node corresponds to a unique f-structure, we have labeled each of VP, V, and NP with a unique f-structure index, \( f \), \( g \), and \( h \), respectively. Recall that these f-structures are not necessarily distinct; for example, because the V is the head of the VP (annotated \( \uparrow = \downarrow \)), \( f = g \). In (26), where VP is the root of its own tree, the f-structure \( f \) consists entirely of the attribute–value pairs collected from the functional descriptions of VP’s immediate constituents V and NP.

Now compare the same VP dominated by the S in example (11), repeated here:
In (27) we find that the f-structure of VP also contains attribute–value pairs collected from the f-structure of its mother node S – namely, those of the subject NP. This result follows from the annotation \( \uparrow = \downarrow \), which means precisely that the f-structure \( f \) of this VP is identified with the f-structure \( e \) of its mother node S. In isolation, the VP specifies an incomplete f-structure which contains no information about the subject other than that it must exist (inferred from the lexical specification of *kissed*). The fact that the f-structure of the VP may vary with the sentential context in which it is embedded, while its internal constituents remain invariant, illustrates very clearly the syntactic noncompositionality of the LFG architecture. In general, the f-structure of a constituent may depend on its surrounding syntactic context, and not merely on its internal constituents. Indeed, this is how discontinuous constituents, such as we find in Warlpiri (Chapter 1), are unified. In a sense, our analysis of English treats the VP as a potentially discontinuous constituent, whose f-structure contents may be dispersed across the sentence.

Compositionality of predication relations in the constituent structure is a defining property of many grammatical architectures. However, LFG has been deliberately designed as a noncompositional grammatical architecture, for the reason that the typological diversity of syntactic structures we find across languages motivates a more flexible design of grammar than strict compositionality allows. Grammatical phenomena motivating noncompositionality in syntax can be found in Chapters 1, 7, and 9 and in the Problem Sets.

### 5.4 Conclusion

Interpreted epistemologically, LFG represents knowledge of language as localized, partial knowledge that is synthesized by constraint satisfaction. Because of its distinctive architectural properties – monotonic, lexicalist, parallel, and constraint-based – and its explicit mathematical model, LFG has attracted interest beyond linguistics proper, and has been incorporated into psychological theories of language acquisition, perception, and production, as well as into computational systems of language processing. The reader of Chapters 1–5 is well equipped to pursue further readings in these areas.
Part III
Inflectional Morphology and Phrase Structure Variation

Introduction

The formal model given in Part II allows us to analyze a wide range of syntactic phenomena and to develop some central principles of syntactic theory.

We can now see explicitly how the syntax of language is modeled as linked parallel structures, each of a different formal character. We can also see how the grammar and lexicon consist of a set of local, codescriptive constraints on partial structures. There are no serial operations involved: grammatical structures are defined by constraint satisfaction. If grammar is taken to represent knowledge of a language, then a lexical-functional grammar represents this knowledge as localized, partial knowledge – an epistemologically distinctive conception with very different implications from the conventional generative view.

However suggestive this formal architecture of grammar may be, it does not by itself answer a number of substantive questions of syntactic theory. Perhaps the central questions are Where do the annotated c-structure constraints come from? and What gives c- and f-structures the properties of variability and invariance they are supposed to model? The purpose of Part III is to sketch the outlines of an answer, focusing particularly on the source of variability.

Chapter 6 addresses the first question by proposing general principles for annotating c-structures with functional schemata. This theory prevents arbitrary structure–function mappings, and thereby gives one solution to the problem posed by the existence of “monsters” of c-structure/f-structure correspondence (Problem Set 1). At the same time it allows for very substantial variation in modes of...
expression across languages, permitting what is possibly the richest syntactic
typology of all current generative theories.

The problem of variability is also addressed in Chapter 6, beginning with the
principles of economy of expression and lexical integrity, which create competition
between words and phrases expressing the same f-structure information. In a kind
of lexical bias, LFG gives preference to lexical over syntactic representations of
equivalent f-structures. Extensive illustrations of the interplay between lexically
and configurationally expressed information are given in Chapters 7, 8, and 9 (on
head movement, pronominal incorporation, and scrambling/extraction).
6 A Theory of Structure–Function Mappings

Why should phrase structure vary across languages? It is a surprising fact that virtually all generative theories of universal grammar are completely compatible with the absence of variation across languages.¹ We may stipulate that there are alternative universal schemata for phrase structure, or different parameters of variation and choices of formal features, but we do not thereby explain this fact, or relate it to other properties of language. In contrast, functionalists have long argued that language variability reflects conflicting functional constraints such as iconicity and economy (e.g. Haiman 1985), which may be resolved differently by different languages. Yet they have found it difficult to relate those constraints systematically to generative theories of linguistic structure, perhaps because the functional constraints are “output-oriented,” applying to overt, “surface” forms of expression rather than to underlying structures. In most generative theories of universal grammar, all of the linguistically significant properties of surface forms are completely derivative from underlying structures by means of the generative mechanisms. No independent theoretical status is accorded to “surface” forms of expression.

The formal architecture of LFG suggests a distinctive theoretical answer to these questions: the parallel structures of LFG do have an independent status and may be subject to conflicting constraints. For example, as we have already seen in Chapter 4, the principles of completeness and coherence require full representation of grammatical relations in f-structure, and this induces the presence of certain

¹ An important exception is optimality theory (OT) (Prince and Smolensky 2004), which defines grammars to be the language-particular prioritizations of conflicting universal constraints. Since universal constraints conflict, they cannot simultaneously be satisfied. In this framework, variation could be eliminated only with the extrinsic stipulation of a single, universal prioritization. For work on LFG in an OT setting, see Bresnan (2000), Sells (2001b,c), Kuhn (2001, 2003), Lee (2006, 2007), Wescoat (2007), and others.
c-structure constituents through the correspondence mapping. Hence full representation might be thought of as a universal iconicity requirement between syntax and semantics. In contrast, principles of lexical integrity and economy of expression, to be discussed directly, universally require elimination of unnecessary syntactic constituents from c-structure. The elimination of syntactic complexity has an equally valid functional motivation, minimizing effort in computing forms of expression. Thus, these parallel c- and f-structures are subject to conflicting principles related to their roles within the overall grammar as a system of transduction between meaning and form. Hence, the correspondence between them cannot be perfect. There will be possible mismatches between the parallel structures and redundancies between types of forms of expression. In this setting, principles of conflict resolution can play an explanatory role in accounting for variation in forms of expression.

In the present work, we will adopt the specific economy principle stated in (1):\(^2\)

\begin{align*}
(1) \quad \textbf{Economy of expression:} \\
\text{All syntactic phrase structure nodes are optional and are not used unless required by independent principles (completeness, coherence, semantic expressivity).}
\end{align*}

Here the restriction to \textit{syntactic} phrase structure nodes is meant to exclude both terminal nodes, which are morphological words, and preterminal nodes, which immediately dominate words. In (2), NP, N\(^{\prime}\), AP, and A\(^{\prime}\) are syntactic phrase structure nodes: \textit{big} and \textit{lions} are terminal nodes; \textit{A} and \textit{N} are preterminal nodes.

\begin{align*}
(2) \\
\text{NP} & \quad \text{syntactic phrase structure nodes} \\
\text{AP} & \\
\text{A}^{\prime} & \quad \text{preterminal nodes} \\
\text{N}^{\prime} & \quad \text{terminal nodes} \\
\text{A} & \quad \text{lions} \\
\text{big} &
\end{align*}

Thus “syntactic phrase structure nodes” refers to those nonterminal nodes which do not immediately dominate a lexical element. The restriction of economy of expression (1) to syntactic phrase structure nodes privileges lexical over phrasal expression where possible, as we will see. Economy of expression requires that if a syntactic phrase structure node does not contribute to completeness, coherence, or semantic expressivity, then it is not allowed. “Semantic expressivity” allows for the use of nodes like the AP \textit{big} in (2). Adjuncts like this AP are not required by completeness and coherence; yet they are retained because \textit{big lions} differs from...

\(^2\) See Dalrymple et al. (2014) for a thorough formalization and critical discussion of different notions of economy of expression in the LFG literature.
lions in semantic expressivity. Indeed, any nodes that are needed for incorporating content words into a sentence are retained for this reason, in addition to satisfying completeness in some cases.

Now the principle of economy of expression implies that if a syntactic phrase structure node provides only redundant information, it is not allowed. Within the scope of our study, we can model relative information by the lattice of f-structures described in Chapter 5: a phrase structure node is omitted if the f-structure arising in its absence is at least as specific as the f-structure arising in its presence.\(^3\) C-structure economy is thus not to be equated with “morphological blocking” (Andrews 1990b; Toivonen 2000), where synthetic forms such as bigger compete with analytic realizations such as more big. In each case we will compare c-structures of a given sentence for which the lexical choices have antecedently been made. Under these assumptions, the satisfaction of the economy principle is clearly decidable, and follows from the decidability of grammaticality in LFG (Chapters 4 and 5). An immediate consequence is that an empty c-structure category dominating no terminal element and providing only redundant f-structure information will not be allowed. For example, the nodes labeled N and N\(^\prime\) in (3) would be rejected by economy of expression:

\[(3) \quad \begin{array}{c}
NP \\
\uparrow = \downarrow \\
N' \\
\uparrow = \downarrow \\
N \\
\downarrow e
\end{array}\]

The N node dominates no terminal node\(^4\) and so does not contribute to semantic expressivity; it also adds no new functional information of its own, being annotated only with the \(\uparrow = \downarrow\) schema which simply identifies the f-structures of the mother and daughter nodes (Chapter 4). The same is true of the N\(^\prime\) node. Thus both N\(^\prime\) and N will be rejected by economy of expression in favor of a similar structure without these nodes. Whether or not the node labeled NP in (3) is allowed depends on whether its annotations provide information needed for completeness and coherence of the sentence of which it is a part. In isolation as in (3), it would simply be rejected by economy of expression. In the present framework (following Bresnan 1998, Choi 1996, 1999, 2001, and Berman 1997), empty categories

---

\(^3\) Clearly, this idea can be generalized to other dimensions of information than that represented by f-structure, but we will not take this further step in the present study.

\(^4\) The familiar symbol \(e\) originating in formal language theory denotes the empty string; it thus stands for the absence of a terminal node, not for the presence of a special “empty” terminal node.
can appear as a “last resort” in highly configurational languages which lack other means of specifying functions. Examples are discussed in Chapter 9.

Economy of expression may be viewed as a special case of the functionalist economy principle articulated by Haiman (1985, pp. 158–159) as the avoidance of syntagmatic redundancy, or “the tendency to economize on the length or complexity of any utterance or message.” However, it is structural complexity rather than length in words that is economized by (1). Although not articulated explicitly in these terms until the publication of Bresnan (2001c), something like this principle had been implicit in analytic work in LFG, which has always avoided empty categories or structures empirically unmotivated by overt forms.\(^5\) Another way to think of the principle is to see that it requires each c-structure node to contribute to the overall f-structure; from this point of view it may be better to regard it as a principle of functionality of c-structure.

Economy of expression creates potential competition between different forms of expression that carry overlapping information within the same sentence or phrase. When we consider a further principle, explicit in LFG from the beginning (Bresnan 1982b; Simpson 1983a), the elements of our theoretical explanation of phrase structure variation fall into place. This is the principle of lexical integrity:\(^6\)

\[(4) \text{ Lexical integrity:} \]
\[
\text{Morphologically complete words are leaves of the c-structure tree, and each leaf corresponds to one and only one c-structure node.}
\]

Principle (4) implies that the structural formation of words is independent of the structural formation of phrases.\(^7\) We see this difference clearly in Warlpiri c-structure: while the relative order of words in sentences is extremely free (see Chapters 1 and 9), the relative order of stems and inflections in words (such as the case and tense markers) is fixed. It is quite generally true across languages that morphemic order within words is rigidly encapsulated from the kind of scrambling and free orderings seen in word-external structures. Not only the order of word-internal elements but also their structural type differs from that of c-structure phrases. Even in cases of word formation that appear to interact with the structure of the clause, such as West Greenlandic noun incorporation (Problem Set 2), where a verb-internal noun stem may specify an f-structure complement of the clause, the incorporated noun is a bound stem which lacks the structural

---

\(^5\) Compare Zaenen’s (1989) WYSIWYG (“what you see is what you get”) principle, which is close in spirit though not identical in consequence.


\(^7\) Compositionality effects of word formation on the syntactic context do occur, because the order in which valence-adding and valence-reducing morphological components are utilized affects the valence of the resulting word: see Alsina and Mchombo (1990) and Alsina (1999) for discussion.
properties of syntactic noun phrases (such as case morphology). This difference reappears in other noun incorporation languages (T. Mohanan 1994, 1995). Such structural differences have further consequences which can be traced to the fundamental requirement that words be composed of lexical materials (stems and affixes), which exclude purely syntactic constructs such as empty categories and phrasal configurations (T. Mohanan 1994; Bresnan and Mchombo 1995). Thus, while it is possible that certain types of words may be compounded from elements that are arranged in a word-internal morphemic tree structure whose constituents may even have f-structure functions, these word trees still give evidence that they are not subject to the c-structure principles or rules (such as extraction configurations) that we find in the structural formation of syntactic phrases.

Lexical integrity within LFG differs from other formulations of lexical integrity which assert that the internal structure of words is invisible to all syntax. Principle (4) keeps the internal structural formation of words invisible to c-structure principles, but it allows the f-structures specified by words to unify with the f-structures of the syntactic contexts.

This conception of lexical integrity has close parallels in prosodic phonology. The phonological word is the minimal element in sentential prosodic structure, and it is well known that phonological words may mismatch and overlap c-structure words (Inkelas and Zec 1990). Similarly, within a morphological word, prosodic units such as syllables and feet may mismatch the morphemic units, giving rise to prosodic infixation. In the same way, the morphologically complete word is a minimal element in c-structure, but it may correspond to several “functional words.” Conversely, a single “functional word” may correspond to several morphologically complete syntactic words. We have already seen examples of such mismatches: the Greenlandic verb can be analyzed as a single c-structural word that may incorporate different f-structure “words” (an object and the main predicator), each corresponding to a different \textit{pred} attribute; similarly, the synthetic verbal forms of Ulster Irish are morphologically complete c-structure words that correspond to distinct f-structure “words” (a pronominal subject and the main predicator); see Problem Set 2.

As we have just seen, LFG’s lexical integrity principle implies that while morphemic words and syntactic phrases are different types of forms of expression in c-structure, they may carry the same types of information in f-structure. In other words, these different forms of expression – words and phrases – may be functionally equivalent (in terms of f-structure content). In such cases of equivalence, economy of expression privileges words over syntactic phrase structure nodes: it is only the syntactic nodes whose presence must be justified by economy of expression. In effect, words are given a competitive advantage over phrases. It then follows that

---

8 For recent work on prosody and prosodic structure in LFG, see Mycock (2006, 2010), Dalrymple and Mycock (2011), Mycock and Lowe (2013), Bögel et al. (2009, 2010), and Bögel (2012, 2013).
9 On the functional word as a \textit{pred}-bearing unit, see Webelhuth and Ackerman (1999), Matsumoto (1996a), and T. Mohanan (1995); on the functional word as an element of a paradigm sharing f-structure features, see Börjars et al. (1997) and Bresnan (2001b).
within a sentence, morphological forms will compete with and pre-empt phrases that carry no additional information. If the syntactic phrase structure nodes do not bear additional functions that distinguish them from the morphological structures, they must be omitted. Morphologically rich languages thus potentially exert a strong competitive pressure on their syntactic phrase structures, and given the historical changes that have led to morphological elaboration and erosion, this result can provide a theoretical explanation for the existence of phrase structure variation within our formal model of universal grammar.\(^{10}\)

The present chapter outlines a particular theory of c-structure to f-structure mappings based on these principles. In the subsequent chapters of Part III we apply this theory to several types of phrase structure variation seen crosslinguistically: head movement (Chapter 7), pronominal incorporation (Chapter 8), and scrambling (Chapter 9). In Chapters 9 and 10 we examine the consequences of this theory for pronominal binding, and we discover independent evidence for the thesis that morphology competes with syntax in the way proposed here.

In relation to Part II, the theory developed in the subsequent chapters is a metatheory. The LFG architecture is compatible with a range of differing substantive theoretical conceptions of grammatical functions, c-structure categories, morphology, and c-structure to f-structure mappings. If we think of each grammar as a formal theory of the language it generates, the substantive linguistic principles under discussion here constitute a metatheory – a theory of theories.

6.1 Grammatical functions

A theory of c-structure to f-structure mappings begins with the definition of the f-structure functions. We will therefore outline the basics of the theory of grammatical functions assumed here; functions are further analyzed in Part IV.

6.1.1 Basics of grammatical functions

Grammatical functions are characterized in Chapter 1 as the “relators” of c-structure to a-structure. Arguments for the usefulness (indeed, necessity) of direct reference to grammatical functions in syntactic analysis have been drawn from a large body of languages and syntactic phenomena (Perlmutter and Postal 1983; Zaenen et al. 1985; Falk 2006; Toivonen 2007; Nikitina 2008, and many others). Each function – e.g. subj, obj, adj(unct) – maps a class of

\(^{10}\) These principles do not of course exhaust the relevant constraints which may come into conflict in LFG’s parallel/correspondence architecture (Asudeh and Toivonen 2015; Asudeh 2012). See Bresnan (2001b) for more thorough discussion and references.
c-structure expressions to argument structures in a characteristic way. The mapping between argument structure roles, or thematic roles, and grammatical functions is highly predictable, although we must allow for some amount of lexical specification (Jackendoff 2007). This mapping is discussed in Chapter 14. Syntactic functions are thus a useful abstraction from the variability of c-structures. This property holds regardless of the particular inventory of functions defined by the metatheory.\footnote{Some alternatives are to employ: a coarser-grained inventory of core functions, such as \textit{spec} (specifier) and \textit{comp} (complement) (e.g. Bresnan 2000), or of object functions (Joshi 1993; Alsina 1996b); a finer-grained inventory of core functions distinguishing transitive subject (A) from intransitive subject (S) (e.g. Dixon 1972; Kiparsky 1997b) or distinguishing different aspects of the \textit{subj} grammatical function (Falk 2000, 2006); a coarser inventory of discourse functions using the concept of pivot (e.g. Manning 1996); or different primitive classifications of functions (e.g. T. Mohanan 1994; Alsina 1996b; Joshi 1993; Zaenen 1994).}

For example, the \textit{subj} function has no single universal structural form. Instead there is a class of varying forms of expression that participate in the mappings to argument structures in the same way. Structural expressions of the subject include NPs in a certain phrase structure configuration (English), discontinuous nominals bearing a specific case (Warlpiri, Chapter 1), verbal inflectional morphology alternating with syntactic NPs (Ulster Irish, Problem Set 2), and zero pronouns lacking any c-structure representation. These expressions are schematically represented as $c-s_1, c-s_2, \ldots, c-s_n$ in (5), which depicts their shared mappings to argument structures $a-s_1, a-s_2, \ldots, a-s_n$ (e.g. monadic, dyadic, triadic, passive of dyadic, etc.):

\begin{equation}
\begin{array}{c}
\text{a-}s_1 \\
\text{c-}s_1 \text{c-}s_2 \ldots \text{c-}s_n
\end{array}
\begin{array}{c}
\text{a-}s_2 \\
\text{c-}s_1 \text{c-}s_2 \ldots \text{c-}s_n
\end{array}
\begin{array}{c}
\ldots
\end{array}
\begin{array}{c}
\text{a-}s_n \\
\text{c-}s_1 \text{c-}s_2 \ldots \text{c-}s_n
\end{array}
\end{equation}

The “\textit{subj}” abstraction allows us to avoid separately stating the same argument structure mappings for each type of expression, which would make their equivalence accidental:

\begin{equation}
\begin{array}{c}
\text{a-}s_1 \text{a-}s_2 \ldots \text{a-}s_n
\end{array}
\begin{array}{c}
\text{c-}s_1 \text{c-}s_2 \ldots \text{c-}s_n
\end{array}
\begin{array}{c}
\text{SUBJ}
\end{array}
\end{equation}

The characteristic mappings of the \textit{subj} function onto arguments vary typologically along several dimensions. In the basic case (i.e. without special verbal morphology), the subject may map onto the semantically most prominent available role in the argument structure (as in accusative languages), onto the argument in control of the eventuality (as in active languages), or onto the argument most affected by the eventuality (as in ergative languages). The subject may also map
A Theory of Structure–Function Mappings

onto the most prominent argument on a person or animacy hierarchy (as in inverse systems – see Bresnan et al. 2001 and Chapter 8). What these possibilities have in common is the prominence of the subject argument on the selected dimension relative to other arguments.

As with the subj function, the obj function has no single universal structural form. Instead there is a class of varying forms of expression that all participate in the obj mappings to argument structures in the same way. Structural expressions of the object include NPs in a certain phrase structure configuration (English), discontinuous nominals bearing a specific case (Warlpiri, Chapter 1), noun stems morphologically bound to the verb (in some noun-incorporating languages; cf. Greenlandic, Problem Set 2), verbal inflectional morphology alternating with syntactic NPs (Moroccan Arabic, Problem Set 2), and null pronominals lacking any c-structural expression at all. In the Bantu language Kichaga, an SVO language, topical pronominal objects are prefixed to the verb stem as part of the verb morphology, free pronoun objects appear at the right edge of the VP (doubled by the verbal object prefix), and nominal objects are NPs immediately following the verb (Bresnan and Moshi 1990). All three of these different structural expressions of obj behave alike under lexical operations that alter argument structure (e.g. applicatives, causatives, passives). The “obj” abstraction allows us to avoid restating the same argument structure mappings for each type of expression, exactly as in the case of the subj in (6) above. The obj function is thus an equivalence class of c-structure expressions that share these characteristic mappings to argument structure.

Among objects, typologists have made several classifications, distinguishing direct and indirect objects on the one hand, and primary and secondary objects on the other (Dryer 1986). Researchers in LFG have generally adopted the latter classification, using the names “obj” and “obj_θ” for primary and secondary objects, respectively.  

The subject and objects are the core functions associated with the central participants of the eventuality expressed by the verb. They are usually formally distinguished from noncore functions, such as obliques (designated obl_θ and

---

12 For an introductory discussion of equivalence classes in linguistics, see Isac and Reiss (2013).

13 The traditional term “indirect object” refers to a complement with a specific type of argument role (recipient or beneficiary), often associated with dative case. In the present scheme these may be primary or secondary objects. Special syntactic properties of indirect objects are then derived from conditions on their argument role or the effects of dative case-marking (Alsina 1994b, 1996b). “obj_θ” designates any secondary object; secondary objects are indexed to some thematic role. See Alsina (1994b, 1996b) for an alternative representation of secondary objects, and see Siewierska (2003) for a discussion of indirective and secundative alignments of ditransitives in LFG.

14 Core functions are characterized as “semantically unrestricted” functions in Bresnan (1982a) (see also Kroeger 1998), but in later work (e.g. Levin 1985; Bresnan and Kanerva 1989; Bresnan and Moshi 1990) the terms “restricted” and “unrestricted” are used in a different sense. To avoid confusion, the term “core” is adopted here. “Term” is also used for core functions in LFG by T. Mohanan (1994), Alsina (1994b, 1996b), and Arka (1998).
indexed to their thematic role), sentential and predicate complements (comp and xcomp),\(^{15}\) and adjuncts (adj), which are not argument functions at all. In English, for example, core arguments have canonical c-structure positions which can be occupied only by NPs/DPs; noncore arguments are generally expressed by other c-structure categories (obliques by PPs, other complements by VPs, APs, CPs, etc.). In Zazaki (a variety of Zaza, an Anatolian language belonging to the Northwest subgroup of Iranian languages), core arguments are all marked by the same direct case, while noncore arguments receive the same oblique case (Sandonato 1994). In Malayalam, only core arguments can be expressed as zero pronouns (K. P. Mohanan, 1982b).

The core and noncore functions are arranged in a functional hierarchy, sometimes also referred to as a “relational hierarchy” (Keenan and Comrie 1977), shown in (7):

\[
\begin{array}{c}
\text{core} \\
\text{SUBJ} \triangleright \text{OBJ} \triangleright \text{OBJ}_\theta \\
\text{OBL(1QUE)}_\theta \triangleright \text{XCOMP}, \text{COMP} \triangleright \text{ADJ(UNCT)} \\
\end{array}
\]

Argument functions are all more prominent than adjuncts, and these prominence relations play a role in pronominal binding theory (Chapters 9, 10 and 11).

In addition to adjuncts, there are other nonargument functions that do not map directly to a-structure roles:

\[
\text{Nonargument functions:} \\
\text{TOP(ic), FOC(us), ADJ(UNCT)}
\]

As discussed in Section 4.9, all nonargument functions allow multiple instances without violating the uniqueness condition on f-structures.\(^{16}\) Like the argument functions, the nonargument functions can be defined as equivalence classes of a range of c-structure expressions under the mapping to argument structures. All of the nonargument functions bind their expressions to something other than an argument role.

The ADJ(UNCT) function binds to a pred rather than to one of its arguments: an adj satisfies the completeness and coherence conditions (Section 4.7) by occurring in the same f-structure as the pred it modifies. As with the argument functions, there is no universal structural form taken by all ADJS. They may be of any category type and may occur in a variety of configurations or case-marked forms.

The TOP(ic) and FOC(us) functions map indirectly to the argument structure by being identified with, or anaphorically linked to, another syntactic function.

\(^{15}\)These are sometimes designated together as compl.

\(^{16}\)It is possible to preserve uniqueness by adopting a more fine-grained sortal theory of nonargument functions. Asudeh and Toivonen (2006, 2007, 2012) and Asudeh (2012) also discuss restrictions on the co-occurrence of multiple identical nonargument functions.
For example, the preposed phrase *Rosie* in (9) is both the *FOC* and the *OBJ* of its sentence:

(9)  **Rosie** I named her.

English topicalizations can have either *FOC* or *TOP* functions, as shown by the *wh*-question test (Gundel 1974; Kroeger 1993). The answer to an interrogative is focused relative to the (topical) residue that remains after subtracting the interrogative phrase. By this test, the construction called “topicalization” in English can either focus the initial constituent or make a (new) topic of it:17

(10)  Q: What did you name your cat?
      A:  **Rosie** I named her. (*Rosie* = *FOC*)

(11)  Q: What did you name your pets?
      (*my dog, my cat* = *TOP*)

However, *TOP* and *FOC* often diverge in their formal expressions, occupying different phrase structure positions or bearing different morphological marking.

Note that *f*-structure is not meant as a model of the pragmatics of discourse functions, but only as one dimension of grammatical structure, which includes the syntactically represented (“grammaticalized”) functions.18 These functions all have much richer, more complex, and variable discourse uses. Similarly, *a*-structure is not meant as a model of semantic structure.

Table 6.1 lists the grammatical functions typically adopted in LFG, along with examples. The list is representative, but variation occurs in the literature. The function *SPEC* is often utilized for *POSS*essor and quantificational determiner phrases (see, e.g., Dalrymple 2001). Some researchers still use the original *OBJ* label instead of *OBJ*. There is a rich body of research exploring the exact characteristics of individual grammatical functions and contrasts between functions; see, for example, Alsina et al. (2005), Börjars and Vincent (2008), Dahlstrom (2009), Falk (2006), Forst (2006), Kroeger (1993), Mittendorf and Sadler (2008), and Zaenen and Crouch (2009).

17 Examples of this particular type were pointed out by Paul Kroeger (personal communication).
18 For recent LFG work on discourse- and information-structure (*i*-structure), see Mycock (2006), O’Connor (2006), Andréasson (2007), Dalrymple and Nikolaeva (2011), Mycock (2013), and Mycock and Lowe (2013). Since *TOPIC* and *FOCUS* in *f*-structure are not meant to model the pragmatics or information structure of discourse functions, and given the recent work on *i*-structure, some of which postulates *i*-structure functions called *TOPIC* and *FOCUS*, Alsina (2008) and Asudeh (2011, 2012) have proposed that *TOPIC* and *FOCUS* in *f*-structure should be replaced with a single, undifferentiated *f*-structural grammatical function which maps to *TOPIC* or *FOCUS* at *i*-structure, such that the latter are now only *i*-structural functions. Alsina calls this function *OP* (for “operator”), whereas Asudeh calls it *UDF* (for “unbounded dependency function”).
<table>
<thead>
<tr>
<th>Table 6.1</th>
<th>Examples of English grammatical functions in LFG (based on Asudeh and Toivonen 2015, p. 380; used with permission)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUBJECT</strong> (SUBJ)</td>
<td>Some people with no shame walked in and wrecked the party. The party was wrecked by some people with no shame.</td>
</tr>
</tbody>
</table>
| **OBJECT** (OBJ) | Primary object  
Ricky trashed the hotel room.  
Ricky gave John a glass.  
Ricky gave a glass to John. |
| **OBJECT$_\theta$** (OBJ$_\theta$) | Secondary object; thematically restricted object (OBJECT$_\theta$theme, restricted to theme roles)  
Sandy gave John a glass.  
Tom baked Susan a cake.  
OBJ$_\theta$ in English restricted to theme, cannot be beneficiary |
| **OBLIQUE$_\theta$** (OBL$_\theta$) | Typically has oblique case or is a PP  
Julia placed the vase on the desk.  
Ricky gave a glass to John. |
| **COMPLEMENT** (COMP) | Closed (saturated) complement: a clausal argument which has its own subject  
Peggy told Matt that she had won the prize. |
| **XCOMP** | Open (unsaturated) predicate complement  
I told Patrick to quit.  
Peggy-Sue seems to be a complete fraud. |
| **ADJUNCT** (ADJ) | A modifier, a nonargument  
Mary read a good book.  
Mary counted the cars very quickly.  
Sally killed a bug in the yard.  
Since she had no money, Mary was forced to get a job. |
| **XADJ** | Open predicate adjunct  
Having no money, Mary was forced to get a job. |
| **POSSESSOR** (POSS) | Possessor phrase  
John’s book |
| **TOPIC** (TOP) | Grammaticalized discourse function; must be identified with or anaphorically linked to another grammatical function  
Bagels, Mary loves .  
As for bagels, Mary loves them. (TOP = OBJ)  
(TOP anaphorically linked to OBJ) |
| **FOCUS** (FOC) | Grammaticalized discourse function; must be identified with or anaphorically linked to another grammatical function  
Which author do the critics praise ?  
Cén  t-údar a  molann na léirmheastóirí é? (FOC anaphorically linked to OBJ)  
Which author COMP praise the critics him (Irish; McCloskey 1979, p. 53) |
6.1.2 Classification of grammatical functions

The grammatical functions may be cross-classified according to several properties. First, we may distinguish the argument functions (AF) from the nonargument functions (\(\overline{AF}\)), as discussed above. The argument functions are labeled \(a-fns\) in (12):

\[
(12) \begin{array}{ccccccccc}
\hline
TOP & FOC & SUBJ & OBJ & OBJ_\theta & OBL_\theta & XCOMP & COMP & ADJUNCT \\
\hline
\text{non-}a-fns & & & & & & & & \\
\end{array}
\]

Next, we may distinguish the grammaticalized discourse functions (DF), referred to as \(d-fns\) in (13):

\[
(13) \begin{array}{ccccccccc}
\hline
TOP & FOC & SUBJ & OBJ & OBJ_\theta & OBL_\theta & XCOMP & COMP & ADJUNCT \\
\hline
\text{non-}d-fns & & & & & & & & \\
\end{array}
\]

These functions are the most salient in discourse and often have c-structure properties that iconically express this prominence, such as preceding or c-commanding other constituents in the clause. In addition, the \textsc{subj} is often identified as the default \textsc{topic} of the clause.\textsuperscript{19}

Note that the \textsc{subject}, according to this classification, has the unique property of being both an argument function and a grammaticalized discourse function. The nondiscourse argument functions are the complement functions (CF), and the nondiscourse nonargument functions are the \textsc{adjuncts}. The function \textsc{poss} is not classified in (12) or (13). Subjects and possessors have some properties in common (Abney 1987; Chomsky 1970), so possessors can perhaps be classified the same as subjects. However, there are also crucial differences between subjects and possessors (Donohue and Donohue 2010), and here we will leave it as an open question how possessors are classified.

The argument functions are further distinguished by primitive features that play a role in lexical mapping theory, which projects nuclear f-structures from a-structures (Chapter 14). This theory imposes fairly narrow limits on the possible alternations of syntactic functions for a given lexical role, both within and across languages, and so may be regarded as a major explanatory source of the relative invariance of f-structures across languages.

Thus, while f-structure functions are not defined by c-structure categories, and hence are irreducible or “primitive” in categorial terms, they may be derived from more primitive functional properties, and so are not primitives of syntactic theory.

\textsuperscript{19} See the discussion and references in Andrews (1985) and Manning (1996). We may formally express this by postulating that the optional constraint ((\(\downarrow\ \textsc{subj} = \downarrow\ \textsc{top}\))) is associated with root sentential nodes.
In the same way, the c-structure phrasal categories are decomposable into primitive categorial features, following Jackendoff (1977) and Bresnan (1982a), as in Section 6.2.1 below.

## 6.2 The organization of c-structure categories

C-structure categories can be organized endocentrically or lexocentrically. Endocentric organization appears in highly hierarchical c-structures, such as we find in English. Lexocentric organization appears in flat c-structures with all arguments (including subjects) being sisters of the verb, such as we find in Warlpiri, Jiwarli, and other nonconfigurational languages of Australia; it requires the specification of syntactic functions by morpholexical means, such as case and agreement.\(^{20}\) Consistent with our model of the grammar as localized constraints on partial structures, many languages have a mixture of both types of structures.

### 6.2.1 Endocentricity and X′ structures

The endocentric organization of c-structure is embodied in X′ theory. The reader is assumed to be familiar with some version of X′ theory, but a brief self-contained review of X′ theory, establishing the notation and terminology used here, can be found in the appendix to this chapter. Empirical exemplifications of the X′ theory assumed here will be given in subsequent chapters of Part III.

Recall from Chapter 4 that we are interpreting our c-structure schemata as tree admissibility conditions (constraints on possible tree structures) rather than as rules for rewriting, generating, or “projecting” structures. We continue to use the “rule” notation as in (14) rather than tree structure notation, in order to keep clearly separate the objects of the model, which are structures, from the grammar, which consists of constraints on structures:

\[
\begin{align*}
\text{a. } & X' & \rightarrow & X^0, YP \\
\text{b. } & XP & \rightarrow & YP, X'
\end{align*}
\]

An important development in X′ theory is the extension of the principle of endocentricity to closed classes of grammatical categories – to “minor” categories such as complementizers, finite auxiliary verbs, or determiners. These belong to a subdivision of “functional” F\(^0\) categories, which are generally closed classes of “function words” distinguishable from the “lexical words” that project the

\(^{20}\) But the converse does not hold: endocentricity does not require the absence of morpholexical means of function specification.
levels of (lexical) categories seen above. In some languages, the functional categories may include inflectionally defined subclasses of lexical categories (such as all finite verbs). In English, for example, $I^0$ (read “infl”) is the category of temporal/aspectual finite auxiliary and modal verbs; $C^0$ is the category of complementizers; and $D^0$ is a category of determiners, demonstratives, and pronouns. Each of these is assumed to be the head of endocentric phrasal projections such as IP, CP, DP, $I'$, etc., as in (15):

\[ \text{(15)} \]

\[ \begin{array}{c}
\text{IP} \\
\text{DP} \\
\text{D} \\
\text{We} \\
\text{are} \\
\text{nearing} \\
\text{the} \\
\text{meadow}
\end{array} \]

\[ \begin{array}{c}
\text{VP} \\
\text{I'} \\
\text{V} \\
\text{DP} \\
\text{NP}
\end{array} \]

In a thoroughly endocentric language, the sentence itself can be identified with IP, possibly dominated by CP. As Kroeger (1993, p. 6) observes, the idea that a sentence (IP) is the projection of $I^0$ captures the widespread generalization that the finite verbal element occupies a unique position in the sentence and functions as its (categorial) head.\(^{22}\) As remarked above, in English only a subset of finite verbs (the auxiliaries and modals) can occupy the $I$ position. This subset of verb forms has special syntactic properties – inverting with the subject (*Is she sleeping?* vs *Sleeps she?), preceding sentential negation *not* (*She is not sleeping* vs *She sleeps not*), permitting contracted negation (*She isn’t sleeping* vs *She sleepsn’t*), and the like. $D^0$ is a functional category of determiners and pronouns in English, but it is not present in all languages. (Warlpiri, for example, has been argued to lack determiners; see Bittner and Hale 1995.) Thus we adopt the following inventory of $X^0$ categories, which project $X'$ and $X''$ phrases:

\[ \text{(15)} \]

**Footnotes:**

\(^{21}\) We have omitted the $V'$ and $D'$ nodes in this example. A common convention is to omit $X'$ when either it or its mother XP fails to branch. Any ambiguities introduced are easily resolved by completeness, together with uniqueness. Below, in Section 6.5, we will show that the structures represented by this notational convention follow from economy of expression.

An interesting relation between the lexical and functional categories has been observed: in many languages $I^0$ and $C^0$ are occupied by verbal elements or verbs while $D^0$ is occupied by nominal elements (Grimshaw 1998). This leads to the idea (proposed by Grimshaw 1998) that functional categories share the categorial features of lexical categories: $I$ is a verbal category, $D$ is a nominal category, and $C$ – we will assume here – may be verbal or nominal (Webelhuth 1992; Bresnan, 1995a).

Formally, $X^\prime$ categories can be analyzed as triples consisting of a categorial feature matrix (17), a level of structure (18), and a third, privative feature $F$, which flags a category as either “functional” ($F$) or unspecified as functional (i.e. lexical, $\emptyset$). We allow up to two levels of distinct functional projections $F_1$ and $F_2$, which can be used, for example, to distinguish IP and CP (Grimshaw 1998). This permits us to state constraints on the combination of functional projections with other categories (Grimshaw 1998):

(17) **Kinds of categories:**

<table>
<thead>
<tr>
<th></th>
<th>“predicative”</th>
<th>“transitive”</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V$</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$P$</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>$N$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$A$</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

(18) **Levels of categories:**

<table>
<thead>
<tr>
<th>Type</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V$</td>
<td>$V'$</td>
<td>$V''$ (VP)</td>
<td></td>
</tr>
<tr>
<td>$P$</td>
<td>$P'$</td>
<td>$P''$ (PP)</td>
<td></td>
</tr>
<tr>
<td>$N$</td>
<td>$N'$</td>
<td>$N''$ (NP)</td>
<td></td>
</tr>
<tr>
<td>$A$</td>
<td>$A'$</td>
<td>$A''$ (AP)</td>
<td></td>
</tr>
</tbody>
</table>

(19) **Examples:**

$V^0$: ( [+ predicative, + transitive], 0, $\emptyset$F )

$VP = V'':$ ( [+ predicative, + transitive], 2, $\emptyset$F )

$I^0$: ( [+ predicative, + transitive], 0, $F_1$ )

$CP = C'':$ ( [+ predicative, + transitive], 2, $F_2$ )

$DP = D'':$ ( [- predicative, - transitive], 2, $F_1$ )

---

23 For Grimshaw (1998), IP and CP are respectively the first ($F_1$) and second ($F_2$) functional projections of VP. She argues that PP is the $F_2$ projection of NP; for evidence against this analysis, see Bresnan (1995a). We assume that not all functional projections need occur, just as not every lexical projection appears in every language. English may simply lack a nominal $F_2$ category.
In what follows, we assume the following categorial combination constraint.

(20) **Combinatorial constraint on functional heads:**
A category $C$ can be the complement of a functional head $F$ only if $F$’s categorial feature matrix is less marked than $C$’s.

(“Less marked” means differing at most in having a minus feature value instead of a plus feature value, referring to the values in (17).)

This will allow the verbal categories to be embedded in both nominal (DP, CP) and verbal (CP, IP) functional projections, while nominal categories can be embedded only in nominal functional projections.

Each functional projection FP, then, provides a grammatically specialized category and position for specific subclasses of words that have a special (syncategorematic) grammatical role such as marking subordination, clause type, finiteness, and the like. As we will see, the extension of X’ theory to functional categories FP enables us to capture significant structural generalizations about syntactic typology and word order that are familiar from the transformational framework. In the present framework, of course, X’ theory is not a theory of the input structures to syntactic transformations, but part of the theory of overt forms of expression (c-structure). As such, our X’ must conform to the principle of **structural integrity of words**, the lexical integrity principle in (4): $X^0$ categories are categories of morphologically complete words. Hence “bare affixes or disembodied morphological features,” as Kroeger (1993, p. 6) puts it, cannot be independently generated in phrase structure. This principle holds for both lexical $L^0$ and functional $F^0$ categories. In English, for example, $C^0$ is the category of *that* and *if*, $I^0$ is the category of *is*, finite *do*, and *must* (finite auxiliary and modal verbs), and $V^0$ is the category of all other verbs. In Russian, $C^0$ is the category of *čto* (‘that’) and interrogative *li*, $I^0$ is the category of all finite verbs, and $V^0$ is the category of infinitives (King 1995). In other words, **functional categories are specialized subclasses of lexical categories which have a syncategorematic role in the grammar (such as marking subordination, clause type, or finiteness).**

The types of c-structure constraints used in Chapter 4 as tree admissibility conditions can now be derived from these more abstract universal c-structure constraints given by the principle of endocentricity. Any c-structure pattern can be considered unmarked if it is an instantiation of these universal endocentric constraints. By this means, our theory allows the presence of marked constructions of irregular form and content alongside instantiations of the universal endocentric patterns.

### 6.2.2 Endocentric mapping to f-structure

The functional component of the X’ constraints (the “rule annotations” of Chapter 4) may also be derived from the following proposed universal principles of
endocentric structure–function association. The head relation in LFG is modeled through the identification of a node’s f-structure with the f-structure of its mother, and not by means of an attribute such as HEAD. Again because of the imperfect correspondence between structure and function permitted in LFG, f-structure heads need not correspond only to c-structure heads:

(21) a. C-structure heads are f-structure heads.
    b. Complements of functional categories are f-structure coheads.
    c. Specifiers of functional categories are the grammaticalized discourse functions.
    d. Complements of lexical categories are the nondiscourse argument functions.
    e. Constituents adjoined to phrasal constituents are optionally nonargument functions.

The classic definitions of heads, complements, and specifiers given in (14) above and in (65) of this chapter’s appendix assume that a zero-bar-level lexical category \( X^0 \) is always present to project higher levels of structure. In contrast, in the present setting any node may be optional, and functional ambiguities are allowed; we therefore need a more flexible and “surface-oriented” definition of these functions. For this reason, the diagrams below specify the functional annotations without reference to the presence of a sister category (except for adjunction structures, which are not purely endocentric in the classic sense of immediately dominating a categorial head which is one bar level lower).

More precise formulation of the structure–function mapping principles in (21) are given in (22) below. The formulations in (22) make use of the following definitions: c-structure heads are defined as projecting nodes – nodes labeled \( X^0 \) and \( X' \), as illustrated in (23a,b). A projection is any \( X^n \) category for \( n > 0 \), and a projection of the same kind as another node N matches the categorial features (including the functional category feature F) of N’s category label. Specifiers, complements, and adjuncts are nonprojecting nodes, defined as nodes labeled by the maximal projections \( X^n \) (or by a nonprojective category S, to be discussed later), as illustrated in (24)–(26). All of the preceding definitions are meant to exclude nodes to which constituents are adjoined, called adjoined-to nodes. The latter are defined to be a syntactic phrase structure node (as in (2)) immediately dominated by a node having the same label; this is illustrated in (26).

\[ \text{Specifiers of lexical categories are not utilized here; as shown below, S provides phrase-internal subjects.} \]
\[ \text{A is adjoined to B when } A \text{ and } B \text{ are immediately dominated by a node labeled } B. \text{ In (26), } YP \text{ is adjoined to XP.} \]
\[ \text{Optional annotation allows for lexocentric specification of an argument function (see Section 6.3.1).} \]
statements in (22a–e) correspond to those in (21a–e), respectively, and to the diagrams in (23)–(26).²⁷

(22)  a. Annotate a projecting node in a projection of the same kind with \( \uparrow = \downarrow \).

b. Annotate a nonprojecting node immediately dominated by \( F' \) with \( \uparrow = \downarrow \).

c. Annotate a nonprojecting node immediately dominated by \( FP \) with \( (\uparrow \text{df}) = \downarrow \).

d. Annotate a nonprojecting node immediately dominated by \( L' \) with \( (\uparrow \text{cf}) = \downarrow \).

e. Optionally annotate a nonprojecting node with \( (\uparrow \text{af}) = \downarrow \) and its adjoined-to sister node with \( \uparrow = \downarrow \).

All occurrences of the notation \( (\uparrow \overline{\text{AF}}) = \downarrow \) in this chapter are an abbreviation for \( (\uparrow \overline{\text{AF}}) = \downarrow \lor \downarrow \in (\uparrow \overline{\text{AF}}) \).²⁸ This allows for the possibility of set-valued nonargument functions, such as the \textsc{topic} exemplified in Section 4.9; the curious reader can consult that section for more on set-valued grammatical functions. However, we do not assume familiarity with these until Chapter 9, when Section 4.9 is presupposed as the formal background for the analysis of Russian \textsc{topics}.

Principles (22a) and (22b) capture one of the central ideas of \( X' \) theory in combination with Grimshaw’s intuition of functional projections as extended projections of lexical categories: at the core of each phrase is a layered “spine” of nodes, extending the characteristics of a head to an intermediate projection and a maximal projection, and further to a higher functional projection (if there is one). If two nodes are “f-structure coheads,” then they map their information into the same \( f \)-structure. Nodes in a projection that are coheads are annotated with \( \uparrow = \downarrow \). Principle (22a) expresses the intuition that all members of the same type in a phrase contribute information to the same \( f \)-structure. This intuition has several consequences for the annotation of c-structures. For example, \( X' \) and \( X^0 \) categories are annotated with \( \uparrow = \downarrow \) (see (23a)). If a functional projection is present, the complement of the functional category will be annotated with \( \uparrow = \downarrow \) (see (23b)).²⁹

(23)  a. \[
\begin{array}{c}
\text{XP} \\
\uparrow = \downarrow \\
X' \\
\uparrow = \downarrow \\
X^0
\end{array}
\]

b. \[
\begin{array}{c}
\text{F'} \\
\uparrow = \downarrow \\
F^0 \\
\uparrow = \downarrow \\
, \\
\text{LP}
\end{array}
\]

²⁷ Recall that \( \text{cf} \) stands for \textit{complement function}, \( \text{df} \) stands for \textit{discourse function}, \( \text{af} \) stands for \textit{argument function}, and \( \overline{\text{af}} \) stands for \textit{nonargument function}; see Section 6.1.2.

²⁸ This includes realizations of the equation that involve particular instances of \( \overline{\text{af}} \), such as \textsc{adj}.

²⁹ The comma in this tree and in tree (26) indicates that the linear order of the daughters does not matter, i.e. that the annotations are the same whether the adjoined-to node is on the left or on the right.
The $\uparrow = \downarrow$ annotations in the structures in (23) ensure that information from different nodes map into the same f-structure. In the overall structure, any spine (i.e. sequence) of $\uparrow = \downarrow$ annotations followed up the tree, without interruption, constitutes a mapping to the same f-structure.

Principle (22c) restricts the specifiers of functional categories to the grammaticalized discourse functions $\text{TOP}$, $\text{FOC}$, and $\text{SUBJ}$:

(24) \[ \text{FP} \]

\[ (\uparrow \text{DF}) = \downarrow \]

\[ \text{XP} \]

Note that we take adjuncts to be excluded from the definition in (22c), as the FP dominating an adjunct is not a projected node but rather an adjoined-to node.

Principle (22d) restricts the complements of lexical categories to $\text{OBJ}$, $\text{OBJ}_\theta$, $\text{OBL}_\theta$, $\text{COMP}$, and $\text{XCOMP}$:

(25) \[ \text{L}' \]

\[ (\uparrow \text{CF}) = \downarrow \]

\[ \text{XP} \]

Principle (22e) posits that a phrase adjoined to a phrasal constituent is not an argument function:

(26) \[ \text{XP} \]

\[ (\uparrow \text{AF}) = \downarrow \]

\[ \text{YP}, \text{XP} \]

\[ \uparrow = \downarrow \]

Note that it is possible for the adjoined phrase YP of (26) to be unannotated; optional annotation allows for lexocentric specification of an argument function (see Section 6.3.1).

The principles in (22) constrain the annotations of c-structure and explain crosslinguistic similarities in how phrases are put together. However, they do not completely specify the annotations; the grammars of individual languages come with their own specifications and constraints, as we shall see.

To see the effects of the mapping rules, let us examine an example c-structure. The annotations on the nodes in structure (27) reflect the mapping principles in (22):  

---

30 To reduce the size and complexity of this example, the internal structures of the AP and DP are abbreviated, and the $V'$ nodes have been omitted in accordance with the tree abbreviatory convention in footnote 21. Section 6.5, particularly the flexible definition of endocentric complements in (57), provides a principled basis for this convention.
The *sadly* AP adjoined to IP is a nonargument function, in accordance with principle (22e). The principle also allows for the node to be left unannotated, but we set that aside here. According to principle (22c), each specifier of IP is a discourse function. The lower IP is mapped onto a complement function, as per principle (22d), which states that the complements of lexical projections (dominated by L’; see footnote 27) are the nondiscourse argument functions. The choice of complement function is lexically determined. Assume for the purposes of this illustration that V’ dominates V IP; then the annotation of the complement functions CF is licensed by (22d). All other mapping annotations, ↑ = ↓, follow from principle (22a). (The omitted V’ would also be annotated with ↑ = ↓ by (22a).)

Example (27) illustrates the predictive power of the mapping principles. However, it also illustrates that the principles do not necessarily determine in detail the exact function to which each phrase maps. The details follow from independent syntactic principles, such as completeness and coherence, as well as language-specific c-structure rules. The fully specified annotations on (27) are given in (28):
The two DPs are subjects. This follows from the specification that specifiers of IP are subjects in English, and it also follows from the principle of completeness. Sadly is an adjunct. The lower IP is a COMP: it is a clausal complement that contains a c-structure subject.

The analysis of English auxiliaries as belonging to the category I₀ deserves some discussion. A sentence can contain several auxiliaries, for example, Mary may have been running. Only the tensed auxiliary occurs in I₀; the other auxiliaries are of the category V₀. Evidence that a tensed auxiliary is the only verbal element in English that can occupy I₀ comes from negation. The tensed auxiliary cannot follow negation, although all other verbal elements can:

(29) a. Mary may have been running.
    b. Mary may not have been running.
    c. *Mary not may have been running.
    d. Mary may have not been running, but walking.
    e. Mary may have been not running, but walking.

If not precedes VP, then (29) shows that may, a modal auxiliary, belongs to I₀, while have and been both head VP projections. As it turns out, auxiliaries may also occupy C₀ in English. The exploitation of the different heads in the verbal
extended projection (VP, IP, CP) is explored in Problem Set 3 (Ivatan) and also in Chapter 7, which includes an exercise on verbal elements.

The phrase structure for (29a) is given in (30):

\[(30)\]

\[
\text{IP} \quad (\uparrow \text{SUBJ}) = \downarrow \text{NP} \\
\text{Mary} \\
\text{I}^0 \quad \uparrow = \downarrow \\
\text{may} \\
\text{V}^0 \quad \uparrow = \downarrow \\
\text{have} \\
\text{V} \quad \uparrow = \downarrow \\
\text{been} \\
\text{running} \]

A potential problem arises: VP is a lexical category, and complements of lexical categories are restricted to nondiscourse argument functions, according to (21d). However, the complements of *have* and *been* in (30) are coheads (annotated with $\uparrow = \downarrow$), not argument functions. All verbal elements in (30) are core members of the extended projection of the head verb, and so they are all coheads. The structure contains a single predicate which consists of a main verb, *running*, and its auxiliaries that supply information about tense, aspect, and modality.\(^{31}\) Intuitively, it thus seems clear that all members of the verbal “spine” should be annotated with $\uparrow = \downarrow$, as per (21a). However, as it stands, (21d) dictates that a complement of a lexical category be a nondiscourse argument function (cf). We will broaden our theory to extend the cohead principle optionally to the complements of lexical

\[^{31}\text{We do not deal here with the detailed co-occurrence restrictions between English auxiliaries and their complements. One approach within LF postulates a morphological projection for this purpose (Butt et al. 1996). Another LF approach uses parameterized c-structure rules, which would allow more fine-grained expansions of different subtypes of verbal projections, such as participial or infinitival (Frank and Zaenen 1998). An auxiliary or modal verb could then locally select for its verbal complement subtype, without any extension of the overall formal power of the system (Peters and Ritchie 1972).}\]
categories, as proposed by Alsina (1996b) and Sadler (1997). We replace (21d) with (31) and the corresponding annotation principle, (22d), with (32):

(31) Complements of lexical categories are nondiscourse argument functions or f-structure coheads.

(32) Annotate a nonprojecting node immediately dominated by \( L' \) with \((\uparrow \text{cf}) = \downarrow \) or \( \uparrow = \downarrow \).

These revisions result in the following corresponding revision to (25):

(33) \[
L' \xrightarrow{\uparrow \text{cf}} \downarrow \lor \uparrow = \downarrow \quad \text{XP}
\]

A nondeterministic choice may be made between the annotation possibilities given in (33). The independent principles of completeness, coherence, and uniqueness will ensure that lexical categories with \text{pred} features will take complements that are nondiscourse argument functions, whereas lexical categories that lack \text{pred} features will take cohead complements. Auxiliaries do not have \text{pred} features, and the complement of \text{have} in (30) is annotated with \( \uparrow = \downarrow \).

The categories and principles proposed in this chapter restrict endocentric c-structures crosslinguistically. However, there is still plenty of crosslinguistic variation. With these principles, the grammar of a given language need not specify either the structures or the general structure–function associations of the endocentric pattern. A particular language may select from the available space of endocentric structures,\(^{32}\) and the codescriptive constraints on partial c-structures and f-structures that constitute a lexical-functional grammar can be derived from these general principles as the instantiations of universal constraints. To this extent, annotated c-structure rules are eliminable.

### Problems

The reader can now undertake Problem Set 3. The possibilities of endocentric c-structures are explored in the Sinhala and Barasano exercises, which highlight some interesting choices that languages may make within the limits set by the universal principles.

\(^{32}\) This selection constitutes parametric variation. For example, English sets the specifier of IP to be only one of the available dfs, namely \text{subj}. Other languages may set the specifier of IP function to be any or all of \text{top}, \text{foc}, and \text{subj}. As we will see in Chapter 7, in Welsh the specifier of IP is omitted altogether, and in Wambaya it is optional.
6.3 Exocentric categories

Not all languages abide by endocentricity in all of their expression structures. Clauses in some languages are nonconfigurational: they have verbs, but the verbs do not project a VP. Many languages show evidence for an exocentric clausal category S that contains a subject and predicate but does not require a distinguished verbal (V, C, or I) head. “Small” words, such as clitics and particles, are syntactically independent and head-like but do not project full phrases.

### 6.3.1 Lexocentricity and S

An alternative to endocentric c-structure organization – lexocentricity – associates syntactic functions directly with features borne by words rather than with the configurational relations of phrases in syntax. This mode is evidenced in such typologically diverse languages as Tagalog (Kroeger 1993), Hungarian (Kiss 1987, 1994), Malayalam (K. P. Mohanan 1982b), Warlpiri (Simpson 1991), Jiwarli (Austin and Bresnan 1996), Wambaya (Nordlinger 1998a; Nordlinger and Bresnan 1996), Jakaltek, and others (Woolford 1991). Under this mode of c-structure organization, information about grammatical relations cannot be exclusively associated with the syntactic context of words in the form of distinct hierarchical phrase structure configurations, but must be “lexically localized” – that is, directly associated with the forms of words themselves (by case and agreement morphology, for example).

These languages reveal that universal grammar makes available a nonprojective, exocentric category S for clauses. S stands for “sentence” or “small clause,” distinct from IP (Bresnan 1982a; Chung and McCloskey 1987; Kroeger 1993; Austin and Bresnan 1996; Choi 1999; Nordlinger and Bresnan 1996; Nordlinger 1998a; Sadler 1997; Sells 1998).

Nonprojectivity in this context means that S lacks a categorial head: its category cannot be identified with any fixed category X⁰. Exocentricity means that S may have an f-structure head of a different category, whether V, N, A, VP, NP, AP, or other. The nonprojectivity of S implies that it may dominate multiple distinct categories C not bearing the typical branching relations of endocentricity, because it is not subject to the X′ schemata:

\[(34) \quad S \rightarrow C^*\]

In this radically nonconfigurational structure type, syntactic functions cannot be identified by phrase structural configuration – nor should they be. Instead, the functions are associated with information carried by words themselves. Let us assume that the categories C in (34) are freely associated with the annotations for f-structure head \(\uparrow = \downarrow\) and nonargument functions, but that c-structure does not associate argument functions with constituents; instead, these functions are
characteristically associated with case and agreement features of the predicator and its arguments.

To see how the lexocentric mode works in principle, consider the c-structure in (35), and assume that configurational information about the grammatical function of the NP is lacking in S. We know only that it is not the head but a dependent (argument or modifier) of the head:

(35)

\[ S \]
\[ \ldots \quad \text{NP} \quad \ldots \]

Suppose that the NP is headed by a nominal inflected for case, which carries the specification (↑case) = acc. [case acc] will then be a feature of the NP’s f-structure \( f_{np} \). Suppose further that, in the language in which (35) occurs, acc is the case of objects obj. The latter generalization can be expressed by annotating the conditional functional schema in (36) to the NP in (35):

(36) \( (\downarrow \text{case}) = \text{acc} \Rightarrow (\uparrow \text{obj}) = \downarrow \)

As explained in Section 4.6, (36) will test for the presence of the accusative case feature in \( f_{np} \) (the f-structure of the NP), and if it is present, it will identify that f-structure as the value of the obj attribute in the containing f-structure of S, \( f_s \). In this way, a case feature carried by a word can be used to construct the syntactic function of the NP. This mode of function identification is called dependent-marking, because the relation of the dependent to the head is marked on the dependent.

Alternatively, the language in which (35) occurs might be a head-marking language, in which the relation of the dependent to the head is marked on the head. Let us assume that this language is caseless, lacking dependent-marking altogether, as well as radically nonconfigurational. How can the grammatical function of NP be identified? Let us assume that the head of the S is a verb V, which is inflected to agree in person, number, and gender with both the subject and the object. The head will then specify, say, (↑obj gend) = masc, (↑obj pers) = 3, etc. These verbal inflections will create an obj attribute in the f-structure of S, \( f_s \), whose value will be a subsidiary f-structure containing just these agreement features. Now we can check the f-structure of NP, \( f_{np} \), for the presence of the features [gend masc] and [pers 3], etc., and if they match the features of the object specified by the head, we can identify the grammatical function of the NP as obj. We can do this by annotating the following conditional constraint onto NP in (35):

(37) \( (\downarrow \text{pers}) = (\uparrow \text{obj pers}) \& (\downarrow \text{gend}) = (\uparrow \text{obj gend}) \Rightarrow (\uparrow \text{obj}) = \downarrow \)

---

33 See Section 4.6 for the formal interpretation of conditional functional schemas.
These two general types of lexocentric function specification – “dependent-marking” and “head-marking” – are schematized abstractly in (38):²⁴ (Here $\text{AGR}$ is used simply as a metavariable for attributes such as $\text{PERS}$, $\text{NUM}$, and $\text{GEND}$, just as $\text{GF}$ is used as a metavariable for function attributes such as $\text{SUBJ}$ and $\text{OBJ}$.)

(38) **Types of morphological function specification:**

a. Dependent-marking:
   \[
   (\downarrow \text{CASE}) = \kappa \Rightarrow (\uparrow \text{GF}) = \downarrow
   \]

b. Head-marking:
   \[
   (\downarrow \text{AGR}) = (\uparrow \text{AF} \text{AGR}) \Rightarrow (\uparrow \text{AF}) = \downarrow
   \]

Assume free and optional annotation of the schemata to the NP in (35). Then (38a) means that (any instance of) the function $\text{GF}$ can optionally be associated with NP if there is a case attribute with a certain value in NP’s f-structure. Similarly, (38b) means that (any instance of) the argument function $\text{AF}$ can optionally be associated with NP if there are agreement features in NP’s f-structure which match the agreement features provided for that function (by the verbal inflections, for example). Constraints of this type, together with the principles of coherence and completeness, will select the correct function for each $\mathcal{C}$.

Note that analyses along the lines described here still crucially involve c-structure: the morphology contributes its information to f-structure via c-structure annotations. Another approach that has been explored extensively in LFG is the theory of constructive case (Nordlinger 1998a). Constructive case allows case-marking to directly construct grammatical functions independent of c-structure. Formally, this is accomplished with inside-out function application (Chapter 4).²⁵

The crosslinguistic distribution of head-marking conditions generally follows the functional hierarchy for argument functions (Moravcsik 1974; Givón 1976): $\text{OBJ}$ is identified by head-marking only if $\text{SUBJ}$ is, and more oblique arguments are rarely identified by head-marking. The dependent-marking conditions appear to follow the same hierarchy in reverse, the more oblique functions being identified by dependent-marking before the less oblique functions are. Consequently, oblique case-marked arguments rarely show verb agreement; see Section 6.4 for further discussion.

In the head-marking schema in (38b), agreement features borne by a head are used to specify the function of an external syntactic constituent that matches these

²⁴ Cf. Nichols (1986). Our use of the terms in this text is related to the typological characterization given by Nichols. Note that verbal forms not morphologically marked for agreement may nevertheless carry agreement information by virtue of their paradigmatic relation to marked verbal forms; usually the unmarked form carries the complement of the features carried by the marked forms (cf. Andrews 1990b). This is the case with the English present-tense verbal forms and the conditional verb paradigm of Ulster Irish (Problem Set 2).

²⁵ Also see Andrews (1996), Sadler (1997), Barron (1998), Sells (1999), Lee (1999a,b), and Sharma (1999) for more on the morphological construction of f-structures making use of inside-out function application.
features. “Head-marking” also refers to the situation in which the head itself fully specifies both the syntactic function and the semantic content of a dependent (which then must be omitted from phrase structure by virtue of uniqueness and economy of expression). We will study several examples of the latter in Chapter 8. The dependent-marking schema (38a) will be exemplified in Chapter 9.

The most dramatic examples of the structure type shown in (35) come from the Australian aboriginal languages, such as Warlpiri (Simpson 1991), Jiwarli (Austin and Bresnan 1996), and Wambaya (Nordlinger 1998a). Because these are discussed in Chapter 1, Problem Set 1, and Chapter 7, we will not provide further illustration here.

6.3.2 S and endocentricity

The exocentric category S is not everywhere nonconfigurational, if by “nonconfigurational” we mean “lacking a VP” or other projection distinguishing subject position from complement position. Many languages have subject predicate constructions of the form in (39), where XP may be a predicate phrase of any of a range of categories VP, NP, AP, or PP:

(39)  

\[ S \rightarrow NP \rightarrow XP \]

The very fact that the predicate XP, the functional head, may be one of a range of categories indicates that its parent category is not endocentric. Nevertheless, both NP and XP in this example are hierarchical categories organized by endocentricity. A language with this structure may or may not make use of lexocentric means of function identification; it is possible that the subject and predicate simply correspond to the structural configuration. Thus we make the following simple addition to our principles of structure–function correspondence in (21):

(40) The daughters of S may be subject and predicate.

We understand (40) as licensing the annotation of \( \uparrow \text{subj} \) = \( \downarrow \) and \( \uparrow = \downarrow \) to NP and XP in ((39)). We thus make the corresponding simple addition to the annotation rules (22):

(41) Optionally annotate the NP daughter of S with \( \uparrow \text{subj} \) = \( \downarrow \) and the XP daughter with \( \uparrow = \downarrow \).

---

36 Both predicate-final structures like (39) and predicate-initial structures having the typical order XP NP occur. See Kroeger (1993) for arguments that Tagalog has clause-initial predicate phrases of all types except VP in predicate-initial structures.
An example of the configurational S is discussed in Chapter 7 in the analysis of Welsh verb positioning.

### 6.3.3 Nonprojecting words

We now turn to another type of structure that does not directly follow the principles of X′ theory. Nonprojecting words are syntactically independent words that do not project a phrase (Sadler 1997; Sells 1998; Toivonen 2001b, 2003). They are discussed in detail in Toivonen’s LFG analyses of Swedish particles and have been adopted in subsequent LFG literature. Using the notation X for nonprojecting words (pronounced “X-roof”) we can capture the local distribution of such categories with the following c-structure rule:

\[
X^0 \rightarrow X^0, \hat{Y}
\]

The particle _ut_ (‘out’) in the Swedish example in (43) is assumed to be a nonprojecting word, and the c-structure is given in (44).

(43) _Jonatan ska bāra ut stolarna._

   J. will carry out chairs.the

   “Jonatan will carry out the chairs.”

(44)

```
IP
   NP    I'
      Jonatan   V
         I0      VP
            ska
       V0
       bāra
   P    ut
      NP
```

Nonprojecting words can be functional or lexical categories. They can be argument functions (e.g. object clitics), adjuncts (e.g. _too, so_; see Arnold and Sadler 2013), or coheads (e.g. clitic auxiliaries). Since such a wide range of functions is associated with nonprojecting words, we will not propose a specific mapping.

---

37 This literature includes: Asudeh (2004, 2009, 2011, 2012); Spencer (2005); Broadwell (2007); Nordlinger and Sadler (2008); Alsharif and Sadler (2009); Alsina (2009); Duncan (2009); Baker et al. (2010); Nemati (2010); Arnold and Sadler (2013); Duncan (2013); and Laczkó (2013).
principle for them. From this point forward, we shall use the term “nonprojecting” as defined in Section 6.2.2 above, where nonprojecting nodes were defined as nodes labeled by the maximal projections $X^n$ or by the nonprojective exocentric category $S$.

### 6.3.4 Summary of the structure–function principles

Given the revisions in (31) and (32), the set of universal endocentric structure–function mapping principles can be summarized as in (45) and the corresponding annotation principles as in (46):

\[(45)\]
\begin{align*}
a. & \quad \text{C-structure heads are f-structure heads.} \\
b. & \quad \text{Specifiers of functional categories are the grammaticalized discourse functions.} \\
c. & \quad \text{Complements of functional categories are f-structure coheads.} \\
d. & \quad \text{Complements of lexical categories are nondiscourse argument functions or f-structure coheads.} \\
e. & \quad \text{ Constituents adjoined to phrasal constituents are optionally nonargument functions.} \\
\end{align*}

\[(46)\]
\begin{align*}
a. & \quad \text{Annotate a projecting node in a projection of the same kind with } \uparrow = \downarrow. \\
b. & \quad \text{Annotate a nonprojecting node immediately dominated by F'' (FP) with } (\uparrow \text{DF}) = \downarrow. \\
c. & \quad \text{Annotate a nonprojecting node immediately dominated by F' with } \uparrow = \downarrow. \\
d. & \quad \text{Annotate a nonprojecting node immediately dominated by L' with } (\uparrow \text{CF}) = \downarrow \text{ or } \uparrow = \downarrow. \\
e. & \quad \text{Optionally annotate a nonprojecting node with } (\uparrow \text{AF}) = \downarrow \text{ and its adjoined-to sister node with } \uparrow = \downarrow. \\
\end{align*}

The additional exocentric mapping principle and annotation principle are summarized, respectively, in (47a,b):

\[(47)\]
\begin{align*}
a. & \quad \text{The daughters of S may be subject and predicate.} \\
b. & \quad \text{Optionally annotate the NP daughter of S with } (\uparrow \text{subj}) = \downarrow \text{ and the XP daughter with } \uparrow = \downarrow. \\
\end{align*}

The mapping principles summarized in this section will be further generalized in Section 6.5, but first we consider the typological implications of the theory developed thus far.
6.4 Toward a typology

Because the LFG architecture of grammar consists of localized constraints on partial structures, languages may freely mix endocentric and lexocentric modes of categorial organization. This produces a typology of possible syntaxes much closer to a continuum than to a small, discrete parameterization. In her study of nonconfigurationality in Australian languages, Nordlinger (1998a) proposes the following typology to illustrate this important point:

(48) Basic typology of expression of grammatical relations

\[
\begin{align*}
\text{more nonconfig.} & \quad \text{more config.} \\
\text{more head-marking} & \quad \text{Mohawk, Navajo} \\
& \quad \text{Mayali, Chichewa} \\
& \quad \text{Wambaya, Warlpiri} \\
\text{more dependent-marking} & \quad \text{Jiwarli, Icelandic} \\
& \quad \text{Dyirbal, Martuthunira}
\end{align*}
\]

The column on the left shows the lexocentric mode of organization, with head-marking at the top of the scale and dependent-marking at the bottom. The horizontal row at the top shows the endocentric mode of organization, with extreme endocentricity at the right (designated as greater configurationality) and no endocentricity at the left (designated as greater nonconfigurationality). The languages situated in this typological space include Mohawk (an Iroquoian language of northeastern North America), Mayali (a non-Pama-Nyungan language of northern Australia), Jiwarli (a Pama-Nyungan language of western Australia), Dyirbal (a Pama-Nyungan language of northeastern Australia), Navajo (an Athapaskan language of western North America), Chichewa (a Bantu language of southern central Africa; see references in Chapter 8), Icelandic (an insular Scandinavian language), and Martuthunira (a western Australian language). Finnish (a Finno-Ugric language of northern Europe) is a candidate for a possibly configurational language showing both head- and dependent-marking, according to the analyses of Niño (1997) and Toivonen (2000).

We can further refine Nordlinger’s typology by adding languages which have endocentrically organized functional projections FP but lack endocentrically organized lexical projections such as VP, using lexocentric S instead (see the references cited in Section 6.3.1). Such languages will fall between the nonconfigurational and configurational ends of the horizontal continuum, in having one or more mixtures of the structural types, as illustrated schematically in (49). Through choices of various FPs and their embeddings, and choices of S-internal categorial organization, a range of varying structures mixing S and FP is available:
According to our theory of structure–function mapping, languages in the range of the second structure from the left in (49) will show a fixed hierarchical arrangement of the grammaticalized discourse functions $\text{DF}$ but will show nonconfigurational arrangements of argument functions. Such languages are classified as discourse configurational languages (Kiss 1995), and include the head-marking Mayan languages (Aissen 1992; Woolford 1991) and the head- and dependent-marking languages Wambaya (Nordlinger 1998a) and (possibly) Hungarian (Kiss 1987, 1994). Again, this is not a rigid, discrete classification: discourse configurational languages may mix together both more and less configurational structures for argument functions (Kroeger 1993; Sells 1998), and may differ in the number and kinds of embedded functional projections.\(^{38}\) Tagalog, according to Kroeger (1993), falls between this and the second structure from the right (with order of subject and predicate reversed under $S$).

Nordlinger (1998a) provides a careful and detailed study of Australian non-configurational languages within the present theoretical framework, showing that morphology takes over many of the functions of syntactic configuration in some languages, while coexisting harmoniously with others. In subsequent chapters we will investigate the interactions of morphology and configurational syntactic structures.

### 6.5 Effects of economy of expression

The principle of economy of expression, (1), interacts with the principles of structure–function mapping. For a simple English sentence like *Mary swims*, several $c$-structures are possible, as shown in (50). (The internal structure of NP is omitted in these illustrations. Note that $[_{IP} \text{NP } \text{VP}]$ is isomorphic to $[_{S} \text{NP } \text{VP}]$. English main clauses lack the independent evidence for exocentric $S$ described in Section 6.3.2, so we assume that the isomorphic structure to (50d) rooted in $S$ rather than $IP$ is not available for typological reasons.)

\(^{38}\) For LFG analyses of discourse configurationality, see Vilkuna (1989), Mycock (2006), and Gazdik and Komlósy (2011).
By our structure–function mapping principles (45), all of these c-structures support the same f-structure (as the reader can check). These c-structures are thus functionally equivalent. Economy of expression requires us to select the c-structure having the fewest syntactic phrase structure nodes, which is (50d). The IP lacks a head in c-structure, but this apparent anomaly is accommodated by the theory of extended heads developed in Section 7.2.

Observe that for given lexical content, economy of expression can prune away only as much structure as can be eliminated from the structural resources of the language without violating completeness and coherence. The following structure for our example sentence *Mary swims* has fewer nodes than (50d), but it does not support a complete and coherent f-structure by our structure–function mapping principles, given that by hypothesis English has only endocentric structure–function mapping:
Let us further illustrate the interaction of these principles by re-examining the English topicalized CP structure given in Chapter 2, repeated here:

(52)

From general principles we can infer the following functional associations:

(53)

From (22e) we know that the CP must have a nonargument function: top, foc, or adjunct. CP cannot be adjunct in this example, because it would lead to an incomplete f-structure, as the reader can check. Therefore, CP must be either top or foc: df for short. We also know that if the PP is a daughter of V', it must have a complement function (cf), whose type is lexically determined by the verb. Let us assume for purposes of illustration that the passive verb V and the auxiliary verb I in this example include the following functional schemata in their lexical entries:

---

39 ADJ is an alternative to df by our principles, but it will be excluded in the current example by the principle of completeness.

40 As remarked in Chapter 2, captured is a passive participle. The linkages between lexical roles and functions follows from the lexical mapping theory (Part IV) and need not be stipulated.
Our theory then gives us the following correspondence between the c-structure and f-structure of this example:

\[
\text{captured} \quad V^0 \quad (↑ \text{PRED}) = \text{′capture} \langle (↑ \text{OBL}_{ag}) (↑ \text{SUBJ}) \rangle'
\]

\[
is \quad I^0 \quad (↑ \text{TENSE}) = \text{PRES}
\]

\[
(↑ \text{SUBJ}) = \downarrow
\]

\[
(↓ \text{PERS}) = 3
\]

\[
(↓ \text{NUM}) = \text{SG}
\]

To secure completeness and coherence, we must assume that the nonargument DF in (55) is identified with the SUBJ. This connection comes from the universal default that optionally identifies SUBJ and TOP. An alternative would be to postulate an empty category DP in subject position as specifier of IP, identifying SUBJ with TOP by means of an extraction chain modeled by inside-out functional uncertainty (Section 4.8 and Chapter 9). But in this situation, such an empty node would provide only the redundant information that there is a SUBJ identifiable with TOP; this information is already given by the c-structure context without the empty node (from the universal default), and so by the economy of expression principle (1) this option is excluded. (Elsewhere, however, extraction gaps in topicalization are possible; see Section 4.8 and Chapter 9.) The result is shown in (56):

---

41 Here again we follow the convention of using strings enclosed by double quotation marks to abbreviate the content of subsidiary f-structures where it is not relevant to the discussion.

42 We can assume that this option is carried only by the root clause. The functional specification is given in footnote 19.
We have seen that because economy of expression must preserve completeness and coherence, its effects are constrained by the structure–function mappings available in a given language, and hence by the theory of structure–function mapping. In our theory of endocentric structure–function mapping we have assumed the classic definition of X’ complement as immediately dominated by X’. However, instead of defining a complement to be a nonprojecting category immediately dominated by X’, as we did in (46c,d), we could define it as in (57):

(57) **Flexible definition of an endocentric complement:**
A c-structure complement is a nonprojecting node which is the sister of no nonprojecting node.

This definition generalizes the earlier definition of complement assumed in (46c,d), repeated in (58a,b):

(58) a. Annotate a nonprojecting node immediately dominated by F’ with $↑ = ↓$.
b. Annotate a nonprojecting node immediately dominated by L’ with $(↑ cf) = ↓$ or $↑ = ↓$.

The earlier definition requires a c-structure complement to be immediately dominated by a category of one bar level (either lexical L’ or functional F’) in order to receive the lexical or functional complement annotations. Our flexible definition of complement drops the requirement of immediate domination by X’ and requires only that there be no sister node which is nonprojecting. Since it is only nonprojecting nodes that may receive cf specifications by (46), the new requirement is simply defining a complement to be a phrase that does not have as a sister something that could be a complement.\(^43\)

With our new flexible definition (57), we may restate the annotation principles for endocentric complements (58a,b) as in (59a,b):

(59) a. Annotate a nonprojecting complement node dominated by any functional category $F^n$ with $↑ = ↓$.
b. Annotate a nonprojecting complement node dominated by any lexical category $L^n$ with $(↑ cf) = ↓$ or $↑ = ↓$.

The principles in (59) allow the same configurations for c-complements as our previous principles (58) [(46c,d)], but in addition (59) allows complement configurations like (60a,b) while still excluding those like (60c):

\(^43\) Hence, the flexible definition requires the binary branching analysis of multiple complements given in (65a).
Interacting with economy of expression, (59) will cause more extensive pruning of \( X' \) nodes, because there are now alternative structural configurations that support the same functions. In particular, \( X' \) nodes will be pruned when they are either dominated by or dominate nonbranching nodes of the same category type. (See the discussion of example (15) above.)

Thus, the important point to bear in mind about economy of expression is that it economizes the resources for function mapping available to a given language; it does not create new resources. Consequently, a highly configurational language such as English will inevitably show fewer effects of the economy principle than languages which have richer exocentric and lexocentric resources for structure–function mapping. This point will be illustrated in subsequent chapters.

In conclusion, let us summarize here the endocentric c-structure to f-structure mapping principles we will assume. These mapping principles are of course supplemented by the non-\( X' \) principles in Sections 6.3.1 and 6.3.2.

(61) **Endocentric mapping principles:**
   a. **Heads:** Annotate a projecting node in a projection of the same kind with \( \uparrow = \downarrow \).
   b. **Specifiers:** Annotate a nonprojecting node in \( F'' \) with \( (\uparrow DF) = \downarrow \).
   c. **Coheads:** Annotate a nonprojecting complement node (57) dominated by any category \( X^n \) with \( \uparrow = \downarrow \).
   d. **Complements:** Annotate a nonprojecting complement node (57) dominated by any lexical category \( L^n \) with \( (\uparrow CF) = \downarrow \) or \( \uparrow = \downarrow \).
   e. **Adjuncts:** Optionally annotate a nonprojecting node with \( (\uparrow AF) = \downarrow \) and its adjoined-to sister node with \( \uparrow = \downarrow \).

**Further reading and discussion**

Although extended \( X' \) theory is often associated with works in the transformational tradition, functional projections were originally motivated by research in
nontransformational frameworks. The category CP as a projection of C was first introduced into LFG by Fassi Fehri (1981, p. 141ff.; 1982, p. 100ff.) in his analysis of Arabic syntax.\(^44\) The analysis of English pronouns as determiners was first proposed by Postal (1966). The hypothesis of a category DP as the projection of a category of determiners is originally due to Brame (1982). The hypothesis that the sentence is a projection of a functional head (the IP hypothesis) is due to Falk (1984), using $M$ for $I$, in his analysis of auxiliaries within LFG. All of these works are worth reading to understand some of the original empirical motivations for hypothesizing functional projections. For a standard exposition of the X’ theory of lexical categories in English, see Jackendoff (1977). The innovation of factoring apart the linear ordering of X’ categories from their dominance relations is due to Falk (1983). Toivonen (2001b, 2003) explores endocentric X’ theory as a universal theory of phrase structure. She also addresses the issue of nonendocentric structures and discusses how such structures can be learned.

Two works on lexocentricity and phrase structure variation are highly recommended: Kroeger (1993) and Nordlinger (1998a). These provide detailed studies of nonconfigurational and mixed configurational/nonconfigurational languages in LFG.

Appendix: X’ theory

Many versions of X’ theory are compatible with the present theoretical framework, and we will not attempt to distinguish between them empirically here. For concreteness, we outline one set of X’-theoretic assumptions here, without attempting careful empirical justification of each point. The specific version of X’ theory presented here is based on Bresnan (1977), Jackendoff (1977), Falk (1983), Grimshaw (1998), Webelhuth (1992), Kroeger (1993), King (1995), Nordlinger (1998a), and Sadler (1997). Subsequent chapters (Chapters 7, 8, and 9) and problem sets will provide more detailed examples of extended X’ structures and the kinds of evidence that motivate their presence in a grammar.

The simple formal model of phrase structure categories given in Chapter 4 is adequate for descriptive purposes, but it leaves many questions unanswered about the relations between categories, and it permits “monstrous” tree structures (as in Problem Set 1). Because the category labels are simple, unanalyzed symbols, there is no necessary relation expressed between VP and V or NP and N, a problem originally pointed out by Lyons (1968, pp. 234–235) and which led to the development of X’ theory – for although VP (for “verb phrase”) is written as a composite name containing V (for “verb”), in fact it is treated within the formal theory of

\(^{44}\) Fassi Fehri (1981, p. 164; 1982, p. 118) attributes the original (unpublished) proposal to Ken Hale, who used it to analyze auxiliary inversion in English.
context-free phrase structure rules as an unanalyzed symbol (just as the function names in Chapter 4 are treated as unanalyzed symbols denoting f-structure attributes). X’ theory hypothesizes an internal structure to the category labels which permits their relations to be captured (just as current theoretical work on grammatical relations attributes an internal structure to the functions). LFG’s X’ theory, like the theory of grammatical functions, is a metatheory with respect to the grammars permitted by the theory of formal structures presented in Chapters 4 and 5.

Under X’ theory, c-structure categories are decomposed into a level of structure, represented by an integer called the “bar level,” and a kind of category, represented by a feature matrix of categorial features. The kinds and levels of categories assumed here are based on Jackendoff’s (1977)) and Bresnan’s (1982a)) theories of categories.45 Two basic properties of categories are hypothesized, predicative and transitive. “Predicative” categories are those which cannot stand alone as arguments, but require an external subject of predication. Adjective and verb are predicative categories; noun and preposition are not. “Transitive” categories are those which may take an object or direct complement function. Verb and preposition/postposition are transitive categories; noun and adjective are not. This analysis is shown in (17) and (18), repeated here as (62) and (63), respectively:46

(62) Kinds of categories:

<table>
<thead>
<tr>
<th></th>
<th>‘predicative’</th>
<th>‘transitive’</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>P</td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td>N</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>A</td>
<td>+</td>
<td>−</td>
</tr>
</tbody>
</table>

(63) Levels of categories:

<table>
<thead>
<tr>
<th>Type:</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>V’</td>
<td>V’’</td>
<td>(VP)</td>
</tr>
<tr>
<td>P</td>
<td>P’</td>
<td>P’’</td>
<td>(PP)</td>
</tr>
<tr>
<td>N</td>
<td>N’</td>
<td>N’’</td>
<td>(NP)</td>
</tr>
<tr>
<td>A</td>
<td>A’</td>
<td>A’’</td>
<td>(AP)</td>
</tr>
</tbody>
</table>

The categorial features “predicative” and “transitive” of (62) can be defined in terms of the syntactic functions subj and obj (Bresnan 1982a). They capture the widespread generalizations that: (i) (some) lexical elements of categories V and P can take direct object complements, while those of categories N and A cannot; and (ii) the phrases headed by P and N can serve as complete arguments, while those headed by V and A cannot but must have a subject of predication.47 The

45 Other categorial analyses are of course compatible with the general framework.
46 Here “A” is used to cover the category of adverb as well as adjective, as in Emonds (1976).
47 These generalizations are not exceptionless, however; see Simpson (1991).
categories of level 0 are called **lexical categories**; the categories of levels 1 and 2 are called **projections**; projections of the highest level (i.e. level 2 in (63)) are called **maximal projections**.

X’ theory allows us to capture relations between different categories. It postulates that phrases are related to heads in a uniform way, as shown in (64), where the comma indicates no specification of relative order of the categories it separates, and the arrow is read as “immediately dominates.”

\[
\begin{align*}
(64) & \quad a. \quad X' \rightarrow X^0, YP \\
& \quad b. \quad XP \rightarrow YP, X'
\end{align*}
\]

In this, the endocentric pattern, \(X^0\) is the **c-structure head** (c-head) of XP (= \(X''\)). More specifically, \(X^0\) is the head of \(X'\), and \(X'\) is the head of XP. A phrase and its head have the same feature matrix, in terms of the predicative and transitive features of (62) and (63). Thus endocentricity guarantees that the c-head of every phrase is a category having the same feature matrix but of a lesser level of structural complexity.

The YP in (64a) is the **complement**. The YP in (64b) is the **specifier**. Specifiers and complements are maximal projections in the endocentric mode. They need not share the category features of their mother category. Multiple complements are sometimes treated by adding the recursive pattern of (65a) to (64a), which preserves binary branching, or by replacing (64a) with (65b), which creates a flatter complement structure. We will adopt here the analysis in (65a):\(^{50,51}\)

\[
\begin{align*}
(65) & \quad a. \quad X' \rightarrow X', YP \\
& \quad b. \quad X' \rightarrow X^0, YP^*
\end{align*}
\]

**C-structure** adjuncts are often analyzed as sisters to XP dominated by XP or as sisters to \(X'\) dominated by \(X'\).\(^{52}\) Nonprojecting words, \(\hat{X}\), are sisters to \(X^0\) dominated by \(X^0\).

---

48 We write “c-structure head” here rather than the familiar unqualified “head,” which is used in other treatments of X’ theory, in order to distinguish this strictly categorical notion of headedness from the generalized notion of headedness introduced in the next chapter.

49 By taking the transitive closure of this relation (“being an immediate c-head of”), we can define the sense in which N is the head of NP, V of VP, and the like.

50 See footnote 41 for one motivation.


52 Given (64a), this proposal creates functional ambiguity for a constituent that is a sister to \(X'\): it may be either a complement or an adjunct. However, because of the general imperfect correspondence between structures and functions in our framework, the functional ambiguity of structural form is harmless. (In fact, it may play an explanatory role in the historical change of syntax, as conjectured in Bresnan and Mchombo 1987 and discussed more fully in Börjars et al. 1997 and Toivonen 1997, 2000.) The solution algorithm in Chapters 4 and 5 treats alternative annotations on the same c-structure rule as cases of nondeterministic choice.
It is important to understand that the $X'$ terminology and definitions are independent of the relative order of sister constituents. Consider the abstract example in (66):

\[
\text{(66)}
\]

In (66), RP, GP, MP, and BP are maximal projections. GP is a specifier, BP is a complement, and MP is an adjunct.

Some examples of cross-categorial parallelism in English are given in (67).\(^{53}\)

\[
\text{(67) a. We are \textit{nearing} the meadow.}
\]

\[
\text{b. \textit{Nearness} to the meadow is the great virtue of our house.}
\]

\[
\text{c. The house was \textit{much nearer} to the meadow after the tornado.}
\]

\[
\text{d. \textit{Near} the meadow, we built a house.}
\]

Although the italicized phrases belong to different categories, they show striking parallelisms. Each phrase is headed by a category having the same feature matrix: the VP by the verb \textit{nearing} in (67a), the NP by the noun \textit{nearness} in (67b), the AP by the adjective \textit{nearer} in (67c), and the PP by the preposition \textit{near} in (67d).\(^{54}\)

Each head has a complement and precedes it. In contrast, in a head-final language such as Navajo (Chapter 8), complements precede their heads in each category. At the same time, the categories show differences reflecting their different featural composition. The verb \textit{nearing} and the preposition \textit{near} take direct NP complements, while the noun and adjective take indirect PP complements. This reflects the categorial analysis of V and P as [+ transitive] and of N and A as [− transitive] in (62). Further, the NP and PP categories need not have a subject of predication, as in (67b,d), while the AP and VP categories must have a subject of predication, as they do in (67a,c). This contrast reflects the feature [± predicative].

---

\(^{53}\) These are from Bresnan (1977).

\(^{54}\) These categories are morphologically distinguishable: the verb can have verbal tense/aspect inflections -\textit{s} or -\textit{ed}; the adjective can have comparative and superlative inflections -\textit{er} or -\textit{est}; the noun bears nominalizing derivational morphology; the preposition is uninflected and underived.
7 Endocentricity and Heads

The structure–function mapping principles of Chapter 6 entail that large regions of constituent structure, for example a VP and its dominating IP and CP, may be mapped into a single f-structure. Let us refer to this region as a single functional domain under the correspondence mapping from c-structure to f-structure.\(^1\) The imperfect correspondence between c-structure and f-structure explains two types of interesting phenomena that have been observed within a single functional domain: head mobility and distributed exponence. Both phenomena can be seen as consequences of the same general principles for sharing f-structure head properties in a complex c-structural domain.

7.1 Head mobility

The mapping principles of Chapter 6 entail the noncompositionality of f-structures in c-structures; that is, the f-structure of a node not only is a function of the f-structures of its immediate constituents but also depends upon the surrounding syntactic structure in the functional domain. For example, the English VP (as discussed in Section 5.3.4) has an f-structure subject whose contents come from the higher S or IP in which the VP is embedded. This follows from the principle that the complement of a functional category is an f-structure cohead (Chapter 6). By this principle, the contents of a VP f-structure could be distributed across the entire functional domain of the VP (i.e. the higher S, IP, and CP structures). This is true not only for verbal dependents, such as subjects and objects, but also for the head itself. The noncompositionality of LFG thus implies that VPs can be discontinuous phrases whose heads may appear external to the rest of the phrase.

---

\(^1\) Grimshaw’s (1991) “extended projection” corresponds closely to the functional domain in LFG.
A number of languages exhibit this phenomenon, which is commonly known as “head movement” but perhaps more accurately termed “variable head positioning.” One such case of head mobility that we will examine in this chapter occurs in Welsh.

7.1.1 Verb order in Welsh

As pointed out in Chapter 6, Welsh is one of the many languages employing subject predicate constructions of the form in (1), where XP may be a predicate phrase of any of a range of categories – VP, NP, AP, or PP:

(1)

\[
\begin{array}{c}
\text{IP} \\
\text{I} \\
\text{S} \\
\text{NP} \\
\text{XP}
\end{array}
\]

The specifier of IP is taken to be null (omitted) in Welsh, as a parametric choice.

In Welsh, the finite verb is clause-initial, yielding V\text{fin}\text{SO} word order. However, the SVO order appears when V is a “verbal noun,” a nonfinite verbal complement to a finite auxiliary verb which occupies the clause-initial position: Aux\text{fin}SV\text{n}\text{O}. These alternative orders are illustrated by (2a,b) from Sproat (1985, p. 176):

(2) a. *Gwelodd Siôn ddraig.*
    saw-3.sg.past John dragon
    “John saw a dragon.”

b. *Gwnaeth Siôn weld draig.*
    do-3.sg.past John see.vn dragon
    “John saw a dragon.”

Example (2b) illustrates the structure of (1) very clearly. Here the finite auxiliary verb *gwnaeth* (‘did’) appears in the I position, with the nonfinite form of ‘see’, the uninflected verbal noun *gweld*,\(^2\) in V position in the VP:\(^3\)

\(^2\) Consonant mutations affect the verbal form in context.

\(^3\) The Welsh verbal noun has both nominal and verbal properties, and could be categorized in alternative ways without affecting the essential point here. See Awbery (1976), Sproat (1985), and below for some discussion.
Evidence for the presence of a VP containing the nonfinite verb and its complements includes the fact that this constituent may be fronted, a characteristic of the Celtic languages (Tallerman 1998b, pp. 24–25, and Tallerman 1998a). In the cleft construction of (4), for example, the main verb ‘built’ and its complement ‘houses’ and adjunct ‘in Bangor’ are all fronted together in their normal order as a unit in front of the sentence (Tallerman 1998b, p. 245):

(4) \[VP \text{Adeiladu tai ym Mangor] a wnaeth o.}

build house.pl in Bangor prl do.pst.3sg he

“He built houses in Bangor.”

The c-structure to f-structure mapping principles of Chapter 6 yield the annotations to (3) shown in (5):\(^4\)

\(^4\)The principles of Chapter 6 actually tell us only that the rightmost NP has a complement function cf; the lexical requirements of the verb (Part IV) select exactly what type of complement function it is – OBJ in this case. In this illustration we have anticipated which of the possible complement functions on the NP in VP will match that of the PRED attribute, satisfying completeness and coherence.
From this we can see that the nodes I, IP, S, VP, and V belong to the same functional domain. In this example the tense inflection is carried by the auxiliary verb *gwnaeth* (‘did’). We will assume that this verb serves merely as a tense and agreement carrier without a PRED attribute to conflict with that of the V in VP. We will therefore provide it with the following morpholexical specifications (which are created by the inflectional morphology):

\[
\begin{align*}
\text{gwnaeth} & \quad (\uparrow \text{TENSE}) = \text{PAST} \\
& \quad (\uparrow \text{SUBJ}) = \downarrow \\
& \quad (\downarrow \text{PERS}) = 3 \\
& \quad (\downarrow \text{NUM}) = \text{SG}
\end{align*}
\]

The PRED attribute of example (2b) is carried by the nonfinite verb form *weld* (‘see’) in V:

\[
\begin{align*}
\text{weld} & \quad (\uparrow \text{PRED}) = \text{‘see' (}(\uparrow \text{SUBJ})(\uparrow \text{OBJ}))'
\end{align*}
\]

Together, these constraints yield the following correspondence between the c-structure and f-structure:

\[
\begin{align*}
\text{(8)}
\end{align*}
\]

Now the main verb *weld* (‘see’) of (2b) also has a finite inflected form, based on the inflecting stem *gwel-* . Since all finite verbs in Welsh appear in initial position (represented by I in our structure (3)), we simply assume that the rules of Welsh inflectional morphology produce the following form for lexical insertion into an I:

\[
\begin{align*}
\text{(9)}
\end{align*}
\]

\[\text{gwelodd} \quad (\uparrow \text{PRED}) = \text{‘see' (}(\uparrow \text{SUBJ})(\uparrow \text{OBJ}))'
\]

\[
\begin{align*}
& \quad (\uparrow \text{TENSE}) = \text{PAST} \\
& \quad (\uparrow \text{SUBJ}) = \downarrow \\
& \quad (\downarrow \text{PERS}) = 3 \\
& \quad (\downarrow \text{NUM}) = \text{SG}
\end{align*}
\]

\[\text{5} \quad \text{The actual attribute–value pairs for *ddraig* are abbreviated by “dragon” in (8), following our convention for abbreviating the content of subsidiary f-structures where it is not relevant to the discussion.}\]
If we insert *gwelodd* (*saw-3sg*) into the I position of the structure (3), thereby replacing the auxiliary with this particular I verb, there will be two instances of ‘see’ in the same clause, giving rise to a violation of the functional uniqueness principle. By our general principles of structure–function correspondence together with the transitivity of equality, the VP f-structure is identified with the IP f-structure containing the finite verb features, and consequently the PRED attribute would have two values, one for each instantiation of a verb (the finite I in IP, the nonfinite V in VP). Therefore, inserting *gwelodd* (*saw-3sg*) into structure (3) produces an inconsistency in the value of the PRED attribute (because of the property of unique instantiation of semantic features – see Sections 4.2 and 4.4, as well as footnote 12 in Chapter 4). Could we resolve this clash of values by omitting the lexical content of V, creating an empty category? An empty category V counts as a syntactic node for the principle of economy of expression (Chapter 6), because it dominates no terminal lexical node. Hence it would be eliminated because it provides no information that is not already available from the syntactic context without it. Economy of expression thus forces us to eliminate V when we insert *gwelodd* (*saw-3sg*) into I, as in (10):6,7

(10)

```
   IP
    /\  
   I   S
   / \  /
 *gwelodd* *NP* *VP*
   'see-3.G.PAST'   'Siôn'   *NP*
    'John'         'ddraig'
                   'dragon'
```

Observe that this structure closely resembles a transformationally derived structure in which the finite verb has been moved from V to I, except that there is no trace of movement in the form of an empty category V in VP. However, the absence of the V does not affect our principles of structure–function correspondence (the annotation principles that produced (5) above). The result is shown in (11):8

---
7 We could also choose to solve the problem by eliminating I, but I is presumably required because of the need for tense or other attributes to be present in the sentence.
8 In this illustration we have again anticipated which of the possible complement functions (cf) on the NP in VP will match that of the PRED attribute, satisfying completeness and coherence.
These constraints yield the following correspondence between the c-structure and f-structure:

Note that (10) and (3) have the same f-structures, displayed in (12) and (8), respectively. The functional equivalence of (10) and (3) has suggested to many that the head “moves” from one position to the other. But we can now see that the apparent mobility of the head arises nonderivationally from general principles governing the imperfect correspondence between c-structure and f-structure. A much fuller discussion of the theory of structure–function mapping in relation to Welsh syntax can be found in Sadler (1997).

---

9 Alternative analyses of these Welsh and (more generally) Celtic structures are possible and have been given (see, e.g., Borsley 1989, 1990). We have also set aside for expository purposes the very real possibility that auxiliaries in some languages may have semantic content forming a composite PRED with the main verb (Butt 1995; Alsina 1997; Mohanan 1994; Webelhuth and Ackerman 1999; Frank 1996; Andrews and Manning 1999).
7.2 Endocentricity and extended heads

The mobility of heads within their functional domains naturally raises questions about the status of the phrases with missing heads.

One question is this: why does the VP in (11) escape elimination by economy of expression? Welsh permits XPs other than VP in S, so it is a possibility within the structural resources of the language that the headless VP could be replaced by an NP. But these XPs are interpreted as the “predicate” (f-structure heads) of their S, and must be annotated with ↑ = ↓, as discussed in Section 6.3.2. In the case of examples like (11), eliminating the VP would require annotating the NP immediately dominated by S with ↑ = ↓, leading to an inconsistent f-structure: functional uniqueness would be violated, because the verb ‘saw’ already provides the main predicador for the sentence.

Another question is: why does economy of expression not eliminate the structure in (5) as having too many nodes compared to the functionally equivalent structure in (11)? If these two c-structures have identical f-structures, there is no appeal to semantic expressivity to distinguish them. Notice, however, that although it is true that (5) has more c-structure nodes than (11), the extra nodes are preterminal nodes dominating lexical material, and these are exempt from economy of expression, as pointed out in Chapter 6.

A more fundamental question that we must consider is why our analysis of Welsh verb order does not violate the basic principle of endocentricity which X’ theory was designed to embody – that every category has a head which determines its properties. In (12) the embedded VP lacks an internal V constituent. In our framework, however, it is incorrect to say that VP lacks a head: after all, the finite verb in I functions as its head in f-structure. Because of the imperfect correspondence between c-structure and f-structure, the head of a constituent cannot in general be fixed in a unique structural configuration (indeed, this is why variable head positioning can occur at all, within the present framework); but the head can be recovered from looking at the set of nodes that are mapped into the same f-structure as VP under the correspondence function \( \phi \). In other words, we use the inverse function to \( \phi \), denoted by \( \phi^{-1} \), which takes each f-structure \( f \) into the set of nodes that correspond to \( f \) under \( \phi \).\(^{10}\) Within the inverse image of \( \phi(\text{VP}) \) (that is, within \( \phi^{-1}(\phi(\text{VP})) \)) will be all the nodes that are mapped to VP’s f-structure by \( \phi \). Among these nodes, the closest nondominating node to VP can be identified as the head. This will be the internal c-structure head if it is present, otherwise the

\(^{10}\) Recall that \( \phi \) is a many-to-one function from c-structure nodes to f-structures. Hence the inverse mapping from f-structures to nodes is not a well-defined function, because a single f-structure \( f \) is not associated with a unique c-structure node. However, the set of all c-structure nodes mapped by \( \phi \) into \( f \) does give a unique value for \( f \), and that allows the inverse of \( \phi \) to be well defined.
Endocentricity and Heads

next higher nondomminating node in the functional domain. The well-known tree relation of c-command can pick out both these cases: A c-commands B if every node properly dominating A also dominates B.\footnote{The “dominates” relation is reflexive, anti-symmetrical, and transitive: every node dominates itself and its daughters, its daughters’ daughters, etc., but it properly dominates only its daughters, its daughters’ daughters, etc. Accordingly, A c-commands itself and all of the nodes dominated by its mother (including that mother).} Therefore, to find the extended head of a given node (call it VP), we look in the inverse image of VP under φ, throw out all of the nodes therein that dominate VP, and pick a node which c-commands VP and is c-commanded by any other node that also c-commands VP. This gives us our definition of extended head:

\begin{enumerate}
\item \textbf{Definition of extended head:}
\item \textit{(based on Jar n.d., Zaenen and Kaplan 1995, pp. 221–222, and Bresnan 2000)}
\item Given a c-structure containing nodes \(N\) and \(C\) and a c- to f-structure correspondence mapping \(\phi\), \(N\) is an \textbf{extended head} of \(C\) if and only if \(N\) is the minimal node in \(\phi^{-1}(\phi(C))\) that c-commands \(C\) without dominating \(C\).
\end{enumerate}

Consider how this definition applies to our previous example (8). Taking VP to be \(C\), the node requiring an extended head, we see that \(V\) and VP are mapped into the same f-structure, \(V\) does not dominate \(VP\), and every node that properly dominates \(V\) also dominates \(VP\). As for \(I\), \(I\) and \(VP\) are mapped into the same f-structure, \(I\) does not dominate \(VP\), and every node that properly dominates \(I\) also dominates \(VP\). However, only \(V\) counts as the extended head of \(VP\). The reason is that \(V\) is the \textit{minimal} node c-commanding \(VP\), because \(I\) c-commands \(V\) (every node that properly dominates \(I\) also dominates \(V\)). In this same figure, (8), it is also true that \(VP\) cannot be the extended head of \(V\) (because \(VP\) dominates \(V\)) and \(VP\) cannot be the extended head of \(I\) (because it does not c-command \(I\)). Referring now to (12), the reader can check that \(I\) is the extended head of both \(IP\) and \(VP\).

Thus (13) amounts to saying that \(X\) is an extended head of \(Y\) if \(X\) is the \(X'\) categorial head of \(Y\) (by the definitions of Chapter 6), or if \(Y\) lacks a categorial head but \(X\) is the closest element higher up in the tree that functions like the f-structure head of \(Y\). It is easy to see that under this definition there is a many-to-one relation between categories and extended heads: categories have unique but not necessarily distinct heads. For example, in (12), each category including \(IP\) and \(VP\) has one and only one extended head, but the same finite verb \(I\) in (12) serves as the head of two distinct categories, the \(I'\) and the \(VP\).

By replacing “head” with “extended head,” we can state a preliminary version of the endocentricity principle of the present framework:

\begin{enumerate}
\item \textbf{Endocentricity (preliminary):}
\item Every category has an extended head.
\end{enumerate}
As it stands, however, (14) is false. There are many instances where categories lack even extended heads. A well-known example is the case of interrogative complements in (Standard) English, where either the complementizer of CP (if or whether) or the specifier of CP (the wh-phrase) is present, but not both:

\[(15)\]
\[
a. \ I \ wonder \ [\text{cp} \ [c \ if] \ [ip \ I \ am \ tall]]
\]
\[
b. \ I \ wonder \ [\text{cp} \ [\text{ap} \ how \ tall] \ [ip \ I \ am]]
\]
\[
c. \ *I \ wonder \ [\text{cp} \ [\text{ap} \ how \ tall] \ [c \ if][ip \ I \ am]]
\]

The same is true for DPs in English; either the determiner of DP (the or a(n)) or the specifier of DP (the possessive phrase) is present, but not both:

\[(16)\]
\[
a. \ [\text{dp} \ [d \ the] \ [np \ house]]
\]
\[
b. \ [\text{dp} \ [\text{dp} \ Mary's \ and \ Lily's] \ [np \ house]]
\]
\[
c. \ *[np \ [Mary's \ and \ Lily's] \ [d \ the][np \ house]]
\]

Of course, endocentricity is violated in this way only under the assumed analyses. If the wh-phrase in (15) and the possessive phrase in (16) were not assumed to be specifiers of functional projections, but perhaps simply alternative realizations of the same category as the interrogative complementizer and the determiner, respectively, there would be no missing heads to worry about (though the alternative violates the basic X’ theory patterns). But there is reason to analyze these elements as occupying positions distinct from the complementizer and determiner. Observe that the specifiers of CP and DP in examples (15) and (16) allow ellipsis of their complements (IP and NP, respectively): She’s tall. I wonder how tall (she is) and Is this your house? No, it’s Mary’s and Lily’s (house). In contrast, the functional heads C and D, even when heavily stressed, do not allow this kind of ellipsis: They say she’ll do it, but I wonder if *(she’ll do it) and Is this a house of yours? No, it’s the *(house of mine).

If we think of (14) as a kind of recoverability condition, requiring us to recover an extended head for every category from its syntactic context, we can see why certain functional projections FP, such as the CP and DP in (15) and (16), might be exempted from the endocentricity requirement. If the category is headed by a sufficiently small closed class of grammatical elements, recoverability is trivial and the contribution of the head often redundantly encoded. English complementizers carry limited grammatical information about finiteness and sentence type; with an interrogative specifier, an interrogative complementizer is redundant. The English determiners likewise carry limited grammatical information about definiteness, and the definite feature is redundant with the possessive specifier. We can therefore replace (14) with (17):

\[(17)\]
\[
\textbf{Endocentricity:}
\]
\[
\text{Every lexical category has an extended head.}
\]
In (17), “lexical category” picks out the $L^n$ categories of Chapter 6, excluding the “functional categories” $F^n$. Note that the converse of (17) is not true: there are lexical categories that are not the heads of lexical projections, as when a lexical verb in a nonconfigurational language like Warlpiri is immediately dominated by $S$. Finally, observe that (17) can be applied even to lexical categories $L^0$: the terminal node dominated by $L^0$ will count as its extended head by our definition (13).

In sum, the problem that head mobility poses for endocentricity can be resolved by recovering the head of a locally headless phrase from the inverse image of the f-structure of the phrase.

7.3 Distributed exponence

We have seen that according to the principles of the mapping theory in Chapter 6, the f-structures of functional heads $F$ are identified with those of their c-structure complements. By the transitivity of identity, it follows that all of the c-structure heads within the same functional domain will share their f-structure attributes. Hence, if a functional head contributes f-structure information to the clause, it must be consistent with that of all other heads in the same functional domain. In this way, for example, complementizers and verbs may be seen to agree, even though they may be widely separated in their c-structure tree positions:

(18)

An interesting case of this sort may be found in West Flemish (Problem Set 4).

Now looking at the same correspondence mapping from the point of view of the f-structure (reversing the arrows in (18)), we see that information about the same functional property (meaning an f-structure attribute such as tense) may appear distributed in c-structure across multiple heads. This is what is meant by distributed exponence – an exponent of a “functional” feature (such as tense, num, pers) being an expression of that feature in c-structure. The structure–function mapping principles make it possible to have syntactically distributed exponents of the same morphosyntactic category. This phenomenon occurs in a number of languages. We will examine here the case of Wambaya (Nordlinger 1998b), an
Australian language where tense-marking occurs simultaneously on both auxiliary (I) and main verb (V):

\[(19)\]

\[
\text{IP} \rightarrow \ldots \text{I} \rightarrow \text{S} \rightarrow \ldots \text{V} \rightarrow \ldots
\]

In Wambaya, the tense values of a clause arise compositionally from the individual inflections on I and V which have overlapping values, and thus are not a simple matter of feature copying.\(^{12}\)

### 7.3.1 Wambaya c-structure

The c-structure of Wambaya is outlined in Nordlinger (1998a) and is similar to that which has been proposed for Warlpiri (e.g. Simpson 1991; Kroeger 1993; Austin and Bresnan 1996). In this structure, a nonprojective, nonconfigurational constituent S is generated as a sister to I. I is the locus of the second position auxiliary, while the main verb appears in V (within S) or in I (under circumstances discussed below). The order of constituents within S is completely free and all constituents are optional. Since S is exocentric, its head may be either a verbal predicator (as in (20)) or a nominal predicator (as in (21)):

\[(20)\]  
\[
\text{Naniyawulu nagawulu baraj-bulu wurlu-Ø-n} \\
\text{that.du.ii.nom female.du.ii.nom old.person-du(nom) 3du.s-np-prog} \\
\text{duwa.} \\
\text{get.up(unm)} \\
\text{“The two old women are getting up.”}
\]

\[(21)\]  
\[
\text{Iligirra buyurru.} \\
\text{river(nom) dry(nom)} \\
\text{“The river is dry.”}
\]

All permutations of the constituents are possible (although some may be more pragmatically marked than others), as long as the auxiliary remains in second position:

---

\(^{12}\) The following account closely follows Nordlinger and Bresnan (1996), for which permission from the publisher is gratefully acknowledged.
Like Warlpiri (Chapter 1), Wambaya also has discontinuous NPs and lacks a VP. The contrast between (20) and (23) shows that while the auxiliary can follow a NP constituent as in (20), it cannot follow the main verb and its object as in (23). This suggests that the verb and its object do not form a constituent in Wambaya since, if they did, we would need to explain why it is that the VP constituent cannot appear before the auxiliary while other constituents can:

(23) * Daguma janji ng-a ngawurniji.
hit(unm) dog(acc) 1sg.a-pst 1sg(erg)
“I hit the dog.”

The specifier of IP position is optional and can be filled only by a maximal projection; thus in Wambaya it is limited to NPs and subordinate clauses (since there is no VP, as discussed above). The structure of a simple sentence is given in (24) (auxiliary placement is discussed below). The annotations shown follow from the theory of structure–function mapping in Chapter 6.13,14

---

13 The phrase in the specifier of IP position is represented here as having a focus function. While this appears to be a reasonable characterization of its function, the discourse function of this initial position in Wambaya has not yet been studied in any detail and this may, therefore, turn out to be a simplification of the facts. “gf” can be any function but foc.

14 There may also be a small class of X⁰ elements that have an adjunct function, such as adverbs; the annotation on X⁰ would be modified accordingly.
Since S is a nonconfigurational category, the assignment of grammatical functions to NPs within S is determined not by annotations in the phrase structure rules (as it is in a configurational language such as English) but by lexocentric case principles whereby lexical predicators select for the case features of their arguments. Each NP can be assigned a set of possible functions by means of dependent-marking conditional annotation schemata of the form in (25), which we assume apply to NP daughters of S (i.e. those NP instances of S → C; cf. (24)).

(25) \((\downarrow \text{case}) = \kappa \Rightarrow (\uparrow \text{gf}) = \downarrow\)

The general principles of functional uniqueness, completeness, and coherence will ensure that the correct NPs in the c-structure are associated with the correct grammatical functions in the corresponding f-structure. For example, a transitive verb such as dawu (‘bite’) in (22) will require that its subject have ergative case and its object accusative case, thus specifying an f-structure like the following:

(26)
\[
\begin{array}{c|c}
\text{pred} & \text{bite} \langle \ldots \rangle \\ \hline
\text{subj} & \text{case erg} \\ \hline
\text{obj} & \text{case acc}
\end{array}
\]

The only f-structures for the sentence that satisfy completeness and coherence will be those in which an accusative NP (alaji in (22)) is identified with the \textit{obj} grammatical function and an ergative NP (janyini in (22)) is identified with the \textit{subj} grammatical function.

In a situation where the specifier of IP is filled with an NP (as in (20)), we may assume that the NP is identified with the \textit{foc} function within the f-structure of S (by virtue of its position) and will not receive a nonfocus \textit{gf} specification in that position. Instead, we will provide optional within-S linking equations \((\uparrow \text{foc case}) = \kappa \Rightarrow (\uparrow \text{foc}) = (\uparrow \text{gf})\), and completeness and coherence will ensure matches with the verb’s requirements. (See Simpson 1991, Austin and Bresnan 1996, and Nordlinger 1998a for further discussion.)

Evidence for the existence of S as a constituent separate from the auxiliary comes from (at least) two sources: clauses with nominal predicates, and

---

15 In the majority of cases this is predictable from the argument structure of the verb.
16 The account given in Nordlinger and Bresnan (1996) differs from this. The present account follows Simpson (1991) and conceptually resembles the treatment of grammatical functions in Problem Set 1; see Nordlinger (1998a) for a full discussion of the theory of dependent-marking function specification in nonconfigurational languages using “constructive case” – inside-out function application – rather than case conditionals.
coordination. First, clauses with nominal predicates, such as (21), can never contain an auxiliary and thus can only be of category S:

(27)
```
S
 /\   /
NP NP
 /\   /
N N
```

This follows from the fact that there is a dependency between verbs and auxiliaries, both being inflected for tense, while nominal predicates lack tense inflection. Verbs may not appear in auxiliary-less sentences, except when two Ss are conjoined as a single c-structure complement of the same auxiliary I.

The possibility of conjoining Ss under I constitutes the second piece of evidence for the I–S constituent structure of (24). It is possible to coordinate either IPs (e.g. (28a)) or Ss (e.g. (28b)). In the latter case there is no auxiliary in the coordinated clause(s):

(28) a. *Manjungu ngirr-a angbardi, ngu ya ngirr-a*
    shade(ACC) 1PL.EXC.A-PST build(UNM) dig(UNM) 1PL.EXC.A-PST
    jamba, wugbardi ngirr-a mayinanji.
    ground(ACC) cook(UNM) 1PL.EXC.A-PST goanna(ACC)
    “We built a shade, (and) we dug (a hole in) the ground (and) we
    cooked the goanna.”

    b. *Manjungu ngirr-a angbardi, ngu ya jamba,
    shade(ACC) 1PL.EXC.A-PST build(UNM) dig(UNM) ground(ACC)
    wugbardi mayinanji.
    cook(UNM) goanna(ACC)
    “We built a shade, (and we) dug (a hole in) the ground (and we)
    cooked the goanna.”

An interesting consequence of this analysis is that the FOC function will be automatically distributed across the set of f-structures of conjoined Ss, while the within-S function (OBJ) in the case of (28b) will be confined to the left conjunct only (assuming a basic LFG formalization of coordination such as that of Peterson (2004); see also the brief discussion of coordination in Russian in Section 9.2).

This analysis accounts for all the structural aspects of a simple Wambaya clause considered so far, except for one: the possible appearance of the verb before the
auxiliary, shown in (22). The reason is that by our endocentric principles, only nonprojecting categories can appear in the specifier of IP position, and the only pre-I position we have defined so far is the optional specifier of IP. The auxiliary belongs to the c-structure category I. However, it is actually an enclitic (despite the convention of writing it as a separate word), and its placement is prosodically conditioned; it needs to follow another word to which it can cliticize. When the optional specifier of IP is omitted, the enclitic auxiliary requires a host. In this situation we will assume that the main verb can be generated in I to the left of the auxiliary. Thus we assume that the Wambaya I has the structure shown in (29). Since the specifier of IP is annotated with the \texttt{FOC} function, we can express the incompatibility of having V in I together with specifier of IP by means of a negative existential constraint \(\neg(\uparrow\texttt{FOC})\) attached to the I categorization of verbs:

\begin{equation}
\text{(29)}
\end{equation}

\[\text{I} \quad \neg(\uparrow\texttt{FOC}) \quad \text{V} \quad \text{I}\]

Across languages, there are often dependencies between elements in a head position and the specifier of the head. The constraint in (29) is simply a formalization of the idea of a specifier-head dependency.

Wambaya main verbs are lexically categorized as V, then, and V may appear either in the nonconfigurational S or in I:

\begin{equation}
\text{(30)}
\end{equation}

dawu V ‘bite (\(\uparrow\texttt{subj})(\uparrow\texttt{obj})\)’

The structure of the initial sentence in (22) above is given in (31). The annotations follow from the structure–function mapping theory in Chapter 6, together with (29). Economy of expression has eliminated I'; the case conditionals (25) are simplified to their true consequents.

---

17 This is supported by the fact that the auxiliary never constitutes a phonological word of its own (for example, its first syllable never receives primary stress) but forms a phonological word with the element to its left. When the auxiliary is monosyllabic, it is completely unstressed; when it is polysyllabic, it constitutes its own stress domain, as do all polysyllabic morphemes in Wambaya (Nordlinger 1998b), having secondary stress on the first syllable.

18 Nordlinger and Bresnan (1996) and Nordlinger (1998a) adopt a different analysis, based on “prosodic inversion” (Simpson 1983a, 1991; Halpern 1995; Austin and Bresnan 1996).

19 On existential constraints and negation, see Section 4.6.

20 Presumably both V and Aux must be annotated with \(\uparrow = \downarrow\) under I, because all are verbal categories. For discussion of \(X^0\) adjunction, see Chapter 6.
What is interesting about Wambaya to us here is that both the auxiliary and the verb are inflected for tense and share tense attributes regardless of their structural positions in I and V.

7.3.2 The Wambaya tense system

The Wambaya auxiliary has no morphological head/base, but is simply a cluster of clitics and suffixes marking some combination of tense, aspect, mood, directional information, and subject and object information. The auxiliary maximally makes a three-way tense distinction, distinguishing past, present, and future tenses. In addition to the tense-marking in the auxiliary, tense-marking is also found on the main verb; however, the system of marking on each element is different. Thus, rather than redundantly marking information already provided by the auxiliary, the verbal inflection works in conjunction with the auxiliary-marking, the ultimate combination defining the tense category for the clause as a whole. Verbs in Wambaya have two forms: the -ba form, which occurs in positive future-tense clauses and in imperative clauses, and the unmarked form (also the citation form), which occurs in all other contexts. The marked form -ba carries the information that the speaker is uncertain as to whether the (as yet unrealized) event will actually occur, yet predicts it to be likely to occur. The unmarked verb form (in the absence of incompatible information) carries the meaning that the speaker is certain about the occurrence or likelihood of occurrence of the event.

An example of the role of these inflections is shown by the contrast between (32) and (33). In (32) the future-tense suffix in the auxiliary co-occurs with an

---

21 Regular verbs belong to one of two phonologically determined verb classes which differ slightly in the forms of their unmarked inflections and in the nature of the stem to which the -ba suffix attaches.
unmarked verb, giving the clause a meaning of immediate or definite future tense, similar to “be going to” or “be about to” in English:

(32) Daguma-Ø gunu-ny-u ninki!
     hit-UNM 3SG.M.A-2.O-FUT this.SG.M.ERG
     “He’s going to hit you!”

In (33) (from Nordlinger 1998a, p. 232) the future-tense suffix in the auxiliary co-occurs with a ba-marked verb, giving a simple future-tense meaning: 22

(33) ... ngawu ng-u ini dudiyarri-j-ba.
     1.SG.ERG 1.SG.A-FUT this.1.SG.ACC spear-TH-FUT
     “I’ll spear this one.”

Nordlinger and Bresnan (1996) propose that the Wambaya tenses are composites of three primitive binary features: [±PAST], [±FUTURE], and [±UNCERTAIN]. The various compatible combinations of features give rise to the various tense values of Wambaya. This is illustrated for future and immediate future in (34): 23

(34) a. FUTURE: 
     \[
     \begin{bmatrix}
     - & \text{PAST} \\
     + & \text{FUTURE} \\
     + & \text{UNCERTAIN}
     \end{bmatrix}
     \]

b. IMMEDIATE FUTURE: 
     \[
     \begin{bmatrix}
     - & \text{PAST} \\
     + & \text{FUTURE} \\
     - & \text{UNCERTAIN}
     \end{bmatrix}
     \]

The different auxiliary and verb inflections encode various combinations of these features, as illustrated in (35) and (36); here (35) is an example featural specification of the auxiliary tense morphology, while (36) is one of the verb tense morphology:

(35) Sample auxiliary tense inflection:
     \[-u: \begin{bmatrix}
     - & \text{PAST} \\
     + & \text{FUTURE}
     \end{bmatrix} (= \text{future})\]

(36) Sample verb tense inflections:
     a. -ba: [+ UNCERTAIN]
     b. -bi, -Ø: ([− UNCERTAIN])

22 A = transitive subject, TH = thematic consonant.
23 Other values of the possible combinations are not discussed here; see Nordlinger (1996) and Nordlinger and Bresnan (1996) for details.
Thus, from the general principles of structure–function association mentioned above, the different future tenses are arrived at by combining the information provided by the auxiliary suffix with that provided by the verbal suffix. In (37) the combination of the auxiliary suffix and the verbal suffix fully specifies the category of future tense, and so this is the only possible interpretation for the clause:

(37) a. ... ngawu ng-u init ini dudiyarri-j-ba.
    1SG.ERG 1SG.A- [− PAST + FUT.] this.1SG.ACC spear-TH- [+ UNCERT.]
    “I’ll spear this one.”

As described at the outset, by the theory of structure–function mapping, both the auxiliary in I and the main verb in V are f-structure heads of the clause. Their respective f-structures are unified with each other and with the f-structure of the clause as a whole. This fact, along with the lexical integrity principle, which ensures that each word is inserted fully inflected into the syntax, allows in principle for a situation in which both the auxiliary and the verb are inflected with the same inflectional feature.

7.4 Conclusion

We now see that the phenomenon of distributed exponence can be explained by the same theory of structure–function mapping that explains the mobility of heads. The difference is that with distributed exponence each head is filled and

---

24 Nordlinger and Bresnan (1996) further assume that unspecified UNCERTAIN features are given the unmarked (i.e. negative) value by default. The idea of default feature specification can be expressed in LFG in various ways, including morphological blocking (Andrews 1990b) and type hierarchies (Markantonatou and Sadler 1996). Restricting ourselves to the formal architecture of Chapter 4, we could provide (36b) with a conditional schema: \( \neg (\uparrow \text{UNCERTAIN}) \Rightarrow (\uparrow \text{UNCERTAIN}) = - \). The condition is a negative existential constraint testing for the presence of the UNCERTAIN attribute, and the consequent provides a negative value to this attribute if it is not otherwise specified.
contributes partial information to the whole, whereas with head mobility the same information that is distributed across several heads elsewhere is lexicalized in a single word that fills a single head position within the multi-phrasal domain.

**Problems**

The reader is now equipped to solve the first problem of Problem Set 4 (German word order).

**Exercise**

*Verbal elements in English, Swedish, and French*

Let’s assume the following c-structures for basic sentences in English. Note the placement of the verbs and the auxiliary.

(38)

```
      IP
     /   
 NP    I'
 /  
john VP
   
V'
   / 
V⁰  NP
   eats  cookies
```

(39)

```
      IP
     /   
 NP    I'
 /  
john I⁰  VP
   /  
may  V'
    /  
V⁰  NP
    eat  cookies
```
Now consider (40) and (41):

(40)  *John has may eaten the cookies.

The examples in (40) and (41) show that the modal auxiliary *may* precedes the auxiliary *have*. It is generally true that the auxiliaries *be* and *have* can appear after a modal auxiliary, but modals cannot follow other auxiliaries.

a. Invent three more examples that show that modals precede other auxiliaries.

We adopt the following structure for (40), where the second auxiliary *have* is a $V^0$ which takes a VP as its complement:

\[
\begin{array}{c}
\text{IP} \\
\text{NP} \\
\text{John} \\
\text{I'} \\
\text{I}^0 \\
\text{VP} \\
\text{May} \\
\text{V}^0 \\
\text{have} \\
\text{V'} \\
\text{V}^0 \\
\text{Eaten} \\
\text{NP} \\
\text{Cookies}
\end{array}
\]

In other words, we assume that *have* and *be* can appear in both $I^0$ and $V^0$. Note that only tenseless auxiliaries appear in $V^0$.

b. Draw the phrase structure tree for *That boy could be running*.

Now consider (43):

(43)  *John may not eat cookies.*

Example (43) shows that the negation *not* comes between IP and VP, since the modal *may* is in $I^0$ and the main verb *eat* is in $V^0$. If you want to, you can try other examples to see that this is true (you do not need to write this up).

There are several ways to represent the negation word *not* in the phrase structure. For the purposes of this exercise, you can assume that it is in an AdvP adjoined to the VP (the highest VP if there is more than one).
Consider (44)–(46):

(44)  *John not eats cookies.

In (44), has is in I^0. In (45), a “dummy” auxiliary does is inserted into I^0 (we know it is in I^0, since it precedes the negation). Examples (45) and (46) show that a dummy auxiliary is needed in English if the sentence is negated and there is no other auxiliary.

Now consider the Swedish sentences in (47)–(52):

(47)  *John inte har ätit äpplet.
      J. not has eaten apple.the
      “John does not eat the apple.”

(48)  *John inte har ätit äpplet.
      J. not has eaten apple.the
      “John hasn’t eaten the apple.”

(49)  John inte har ätit äpplet.
      J. not has eaten apple.the

(50)  John äter äpplet.
      J. eats apple.the
      “John eats the apple.”

(51)  John äter inte äpplet.
      J. eats not apple.the
      “John doesn’t eat the apple.”

(52)  John inte äter äpplet.
      J. not eats apple.the

Now consider the Swedish yes/no questions in (53) and (54):

(53)  Har John ätit äpplet?
      has J. eaten apple.the
      “Has John eaten the apple?”

C. Draw the tree structures of (47) and (51). Make sure your structures capture the differences between Swedish and English!
(54) *Äter John äpplet?
  eats J. apple.the
  “Does John eat the apple?”

d. Draw an annotated phrase structure tree for (54). The annotations should not violate the mapping principles in Chapter 6.

Now consider the French sentences in (55)–(58):

(55) Jean a complètement perdu la tête.
  J. has completely lost the head
  “Jean has completely lost his head.”

(56) *Jean complètement a perdu la tête.
  J. completely has lost the head

(57) Jean regarde souvent ce film.
  J. watches often this movie
  “Jean often watches this movie.”

(58) *Jean souvent regarde ce film.
  J. often watches this movie

e. Draw the phrase structure tree for (57). (*Hint: pay attention to the placement of the adverb!*)
8 Pronoun Incorporation and Agreement

In the architecture of LFG, as we have seen, morphological words may determine the same kinds of functional structures as syntactic phrases. There is typological variation in the degree of functional specification provided by word structure versus phrase structure. In the grammars of some languages, bound morphemes carry as much functional information as syntactic c-structure constituents. A widespread typological phenomenon called *pronoun incorporation* or *pronominal inflection* can be analyzed in this way: an incorporated pronoun or pronominal inflection is a bound morpheme that specifies a complete pronominal f-structure. The functional specification of a pronoun is incorporated with the functional specifications of the stem to which the morpheme is bound.¹

The functional specification of a pronoun includes its semantic feature(s), binding features which constrain the range of possible syntactic antecedents (Part IV), and case and agreement features. The latter features are shared by lexical nominals and include gender, person, number, animacy, and specificity features. Only pronouns carry the pronominal binding and semantic features. In (1) the attributes *pred, bind, agr*, and *case* respectively represent these four types of features. (Here *agr* is a metavariable over *pers, num*, and *gend* features; likewise, *bind* is a metavariable over the actual binding features – see Part IV. *case* might also be taken as a metavariable over a more primitive decomposition of case features, but we will not pursue this possibility here; see Neidle 1988.) The actual features

¹ The term “pronoun incorporation” is frequently assumed to refer to the transformational movement of a syntactic element into a head (as in Baker 1988). This conception stems from the configurational design of universal grammar, wherein grammatical functions are represented in terms of syntactic phrase structure configurations (Chapter 1). In the alternative design of LFG, there is no such implication: pronoun incorporation involves the incorporation of the function of a pronoun within an inflected word, not the incorporation of the phrase structure of a pronoun into a word. No (synchronic) movement is involved.
for the English pronoun *she* specify a nominative third-person singular feminine definite personal pronoun:

\[
\begin{array}{c}
\text{SUBJ} \\
\text{bind} \\
\text{agr} \\
\text{CASE} \\
\text{IP} \\
\text{DP} \\
\text{she} \\
\text{is}
\end{array}
\]

The **PRED** attribute, as a semantic feature, is uniquely individuated with each instantiation, as represented by the subcripted ‘**pro**’.

A pronominal inflection morphologically bound to a verb stem can specify the same type of f-structure as the pronominal DP shown in (1). An example is shown in (2), based on the Ulster Irish problem in Problem Set 2. The Irish verb stem *chuirf* is the conditional form of the verb meaning ‘put’, and the suffix -**inn** specifies as subject of that verb a nominative first-person singular personal pronoun (‘I’).

\[
\begin{array}{c}
\text{SUBJ} \\
\text{bind} \\
\text{agr} \\
\text{CASE} \\
\text{IP} \\
\text{I’} \\
\text{S} \\
\text{chuirf} \\
\text{inn}
\end{array}
\]

Because of the principle of functional uniqueness, if we are given an incorporated pronoun, it will pre-empt the appearance of any c-structure constituent of the same function having a semantic feature (**PRED** feature). Given the uniqueness of **PRED** values, the verb form *chuirfinn* cannot co-occur with an analytic pronoun in the subject position (the NP daughter of S), even if the pronoun is the first-person singular form *mé* (‘I’). An empty category or gap in that subject c-structure position will not be ruled out by functional uniqueness, but – insofar as it contains no information required for completeness, coherence, or semantic expressivity – it will

\[\text{-**inn** } V_{infl} \quad (\uparrow \text{SUBJ}) = \downarrow \]

\[\begin{align*}
(\downarrow \text{PRED}) &= \text{‘pro’} \\
(\downarrow \text{bind}) &= \beta \\
(\downarrow \text{agr}) &= \alpha \\
(\downarrow \text{CASE}) &= \kappa
\end{align*}\]

2 The functional specifications that give rise to this correspondence are these:
Pronoun Incorporation and Agreement

be excluded by economy of expression (Chapter 6). Absent further constraints, a pronominal inflection will therefore be in complementary distribution with a headed syntactic phrase of the same function. Independent (headed) NPs that co-occur with these pronominal inflections must then have nonargument functions, like the dislocated topics in *My mother, she’s a really good sport* and *She’s a really good sport, my mother*. The incorporated pronoun will agree with such nominals anaphorically, in just the way a pronoun agrees with its antecedent.

At the level of f-structure, the similarities between incorporated pronouns and grammatical agreement inflections in our theory are striking. Verbal agreement morphology carries a subset of the kinds of features carried by pronouns (animacy, specificity, person, number, and gender). Thus, the inflected auxiliary verb *is* specifies a nominative third-person singular subject (as well as clausal present tense, not shown in (3)):

\[
\begin{array}{c}
\text{subj} \\
\text{agr} \\
\text{case} \\
\end{array}
\]

Because of the absence of the semantic and binding features of pronominals in (3) in contrast to (2), functional uniqueness will allow the expression of a syntactic subject DP or NP within the same clause (provided that its agreement features are compatible with those of the inflection), and the principle of completeness (Section 4.7) will require such a syntactic subject, because the verbal predicator will not be satisfied by a subject argument devoid of a semantic feature. Thus, absent other complicating constraints, a grammatical agreement inflection will obligatorily co-occur with a headed syntactic phrase of the same function. The agreement inflection thus “doubles” a syntactic argument, in the sense that the f-structures of the two are identified.

Verbal agreement systems evolve historically from the morphological incorporation of pronouns into verbs or other heads.\(^3\) One trace of this historical evolution is the frequently found formal similarity between bound pronominal inflections and syntactically independent pronouns in the same language: the former tend to be reduced forms of the latter, although the different forms acquire distinct properties (Givón 1976, 1983; Bresnan and Mchombo 1987). Another trace of this evolution is the fact that the categories of verbal agreement across languages – person, number, and gender – are precisely the referentially classificatory

---

properties of definite personal pronouns (see Bresnan and Mchombo 1987 for discussion). Yet another trace is the fact that in many languages the agreement system is in a transitional state between grammatical agreement and pronominal inflections, the same forms having both uses.

These transitional states can be naturally characterized in our theory: the obligatory semantic and binding features of the pronominal inflection become optional. The optionality of features represents a step in their gradual erosion and loss. When the semantic and binding features are present, the inflection behaves like an incorporated pronoun (2), showing complementary distribution with a corresponding syntactic argument. When these features are absent, the inflection behaves like a grammatical agreement inflection (3), doubling a corresponding syntactic argument. This situation is often referred to as “pro-drop.”

Still finer transitional states are naturally characterized within this framework. If, for example, only the semantic feature of the inflection becomes omissible but the pronominal binding features are retained, then the agreement inflection will double only syntactic pronouns, not NPs, because lexical nominals are incompatible with pronominal binding features. Agreement with or doubling of syntactic pronouns is common; it may be restricted by person and number. For example, in some dialects of Irish, some of the personal inflections may double an overt syntactic pronoun (Andrews 1990b, pp. 532–533; McCloskey and Hale 1984, pp. 528–529). In the Bantu language Kichaga, the verbal object agreement prefix is in complementary distribution with lexical object NPs but obligatorily doubles object pronouns (Bresnan and Moshi 1990, pp. 151–152). In Spanish, clitic doubling of accusative object pronouns is obligatory, while doubling of lexical accusative objects is restricted to certain dialects (Andrews 1990b, pp. 539–542; Suñér 1988). Object agreement in a number of Bantu languages is restricted to animate or specific objects (Givón 1976; Wald 1979; Allan 1983); clitic doubling of accusative objects in dialects of Spanish shows similar restrictions (Suñér 1988), and so does clitic doubling of subjects in northern Italian dialects (Suñér 1992). Similarly, a condition of discourse topicality has been

---

4 Like the term “pronoun incorporation,” the term “pro-drop” is often interpreted to refer to an operation on phrase structure, in this case the transformational deletion of a syntactic pronoun or the “licensing” of a phonologically null syntactic phrase representing the pronominal argument. Again, this conception stems from the configurational design of universal grammar, in which syntactic functions are equated with syntactic phrase structure configurations. In the alternative design of LFG, “pro-drop” refers to the functional specification of a pronominal argument by a head; this entails the absence of the structural expression of the pronoun as a syntactic NP or DP.

5 Lexical nominals are subject to “principle C,” not “principle B,” of the binding theory (see Chapter 10); for present purposes let us assume that nominals are negatively constrained for the pronominal feature bind.

6 Instances where pronouns but not lexical NPs are excluded by pronominal inflections also occur (e.g. in Palauan; see Georgopoulos 1991, pp. 52–54). These might be accounted for in terms of an incompatible grammatical feature of the syntactic pronoun and the pronominal inflection; further investigation is required.
observed for object agreement in Northern Ostyak and other Uralic languages (Nikolaeva 1999, 2001); that topicality condition may be the source of definite object agreement in the Uralic language Hungarian (Coppock and Wechsler 2010).

Alongside the historical loss of referentiality in the transition from pronominal to agreement marker runs a transition in form, from independent word to bound morpheme. The principle of economy of expression (Chapter 6) leads to certain expectations regarding the relative timing of the changes in function and form. By way of illustration, consider pronominal clitics, which have a status that is intermediate between word and affix. While such clitics form a phonological word with their verbal host, they nevertheless have often been analyzed as syntactically independent phrase structure nodes (as in the analysis of Spanish clitics in Problem Set 2). Eventually, through diachronic processes of syntactic change, such clitics may become morphologically bound affixes (Givón 1976; Bresnan and Mchombo 1987, 1995; Börjars et al. 1997; Toivonen 1997, 2000, 2001a; Coppock and Wechsler 2010, 2012). What happens at the stage when a syntactically independent clitic loses its semantic feature (pred value) and becomes merely an agreement marker, as has been argued to happen in Spanish? The clitic is no longer required for completeness or coherence. Consider the structures depicted in (4) for the accusative clitic-doubling dialects discussed in Problem Set 2. The question is: why does (4b) not replace (4a), by economy of expression?

(4) a. 
```
    VP
   /\  
  V  XP
 /\  /\ 
Cl lo V a Juan
```

b. 
```
    VP
   /\  
  V  XP
 /\  /\ 
vio a Juan
```

7 In clitic doubling, a clitic co-occurs with an argument DP that agrees with it in person, number, and gender features and which instantiates the same grammatical function (Jaeggi 1982; Borer 1984; Suñer 1988; Torrego 1995; Sportiche 1996; Uriagereka 1988, 1995; Anagnostopoulou 2003; Estigarribia 2005; Roberts 2010). Evidence for the argumental status of the doubled DP comes from prosody as well as the fact that it can occur where an adjunct cannot, for example as the subject of an embedded infinitive (Sportiche 1996).

8 We leave open the nature of the clitic category. A nonprojecting word, as discussed in Chapter 6, would be a good candidate.
The principle of economy of expression requires that all syntactic phrase structure nodes contribute to completeness, coherence, or semantic expressivity; nodes that immediately dominate lexical material are exempt. In (4a) the clitic node Cl is therefore not directly affected by economy of expression, because it dominates a terminal element. However, its mother node V does come under the pressure of the principle when compared with structure (4b), which yields the same f-structure with one fewer syntactic node (the V node dominating Cl and V). So, by the principle of economy of expression, the clitic structure shown in (4a) should be omitted from the c-structure as completely redundant. But it is not omitted. There are two alternative explanations for this within the present theory. One possibility is that when used as a grammatical agreement marker, the clitic still bears some kind of information not available elsewhere, and hence satisfies “semantic expressivity.” The other possibility is that the clitic agreement marker is in fact voided of nonredundant information, but is no longer counted as an independent syntactic node or a lexical choice; it is reanalyzed as part of the verbal host. The fact that optional clitics become obligatory, like morphological inflections, when used as grammatical agreement markers seems to support the reanalysis hypothesis. The reanalysis idea is illustrated by (5a,b):

\[
(5) \quad \begin{align*}
a. & \quad \text{VP} \\
& \quad \text{V} \\
& \quad \text{Cl} \\
\ & \quad \text{lo} \\
& \quad \text{V} \\
\ & \quad \text{vio} \\
\ & \quad \text{a Juan} \\
b. & \quad \text{VP} \\
\ & \quad \text{V} \\
\ & \quad \text{lo-vio} \\
\ & \quad \text{a Juan}
\end{align*}
\]

In this chapter we will apply this theory of pronoun incorporation and agreement to two head-marking languages, Chichewa and Navajo, and briefly compare the latter with the inverse agreement system of Plains Cree. We will also discuss two types of agreement systems, formalized as INDEX and CONCORD, which are motivated by distinct generalizations. In the conclusion, we will examine some implications of the theory for the principle of economy of expression.

\[9\] For evidence bearing on the morphological status of clitics in Catalan and French, see Alsina (1994b) and Miller (1991). For an alternative model of obligatory clitic doubling in LFG, see Sadler (1997) on Welsh.
8.1 Chichewa

Chichewa, a Bantu language of Malawi and neighboring areas of eastern central Africa, is a configurational, head-marking language. Like most Bantu languages, Chichewa has a rich concord system based on gender; Chichewa has 18 gender classes (or noun classes) and no morphological case. Chichewa is also strictly head-initial: every XP begins with X. Thus V is initial in VP, N in NP, P in PP, and A in AP (though prepositions and adjectives are small, closed-class categories). There is no evidence for IP in Chichewa: there is no positionally distinct category of finite verbs, auxiliary verbs, or particles with clausal scope.

In Chichewa the subject is external to the VP, and may precede or follow it and other sentential constituents. This constitutes an exception to the head-initial character of XP. One way of explaining this exception is to analyze the subject and VP as daughters of the nonprojective category S, which lacks a c-structure head. As we saw in Chapter 6, S is not an XP projection for any X. Thus it can be hypothesized that the simple sentence of Chichewa has the following structure, where the comma indicates no order, NP is the subject, and VP is the “predicate” or f-structure head (as in Section 6.3.2, (39) and (40)):

\[
S \\
\quad \text{NP, VP}
\]

As we will see below, Chichewa also admits nonargument XPs under S, so the basic sentence schema is like (7), where the daughters of S are XPs including a subject NP, a predicate VP, and nonargument XPs:

\[
S \to C^*
\]

The verbal inflectional morphology of Chichewa is quite transparent, simple finite verbs having the sequence of prefixes shown in (8):

\[
\text{sm-t/a-(dir)-(om)-V}_{\text{stem}}
\]

---

10 The present section closely follows the exposition given in Bresnan (1993), for which permission from the publisher is gratefully acknowledged.

11 sm = “subject marker,” t/a = “tense/aspect,” (dir) = “optional directional,” (om) = “optional object marker.” This depiction of the sequence of morphemes is not meant to endorse a template (“slot and filler”) morphological structure.
The subject and object markers may historically have arisen from pronominal clitics which were at first phonologically bound to the verb, and subsequently morphologically bound, as Givón (1976) suggests for Bantu.\textsuperscript{12} The agreement prefixes for the noun classes have formal resemblances to syntactically independent demonstrative pronouns, as shown in (9):\textsuperscript{13}

\begin{verbatim}
(9) P/N/CLASS SM OM PRONS DEMS
1stSg  ndi- ndi- ine
2ndSg  u- kú- iwe
1stPl  ti- ti-  ife
2ndPl  mu- kú- ... = ni inu
1,1A  a-, u- mú- iye  uyu
2  a- wá- ówo  ava
3  u- ú-  uwu
4  i- í-  iyi
5  li- li-  ili
6  a- á-  awa
7  chi- chi-  ichi
8  zi- zí-  izi
9  i- í-  iyi
10  zi- zí-  izi
12  ka- ká-  aka
13  ti- ti-  iti
14  u- ú-  uwu
15  ku- kú-  uku
16  pa- pā-  apa
17  ku- kú-  uku
18  mu- mú-  umu
\end{verbatim}

Despite their probable historical origin as independent forms, the subject and object markers are part of the word structure of verbs in the synchronic grammar of the language. First, they are tightly bound to the word: the prefixes cannot be split off from the verb stem in conjunctions, ellipsis, or gapping, and syntactic clitics cannot be inserted between them (see Bresnan and Mchombo 1995). Second, there is allomorphy in the imperative and “associative” forms, which is phonologically conditioned by the foot structure of the stem, including the Dir and Om prefixes (Bresnan and Mchombo 1985). In short, the inflectional prefixes have morphological status in c-structure.

\textsuperscript{12} Similarly, the t/A markers may have historically arisen from auxiliary-like verbal forms (Tabor 1992).

\textsuperscript{13} Some of the classes which are not formally distinct in the verbal concords are distinguished elsewhere in the concord system; “1A” designates a subclass of noun stems that take the usual class 1 concords but lack the class 1 nominal prefix m(u)-.
Chichewa has obligatory subject–verb agreement and optional object–verb agreement. The subject NP can always be omitted, giving rise to a definite pronoun interpretation (“pro-drop”).

(10)  a.  
\begin{align*}
\text{Nj\={u}ch\={i} zi-n\={a}-l\={u}m-a} & \quad a-lenje. \\
10.bee & 10.s-pst-bite-fv 2-hunter \\
\text{“The bees bit the hunters.”}
\end{align*}

b.  
\begin{align*}
\text{Zi-n\={a}-l\={u}m-a} & \quad a-lenje. \\
10.s-pst-bite-fv & 2-hunter \\
\text{“They bit the hunters.”}
\end{align*}

Hence, we can associate the following functional specifications with the subject agreement inflection of the verb:

\begin{align*}
(11) \quad \text{sm-} & \quad V_{infl} \left( \uparrow \text{subj} \right) = \downarrow \\
& \left( \downarrow \text{agr} \right) = \alpha \\
& \left( \downarrow \text{pred} \right) = \text{‘pro’}
\end{align*}

These specifications give rise to the structural correspondence shown in (12):

\begin{align*}
(12) \quad & \left[ \text{subj} \right] \left[ \left( \text{pred} \quad \text{‘pro’} \right) \right] \\
& \text{agr} \quad \alpha \\
& \text{V} \quad \text{SM-verb}
\end{align*}

In the representation in (12), the parenthesized feature abbreviates two f-structures – one with the [pred ‘pro’] feature, the other without it.

The object marker is only optionally present, as shown by (10a) and (13a); but when it is present, the object NP may also be omitted, as shown in (13b). Without the object marker, the object cannot be omitted, as shown in (13c):

(13)  a.  
\begin{align*}
\text{Nj\={u}ch\={i} zi-n\={a}-\text{w\={a}}-l\={u}m-a} & \quad a-lenje. \\
10.bee & 10.s-pst-2.o-bite-fv 2-hunter \\
\text{“The bees bit them, the hunters.”}
\end{align*}

b.  
\begin{align*}
\text{Nj\={u}ch\={i} zi-n\={a}-\text{w\={a}}-l\={u}m-a} \\
10.bee & 10.s-pst-2.o-bite-fv \\
\text{“The bees bit them.”}
\end{align*}

---

14 The numerals used in glosses refer to noun classes, with 1A designating a subclass of class 1; s = subj, o = obj; f = final vowel; pst = past, rec.pst = recent past, pres = present, hab = habitual, pst.hab = past habitual; assoc = “associative” (adnominal) marker; inf = infinitive; small roman numerals = persons; sg = singular.

15 Binding features are omitted; see Part IV.
160

Pronoun Incorporation and Agreement

   10. bee 10.s-st-bite-fv
   “The bees bit.”

Thus the object marker, like the subject marker, permits “pro-drop.” But why is it optional? Optional elements are those which involve some pragmatic or semantic choice. What choice is involved in the Chichewá speaker’s decision to use an object marker? Bresnan and Mchombo (1986, 1987) hypothesize that the Chichewá object marker, unlike the subject marker, is a full-blooded incorporated pronoun; that is, it has the functional specifications in (14).

\[
(14) \quad \text{OM-} \quad V_{\text{infl}} \quad (\uparrow \text{OBJ}) = \downarrow \\
\quad (\downarrow \text{agr}) = \alpha \\
\quad (\downarrow \text{pred}) = \text{‘pro’}
\]

These specifications give rise to the structural correspondence shown in (15):

\[
(15) \quad [\text{OBJ} \quad [\text{PRED \quad ‘pro’}] \quad \alpha] \quad \text{OM-verb}
\]

According to this analysis, the choice involved in using the object marker is simply the choice to use an anaphoric pronoun (which in this language is expressed as a pronominal inflection). The “object” with which the object marker agrees in (13a) is actually a dislocated topic, as indicated in the English translation, not a direct object NP in the VP. And the agreement in gender class between the object marker and this dislocated topic is simply the anaphoric agreement with its referent that a pronoun normally shows.

This hypothesized difference between grammatical agreement with an argument of the verb and anaphoric agreement with a topic explains a number of systematic differences between the subject- and object-agreement markers of the language. Tests based on (i) interactions of word order and agreement, (ii) the use of independent pronouns in discourse, (iii) contrastive focus, (iv) interrogatives and relatives, and (v) other syntactic and phonological differences show that the object prefix to the verb differs from the subject prefix in this way.

16 The Chichewá verb has an internal structure not developed here, in which the object marker and suffixed verbal stem form one morphological unit, while the outer prefixes form another (Bresnan and Mchombo 1985). Presumably the instantiation of the \( \downarrow \) metavariable for the object prefix is thus independent of that for the subject prefix.

17 The following sections closely follow the exposition in Bresnan (1993).
8.1.1 Word order

Word order in Chichewa is affected by the presence of the object prefix. In simple, stylistically neutral, transitive sentences, when there is no object prefix on the verb, the object immediately follows the verb, while the subject may be reordered, as shown in (16):

(16) a. S V O: njúchi zi-ná-lúm-a a-lenje
10.bee 10.s-pst-bite-fv 2-hunter
“The bees bit the hunters.”

b. V O S: zínálúma alenje njúchi

c. O V S: *alenje zínálúma njúchi

d. V S O: *zinálúma njúchi alenje

e. S O V: *njúchi alenje zínáluma

f. O S V: *alenje njúchi zínáluma

But when the object prefix is present, all six orders are possible:

(17) a. S V O: njúchi zi-ná-wá-lum-a alenje
10.bee s-pst-o-bite-fv 2.hunter
“The bees bit them, the hunters.”

b. V O S: zínáwáluma alenje njúchi

c. O V S: alenje zínáwáluma njúchi

d. V S O: zínáwáluma njúchi alenje

e. S O V: njúchi alenje zínáwáluma

f. O S V: alenje njúchi zínáwáluma

This difference follows from the hypothesized analysis above. Object NPs in Chichewa occur in postverbal position in a VP constituent, while the constituents of S include an optional subject NP, a VP, and an optional topic NP, all unordered with respect to each other (as indicated by commas separating them):

(18) S → (NP) , VP , (NP)  

SUBJ TOP

(18) is an instance of (7). Note that while Chichewa’s head-initial VP allows only the single order V O, its S allows six different orders of the subject NP, the VP, and the topic NP.\footnote{Recall that the topic NP in (18) is a grammaticalized topic. Grammaticalized topics – constituents that bear the TOP function – designate discourse topics, but not all discourse topics are grammatically...}
Given these assumptions, the word order facts can be understood in the following way. In (17) we have a transitive verb with an object prefix. The object argument role of the verb can be satisfied by the postverbal NP in the VP. An NP object can only occur in the VP. Therefore the subject NP in S can be reordered before or after the VP, but not inside it. If a topic NP were also generated under S, the extended coherence condition would require that it be linked to the lexical argument structure. This can be done in Chichewa by employing the pronominal object prefix of the verb, which is anaphorically linked to the topic NP. The object prefix precludes an object NP by functional uniqueness. Thus, the free-floating NP that agrees with the object prefix in (17) is not really an object, but a topic. As such, it is freely orderable with respect to the subject and the VP. Thus, (17) should be replaced with the more accurate description (19):

(19) a. subj [vp V] top: njuchi zi-ná-wá-lum-a alenje
   10. bee s-pst-o-bite-fv 2. hunter
   “The bees bit them, the hunters.”

b. [vp V] top subj: zináwáluma alenje njuchi
c. top [vp V] subj: alenje zináwáluma njuchi
d. [vp V] subj top: zináwáluma njuchi alenje
e. subj top [vp V]: njuchi alenje zináwáluma
f. top subj [vp V]: alenje njuchi zináwáluma

In sum, the apparent co-occurrence of the Chichewa object prefix and an object NP with which it agrees is analyzed as the anaphoric linking of an object pronoun incorporated in the verb to a topic NP in S. The agreement of the object prefix in person, number, and gender class with the topic NP is simply anaphoric agreement: person, number, and gender class are universally the categories of pronominal agreement (Lehmann 1982).

The subject prefix contrasts with the object prefix in failing to interact with word order. While the choice of an object prefix precludes the presence of a syntactic NP object, the presence of the subject prefix is obligatory.

### 8.1.2 Independent pronouns

Further evidence of the difference between grammatical and anaphoric agreement can be found in the use of independent pronouns in discourse. It has been observed that all languages have two kinds of pronominals that can be used anaphorically: those used for reference recoverable in discourse and those used for contrast, marked, and the same holds for focus. The discourse topic is what is under discussion, whether previously mentioned or assumed (cf. Chafe 1976, Givón 1976, Wald 1979, and Bresnan and Mchombo 1987).
emphasis, or focus, the former having less phonetic content than the latter (Givón 1983). In English the contrast arises between unstressed and stressed independent pronouns. In Chichewa the object prefixes are phonetically reduced relative to the independent pronouns, so the prefixes would be the topic-anaphoric pronominals, and the independent object pronouns would be contrastive. It is a striking fact about Chichewa, and appears to be a general property of languages of this type (Bresnan and Mchombo 1987), that the analytic object pronouns (i.e. the pronouns that are independent phrasal constituents in the object NP position) are used only to introduce new topics or for contrast. They cannot be used anaphorically to refer to a topic in the preceding discourse, nor can they be anaphorically linked to a grammaticized topic. This is illustrated by examples (20) and (21).

S.F. “The hyena ate the corn. Having eaten it, he went to San Francisco.”

(21) Fisi a-na-dyá čhi-manga. Ā-tā-dya icho, a-na-pitá ku 1A.hyena 1A.s-pst-eat 7-corn 1A.s-serial-eat 7.it 1A.s-pst-go to SanFrancisco.
S.F. “The hyena ate the corn. Having eaten it (something other than corn), he went to San Francisco.”

The discourse fragment in example (20) is fine. Here the incorporated pronoun – the čhi- prefixed to the verb stem for ‘eat’ – is used. In contrast, the discourse fragment in (21) is bizarre. The independent pronoun icho, though it agrees in gender class with čhi-manga (‘corn’), refers to something not mentioned in the previous discourse. For the same reason, the independent pronoun cannot be anaphorically linked to a grammaticalized topic in the same sentence:

(22) ∗M-kángó uu fisi a-na-dyá íwo. 3-lion 3.this 1A.hyena 1.s-rec.pst-eat 3.it “This lion, the hyena ate it.”

Again, the subject prefix contrasts with the object prefix. Serving as a grammatical agreement marker, the subject prefix fails to provide a topic-anaphoric counterpart to the independent subject pronoun, and permits the independent pronoun to take on both communicative functions, like the independent pronouns of English. Thus, the independent pronoun when it is a subject can be used for anaphoric reference to both grammaticalized and discourse topics. The following examples illustrate this:
In both (23) and (24) the subject pronoun \( \text{iwo} \) is anaphorically linked to the topic \( \text{mkango} \) (‘lion’).

This opposition in the pronominal system of Chichewa is quite systematic. Bresnan and Mchombo (1987) show that it extends to prepositional objects as well. One preposition has an alternate form that occurs with contracted pronominal objects; the contracted form is topic-anaphoric, and the uncontracted counterpart is contrastive. Pronoun objects of all the other prepositions, which lack contracted forms, are used ambiguously, like the subject pronoun.

### 8.1.3 Contrastive focus

Susceptibility to contrastive focus is another difference between grammatical and anaphoric uses of the agreement prefixes in Chichewa. Observe first that contrastive focus is possible with the independent object pronoun but not with the object prefix pronoun. Thus, example (25) has a contrastive object reading which (26) lacks, because the prefixed object pronoun \( \text{ndi-} \) (‘me’) in (26) is the noncontrastive pronominal.

(25)  \( \text{M-dyerekezi a-ku-fiñá ine, osatí iwe.} \)  
1-devil 1.s-pres-want me not you  
“The devil wants me, not you (i.e. he doesn’t want you).”

(26)  \( \text{M-dyerekezi a-ku-ndí-fiñá, osatí iwe.} \)  
1-devil 1.s-pres-i.sg.o-want not you  
“The devil wants me, not you (i.e. you don’t want me).”

Now observe the contrast between examples (27) and (28): (27) shows that the object NP ‘devil’ can be a focus of contrast when there is no object prefix; the unacceptability of (28) is predicted if the presence of the object prefix makes the
postverbal NP ‘devil’ not an object, but a topic, just as we hypothesize. Because a topic is ineligible to be a focus of contrast, the sentence is bizarre:

(27) \( N\text{di-}k\text{u-funá} \quad m\text{-dyerekezi, osatí iwe.} \)
\[
1.\text{sg.s-pres-want 1-devil not you}
\]
“I want the devil, not you (i.e. I don’t want you).”

(28) \( ?\text{? Ndi-}k\text{u-mú-funá} \quad m\text{-dyerekezi, osatí iwe.} \)
\[
1.\text{sg.s-pres-1o-want 1-devil not you}
\]
“I want him, the devil, not you (i.e. I don’t want you).”

Finally, consider the contrast between (29) and (28): (29) shows that contrastive focus of the subject is possible with the subject prefix present, while (30) (further below) shows that contrastive focus of the object is not possible with the object prefix present.

(29) \( M\text{-dyerekezi a-}k\text{-ndi-fúna, osatí iwe.} \)
\[
1\text{-devil 1.s-pres-i.sg.o-want not you}
\]
“The devil wants me, not you (i.e. you don’t want me).”

This is explained by our hypothesis that the subject prefix, unlike the object prefix, can be a grammatical marker of subject–verb agreement. Thus a subject that agrees with the verb can be clearly distinguished from a topic that is linked anaphorically to an incorporated pronominal subject. Here, then, is another systematic difference between grammatical agreement and anaphora to a topic by a morphologically bound pronoun.

8.1.4 Interrogatives and relatives

Further differences between grammatical and anaphoric agreement derive from three postulates Bresnan and Mchombo (1987) make about the grammaticalized \textsf{top} and \textsf{foc} functions. The first postulate is that in relative clauses, the relative pronoun or relativized constituent bears the \textsf{top} function. The second is that in interrogative clauses, the interrogative pronoun or questioned constituent bears the \textsf{foc} function. And the third is that the same constituent cannot be both focus and topic of the same level of (functional) clause structure.

Given our analysis of the Chichewa object and subject prefixes, a consequence of these postulates is that a direct object should be able to be questioned in place, but only when there is no object prefix on the verb – for by hypothesis the questioned constituent is a focus, while the NP related anaphorically to the object prefix must be a topic, producing a clash of functions. The facts of Chichewa bear out this prediction:
A further consequence is that a subject, in contrast, should be able to be questioned in place with subject agreement – for the focused interrogative constituent would not clash with the subject function, which grammatically agrees with the verb. This prediction is also true:

(32) *(Kodi)* chi-ná-ónéka chi-yáni?
    Q 7.s-past-happen 7-what
    “What happened?”

Still another consequence is that this asymmetry in subject–object agreement with interrogatives should disappear with relatives – for by hypothesis the relative pronoun constituent is a topic, not a focus, so no clash of functions should arise. The facts bear this prediction out as well. An interesting further result is that questions which are formed with apparent movement of the interrogative pronoun should differ from questions formed with the interrogative pronoun in place, because in Chichewa the former are cleft constructions, in which the interrogative pronoun is the focus of the main clause but relativized in the subordinate clause. It follows that cleft questioning of both the subject and the object should be possible with agreement, in contrast to the questioning in place illustrated here.19

8.1.5 Other syntactic and phonological differences

In fact, many other syntactic differences between the incorporated pronoun and the grammatical agreement marker are predicted in our theoretical framework. One is that only the anaphoric agreement relations can be nonlocal to the agreeing predicator – that is, span several clauses. Another is that in contrast to local subjects, the nonlocal NPs with which the subject prefix agrees should not allow questioning in place. Still another is that there should be subject–object asymmetries in the occurrence of cognate objects, idiomatic objects, and other NPs that do not easily topicalize: these NPs should allow agreement with the subject prefix but not the object prefix. And finally, verbally governed case on the full nominal

---

19 See Bresnan and Mchombo (1987) for a detailed discussion of these results and data illustrating them.
is inconsistent with anaphoric, but not with grammatical, agreement. All of these predictions are borne out in Chichewa.20

Finally, there is phonological evidence that the object NP lies within the VP, while the NP we are calling the dislocated topic lies without (Bresnan and Mchombo 1987; Bresnan and Kanerva 1989; Kanerva 1990). Several phrasal phonological phenomena (tonal retraction, vowel lengthening, high tone doubling) can be interpreted as indicators of the presence of a VP boundary, and they clearly show that the presence of the object marker on the verb forces the NP it agrees with outside of the VP.

### 8.1.6 Functional ambiguity of subject and topic

Clearly, then, there are systematic differences between grammatical agreement with a verb and the anaphoric relation between a morphologically bound pronoun and a discourse topic. Chichewa has both types of agreement relations, as shown by a variety of tests. The same tests reveal that the subject prefix of Chichewa is used for both grammatical and anaphoric agreement.

Like the object prefix, the subject prefix can be used anaphorically when the subject NP is omitted, as in (10). Also like the object prefix, the subject prefix can agree with a floating topic NP several clauses above, as is characteristic of pronominal anaphoric relations:

(33) **Mkángó uu, a-lenje a-ku-gáníza kutí ú-ma-fúná ku-gúmúla nyumbá yá mfúmu.**


“This lion, the hunters think that it wants to pull down the chief’s house.”

And just in such nonlocal agreement relations with the subject, the floating NP cannot be questioned in place – in contrast to the case of grammatical agreement between a subject NP and the subject prefix in the same clause.

In sum, the subject prefix behaves like a grammatical agreement marker, while the object prefix behaves like an incorporated pronoun. Yet in circumstances where grammatical agreement is excluded, the subject prefix also behaves like a morphologically bound pronoun. Thus there is ample evidence that the subject prefix in Chichewa is ambiguously used as a marker of grammatical agreement and as a morphologically incorporated pronoun that agrees anaphorically with a topic NP.

Two basic ideas underlie this theory. One is functional uniqueness: regardless of where it is expressed in the word and phrase structure, information about the same

---

20 See Bresnan and Mchombo (1987) for detailed discussion.
function must be consistent and, in the case of meaning, unique. Hence, when an incorporated pronoun – such as a subject or object prefix – loses its pronominal reference, it no longer blocks the co-occurrence of an NP subject or object; but the grammatical information the marker carries – person, number, and gender – remains and, by functional uniqueness, must be consistent with that carried by the subject or object NP that co-occurs with it. In other words, by functional uniqueness, the features of the subject or object marker must merge with those of the subject or object NPs. Nothing has to be added to our theory to derive this result: grammatical agreement follows immediately upon the loss of pronominal reference.

The second basic idea is the functional ambiguity of structural form. In our theory, functional information is related to surface structural form – the concrete word and phrase structure that is phonologically interpreted – by a many-to-one mapping. Consequently, one functional relation, such as that between a topic and an incorporated pronoun, may look exactly like another functional relation (e.g. subject–verb agreement) in all of its structural properties (word order and constituency relations), as illustrated in (34) and (35).

Diagram (34) shows the incorporated pronominal subject anaphorically agreeing with the topic (anaphoric agreement is indicated by the broken-lined arrow), and diagram (35) shows the subject marker agreeing grammatically with the syntactic subject with which its f-structure has been unified through functional uniqueness. Because these alternative functional possibilities correspond to identical expression structures, the alternation between the anaphoric and grammatical agreement is induced by the minimal possible change: the presence or absence of the semantic attributes of the subject inflection. The very minimality of this difference suggests
Pronoun Incorporation and Agreement

Thus the minimal difference between an agreement marker and a morphologically incorporated pronoun is the presence or absence of a referential attribute in the lexical content of the affix. Similarly, the minimal difference between the subject NP and the topic NP is the function, and not the phrase structure attributes of dominance, precedence, and category. In our framework, in other words, functional ambiguity between subject and topic does not imply structural ambiguity, for structure and function are independent planes of grammatical organization.

There is clear syntactic evidence for this crucial idea of functional ambiguity of structural form. In our analysis of Chichewa, the subject and topic NPs appear at the same level of structure in the S, with exactly the same ordering possibilities. An alternative hypothesis is that the structural position of the subject is fixed in Chichewa as [NP VP], and the post-VP subject is really a postposed (right-dislocated) topic anaphorically linked to the subject agreement marker (which is optionally pronominal, as we have seen).

The latter analysis would predict that the subject in VP-final position cannot be questioned in place, for in that position the apparent subject is by hypothesis a postposed topic and hence incompatible with the question word’s foc function. But in Chichewa, the question word can follow the VP, as we saw in example (32), repeated here:

(36) (Kodi) chi-ná-ônéka chi-yâni?
    Q  7.s-pst-happen 7-what
    “What happened?”

This confirms that the subject NP in Chichewa is unordered with respect to the VP.

Another alternative analysis is that both the subject and topic NPs are postposable, but the topic lies outside the subject structure at a higher level of S (or FP):

(37) S → NP , S
    (↑ TOP) = ↓

    S → NP , VP
    (↑ SUBJ) = ↓

Because of the independence of structure and function in LFG, grammatical functions need not be represented by distinctive phrase structural configurations in this way. If the topic NP were generated either initially or finally, at a higher S level than the subject NP, then the subject would always be adjacent to the VP.

---

21 Such an analysis has been suggested for Kihaya by Byarushengo and Tenenbaum (1976).
The \([V \text{ top subj}]\) order could therefore be generated only by analyzing the final \(\text{subj}\) as an \textit{apparent} subject. The apparent subject would actually be another topic NP generated at the topmost level of S structure and anaphorically linked to the subject prefix, which optionally functions pronominally, as we have seen:

(38) \[
[\text{s} \ [\text{s} \ \text{su-} \ \text{ob-} \ \text{V} ] \ \text{TOP} ] \ \text{TOP}
\]

Since interrogative words cannot be topics, this hypothesis predicts that in \textit{in situ} questions, questioning the subject should be possible only when the subject is adjacent to the VP. Our analysis, in contrast, predicts that in such cases questioning the subject should be possible even when the subject is separated from the VP by a topic NP. In fact, the question word subject can be separated from the verb phrase by a topic NP linked anaphorically to the object prefix:

(39) a. (Kodi) chi-ku-i-funá mí-chirá yá mbewa chi-yâni.
Q 7-s-pres-4.o-want 4-tail 4.assoc 10.mouse 7-what
“Mouse tails, who wants them?” [V TOP subj]

b. (Kodi) chi-yâni mi-chirá yá mbewa chi-ku-i-funa.
Q 7-what 4-tail 4.assoc 10-mouse 7.s-pres-4.o-want
“Mouse tails, who wants them?” [subj TOP V]

This confirms that the subject NP is at the same level as the topic NP, as in our analysis.

We see, then, that although the subj function is grammatically distinguishable from the top function in Chiche\={w}a, the subject NP is indistinguishable from the topic NP in its \textit{phrase structure} properties. The evidence suggests that it is functional ambiguity in the structural form of topic and subject constructions in Bantu that has led to the evolution of the incorporated subject pronominal into a grammatical agreement marker.

This theory leads us to expect that we might encounter languages in which the subject pronominal inflection is like the Chiche\={w}a object inflection, a pure incorporated pronoun without the option of grammatical agreement. Among the Bantu languages, Setawana, a northern dialect of Setswana, spoken in southern Africa, has been argued to exemplify this possibility (Demuth and Johnson 1989).22 There are also instances where the object marker has acquired or is beginning to acquire the properties of a grammatical agreement marker: in Kichaga the object marker can double syntactic pronouns only (Bresnan and Moshi 1990, pp. 151–152), the Kiswahili object marker can double animate NP objects (Wald 1979; Allan 1983), and the Makua class 1/2 object markers obligatorily double

---

22 Outside of Bantu, languages in which pronominal inflections provide the core arguments of a predicator have been argued for by Foley and Van Valin (1984), Jelinek (1984, 1989, 1990, 1995), and Baker (1991, 1995), among others.
all NPs of their class (see Bresnan and Mchombo 1987, p. 777 and the references cited there).

8.2 Navajo

Like Chichewa, Navajo is a configurational head-marking language with no morphological case. 23 Navajo is strictly head-final, with V final in VP, N final in NP, and P final in PP. There is some positional evidence for a final I in IP, which can be occupied by a class of uninflected postverbal particles that express propositional attitude or (with a class of defective verbs) temporal reference (Speas 1990, pp. 276–278). Taking the subject as specifier of IP, endocentricity entails a rigidly SOV word order pattern, and this is generally true of Navajo. 24 Examples are given in (40) and (41), taken from Speas (1990, p. 203):

(40)
```
IP
   NP
      at’ée’d
         girl
   I’
   VP
       NP
          ashkii
             boy
       V
          yiyiiłtsá
             3o-3sg-saw
```

“The girl saw the boy.”

(41)
```
IP
   NP
      ashkii
         boy
   I’
   VP
       NP
          at’ée’d
             girl
       V
          yiyiiłtsá
             3o-3sg-saw
```

“The boy saw the girl.”

23 The analysis of Navajo presented here draws on Speas (1990, ch. 4) and Uyechi (1990, 1991).

24 Kaufman (1974, p. 508) shows that with complex sentential arguments, word order is freer; for example, a sentential subject of a transitive verb can follow the object or even the verb. In addition, certain NPs and relative clauses may be right-dislocated, appearing postverbally (Platero 1978, p. 44ff.; Perkins 1982).
The only difference between the two sentences (40) and (41) is the c-structure position of the nouns ‘boy’ and ‘girl’; reversing their order reverses their interpretation as subject or object.

When the NPs in (41) are omitted, a definite pronominal interpretation arises (Speas 1990, p. 260):

(42) \[ V \\
\quad \text{yiyihtsá} \\
3O-3sgs-saw \\
“S/he saw him/her.” \]

The pronominal interpretation stems from the inflectional morphology of the verb.

The morphology of the Navajo verb is often described as having 10 “position classes,” which are numbered as they appear in the word from left to right:

(43) **Navajo verb position classes:**
1. Adverbial (including indirect object)
2. Iterative
3. Distributive
4. Direct object
5. Deictic subject
6. Adverbial/Aspectival
7. Mode
8. Subject
9. Class
10. Stem

Positions 1–3 are referred to as “disjunct prefixes,” and positions 4–9 are called “conjunct prefixes.” The disjunct prefixes are more loosely bound to the verb than the conjunct prefixes.

Here we are particularly interested in the conjunct prefixes in positions 4 and 8, which include the subject and object agreement markers: 25

(44) 4: om 8: sm

<table>
<thead>
<tr>
<th></th>
<th>1sg.</th>
<th>2sg.</th>
<th>3sg.</th>
<th>4th person</th>
<th>1du./pl.</th>
<th>2du./pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:</td>
<td>shi-</td>
<td>ni-</td>
<td>∅/yi/bi</td>
<td>ha-</td>
<td>nibi-</td>
<td>nibi-</td>
</tr>
<tr>
<td>8:</td>
<td>-sh-</td>
<td>-ni-</td>
<td>∅</td>
<td>-iid-</td>
<td>-ob-</td>
<td></td>
</tr>
</tbody>
</table>

25 The third-person marker in position 4 is null if the subject is other than third person, and is yi- or bi- if both subject and object are third person. The choice between yi- and bi- is discussed below. The fourth-person pronouns are discussed in the “Further reading and discussion” section.
These agreement markers bear a close formal resemblance to the syntactically independent pronouns:

(45) **Independent pronouns:**

<table>
<thead>
<tr>
<th>Person</th>
<th>Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg.</td>
<td>shí</td>
</tr>
<tr>
<td>2sg.</td>
<td>ní</td>
</tr>
<tr>
<td>3sg.</td>
<td>bi</td>
</tr>
<tr>
<td>4th person</td>
<td>bo</td>
</tr>
<tr>
<td>1pl.</td>
<td>nibí</td>
</tr>
<tr>
<td>2du./pl.</td>
<td>nibí</td>
</tr>
</tbody>
</table>

Notwithstanding the formal similarity between these inflections and the independent pronouns, the agreement markers are morphologically bound components of the verb. McDonough (1990) argues from phonological and morphological evidence that the Navajo verb stem is a bipartite compound consisting of the verbal base (positions 9 and 10) and the cluster of other conjunct prefixes (positions 4 through 8), while the disjunct prefixes are a syntactically separate clitic group. She argues that the mode and subject morphemes in positions 7 and 8 have fused into portmanteau morphs.

With this picture of the verbal pronominal inflections, it is natural to ask whether they are grammatical agreement markers (as implicitly assumed in the representation of ‘boy’ and ‘girl’ as subject and object) in (40) and (41), or whether they should be analyzed as incorporated pronouns with the NPs as adjuncts. Speas (1990, pp. 238–240) gives a number of arguments in favor of the agreement analysis.

The more convincing arguments are these. First, Speas argues that the rigid SOV order of NPs in Navajo would follow from their being arguments of a strictly head-final language; if they were loosely connected adjuncts or topics linked to pronominal arguments, this strict ordering would require additional explanation. Second, Speas cites evidence of long-distance question extraction in Navajo, which is inconsistent with the adjunct analysis. In the following example, the verb ‘hear’ shows third-person agreement with the complement clause. If that complement clause were an adjunct to a pronominal object argument, then extraction from it should be ill-formed, because extraction paths are blocked by such adjuncts (compare *Mary would love it, a picture of a cat* and *What would Mary love it, a picture of?*):

(46) **Háágóólá Bíí Mary iíyáa-go yidiizts’áá’?**

where.to.Q B. M. 3.P.came-comp 3.3.P.hear

“Where did Bill hear that Mary went?” (Schauber 1979, p. 292)

---

26 Jelinek (1997) proposes that additional constraints on topic/focus structure limit word order possibilities in Navajo under the pronominal argument hypothesis.
Since the example is good, it supports the agreement analysis. However, Schaub (1979, pp. 13–14) notes problems with the examples of leftward long-distance extraction (which is typologically very unusual in an SOV language): "It is quite clear that many of the crucial grammatical examples are considered less than natural by at least some of the Navajos consulted." Apparently it is more typical for question words to appear within their local clause, and speakers disagree about the acceptability and interpretation of examples with extracted question words, as Speas (1990, p. 284) acknowledges.

We can add to these arguments a third, based on the fact that (according to Speas) Navajo shows a constraint on pronominal binding characteristic of arguments and not adjuncts. The constraint is referred to as "weak crossover." The following examples are from Speas (1990, p. 213):

(47) a. T’áá ’altso bimá ’ayói ’áyó’ní.
    everyone his/her-mother really loves
    “Everyone loves his/her mother.”

b. Bimá t’áá ’altso ’ayói ’áyó’ní.
    his/her-mother everyone really loves
    “His/her mother loves everyone.”

Example (47b) shows that a pronoun within the subject cannot be bound by a quantified object. Contrast (47b) with a corresponding Mohawk example from Baker (1995, ex. 15), where coreference is possible:

(48) raoti-skare’ wa’-t-huwati-norukwanyu’ akweku
    MpP-friend fact-dual-MpI/3II-kiss-punc all
    “Their girlfriends kissed all (of them).”

Baker (1995) argues that the Mohawk quantifiers are referential expressions, which are not subject to the pronominal binding constraint exhibited by true quantifying expressions. Pronominal argument languages (that is, languages in which all of the direct arguments of predicators are incorporated pronouns) must make use of this type of quantification (Baker 1995; Jelinek 1995), because non-referential phrases cannot be linked anaphorically to pronominal arguments, as we saw in Chapter 2 ("Further reading and discussion" section). Thus, if Navajo does systematically show this effect, it would support the agreement analysis over the pronominal incorporation analysis.28

---

27 The constraint bears this name because (i) it takes effect when the binder must “cross over” the bound pronoun in terms of word order, and (ii) the effect is weaker than when the pronoun is superordinate in the tree structure to the binder.

28 The reason that true (nonreferring) quantifiers show weak crossover effects is discussed in Chapter 9.
Speas’s other arguments for the agreement analysis of Navajo are less convincing, and will not be discussed here. The main point is that even though several of Speas’s arguments are inconclusive and some data must be treated with caution, on balance the evidence favors the agreement analysis, especially the rigid SOV word order in a head-final language, the possibility for some speakers of extracting question words out of complements with which the verb agrees, and the weak crossover phenomenon with quantifiers. In terms of the present theory, we can therefore analyze yi- as in (49) (omitting the binding features; see Part IV). Here the PRED attribute is optional, meaning that yi- will be used as an agreement marker, and “pro-drop” will occur in the absence of a syntactic NP object. The final specification captures the fact that yi- is used only with a third-person subject:

\[
(49) \quad yi- \quad (↑ OBJ) = ↓
\quad (↓ PERS) = 3
\quad (↓ NUM) = SG
\quad (↓ PRED) = ‘pro’) \quad (↑ SUBJ PERS) = 3
\]

However, this is far from the whole story.

The use of the third-person object markers is associated with an animacy hierarchy in Navajo:

\[
(50) \quad \text{Animacy hierarchy:}
\quad \text{humans} > \text{animals} > \text{insects} > \text{natural forces} > \text{plants, inanimate objects}
\quad > \text{abstract notions}
\]

This hierarchy is described as follows (Uyechi 1990, p. 9):29

Humans are highest in the animacy hierarchy and other NPs, animate and inanimate, follow. The other items are grouped according to what Creamer identified as status-giving qualities: “capacity for having intent or purpose; intelligence; strength, vigor, aggressiveness, or special potency; usefulness to man or relatedness to man; animation, or capacity for motion.” (1974: 30) In accordance with those factors, animals are subdivided into three categories, large (e.g., bears, horses), medium (e.g., sheep, fox), and small (e.g., squirrel, snakes). Natural forces include phenomena such as windstorms, floods, sunshine, and fires from natural causes, and abstract notions encompass concepts like old age, hunger, emotions, and disease. Within the group of plants and inanimate objects, Creamer notes that moving inanimate objects, e.g. a rolling log, take preference over stationary inanimate objects, e.g. a stone,…

---
29 Some authors have described the hierarchy in terms of control rather than animacy; see Klaiman (1991) for discussion and further references.
While reversal of the c-structure positions of subject and object changes the grammatical relations of the sentence in (40) and (41) above, this is only because both boy and girl are human, ranking equally high on the animacy hierarchy. The expression of the subject and object is constrained by the animacy hierarchy. In (51a) (from Hale et al. 1977, p. 381) the subject is more prominent on the hierarchy than the object; in (51b,c) (from Uyechi 1990, pp. 9, 2) it is less prominent:

(51)  
   a. 'ashkii tsé yiztal.
        boy  stone 3o-3sg.s-kicked
        “The boy kicked the stone.”
   b. *dzaanéez 'ashkii yiztal.
        mule  boy 3o-3sg.s-kicked
        “The mule kicked the boy.”
   c. *tsís’na na’ast’oosi yishish.
        bee  mouse 3o-3sg.s-stung
        “The bee stung the mouse.”

Various formulations of this constraint have been given in the literature. Our characterization here is due to Uyechi (1990), who draws on the fact that the initial NP in Navajo is considered to be more topical (for reasons considered below):

(52)  
Third-person topicality condition:
The referent of the third-person topic of the sentence must be of equal or higher rank on the animacy hierarchy than the subject and higher rank than other referents of third-person arguments in the clause.

To this we need only add that the yi- object marker is used in the unmarked case when the clausal subject is identified with the topic. We thus modify our entry for yi- in (49) above to (53):\(^{30}\)

(53)  
   yi- (↑ OBJ) = ↓
   (↓ PERS) = 3
   (↓ NUM) = SG
   (↓ PRED) = ‘pro’
   (↑ SUBJ PERS) = 3
   (↑ SUBJ) = (↑ TOP)

Then examples like (51b,c) will violate (52), because the initial NP is the subject and topic, but is of lesser rank than the object. In contrast, (51a) and both of examples (40) and (41) will pass the condition, because in all three cases the initial

\(^{30}\) Uyechi (1991, p. 445, n. 4) notes that there is speaker variation which can be explained in terms of whether yi- explicitly marks the subject.
NP is the subject and topic, and is of rank greater than or equal to that of the object.

To express events in which a mule kicks a boy or a bee stings a mouse, Navajo employs the bi- object marker instead of yi- (from Uyechi 1990, pp. 9, 2):

(54) a. 'ashkii dzaanéez biztal.
   boy mule 3o-3sg.s-kicked
   “The boy, the mule kicked him.”

b. na’ast’oosi tsis’ná bishish.
   mouse bee 3o-3sg.s-stung
   “The mouse, the bee stung it.”

Again following Uyechi (1990) and Speas (1990), we analyze bi- as an incorporated pronoun which is anaphorically linked to a marked topic – not the subject, but a dislocated NP adjoined to IP:31

(55) bi- (↑ OBJ) = ↓
    (↓ PERS) = 3
    (↓ NUM) = SG
    (↓ PRED) = ‘pro’
    (↑ SUBJ PERS) = 3
    (↑ SUBJ) ≠ (↑ TOP)

The c-structure and f-structure of example (54a) under this analysis are as follows:

(56) “The boy, the mule kicked him.”

---

31 The fact that bi- is anaphorically linked to a marked topic other than the subject could be characterized as part of its binding features: [SUBJECT −, TOPIC +].
hierarchy, and ill-formed when the subject outranks the object on the hierarchy. All three predictions are true (Hale et al. 1977).

Independent evidence for this analysis comes from a variety of sources. First, the syntactically independent pronouns differ from the pronominal inflections in being contrastive (Willie 1989, pp. 411–412):

\[(57)\] a. *Yishádl.*
   1sg.walking
   “I am walking”

   b. *Shi yishádl.*
   I 1sg.walking
   “I am walking.”

\[(58)\] a. *Yisháash.*
   du.walking
   “We (two) are walking.”

   b. *Nihi yisháash.*
   dual 1du.walking
   “We (two) are walking.”

The third-person independent pronoun *bí* is also contrastive, as Uyechi (1991, p. 438) notes:

\[(59)\] *ashkii bí yi-yiiltsá*
   boy her yi-saw
   “The boy saw her.”

The same contrast is found with the object prefixes and independent pronoun objects in Chichewa (Section 8.1).

Second, researchers on Navajo have often noted a difference in the “aboutness focus” of the *yi- and bi- sentences, in that the sentence is felt to be “about” the initial NP. This is partly captured in the translation used by Barss et al. (1989, p. 321):

\[(60)\] a. *Ashkii at’ééd yi-yiiltsá.*
   boy girl yi-saw
   “The boy saw the girl.”

   b. *At’ééd ashkii b-iiltsá.*
   girl boy bi-saw
   “The boy saw the girl (speaking of the latter).”

Platero (1974, p. 210) also comments that “the higher ranking nominal appears in initial, or ‘topic’, position” and notes that a contrasting pair of *yi-/bi- sentences*
differ in that the former is primarily about the agent while the latter is primarily about the patient. Uyechi (1991) notes that a similar observation is made for Jicarilla Apache, a closely related Athapaskan language, by Sandoval and Jelinek (1989):

(61)  a. ‘ishkiyú chékéé yaa’í
    boy girl yi.sees
   “The boy sees the girl.”
  b. chékéé ‘ishkiyú baa’í
    girl boy bi.sees
   “The girl is seen by the boy.”

They observe that (61a) answers the question *What did the boy do?*, while (61b) answers the question *What happened to the girl?*. Uyechi (1991, p. 438) observes, “[i]n each case, the sentence initial noun phrase refers to who the sentence is about and the remainder of the sentence responds to the question. In this sense, the sentence initial positions of both of these sentences function as discourse topics (Dik 1978).”

Third, the NP linked to *bi*- need not occur in the same clause, but can appear in a higher clause separated by a pause, according to Uyechi (1991, p. 437):

(62)  Kii, [s Mary anígo [s li’ biztal ] ni ].
      K. M. recently horse bi.kick said
   “Kii, Mary said that recently the horse kicked him.”

Fourth, a topic question enclitic can attach to the initial NP linked to *bi*:-

(63)  ashkii=sha’ li’ nabílgo’
      boy=Q horse 3.3.P.throw
   “Was the boy thrown by the horse?” (Schauber 1979, p. 111)

A fifth source of support for the incorporated pronoun analysis is the distribution of the *yi*- and *bi*- inflections elsewhere in the grammar of Navajo. In fact, nouns and postpositions may be inflected for *yi-/bi*- as well as verbs. The following examples from Speas (1990, pp. 272, 266) show some of the effects.32

(64)  a. Hastiin Baa’ yili’ yizlob.
      man B. poss-horse 3sg.o-3sg.s-roped
   “The man roped Baa’s horse.”

---

32 There appears to be some variation in the use of *bi*- with kinship nouns. Speas claims (1990, pp. 272–273) that *bi*- is obligatory with kinship nouns, but Uyechi (1990) cites a counterexample from Young and Morgan (1980, p. 9). There could well be speaker variation in the use of these morphemes. Further investigation is required.
b. Hastiin Baa’ bilíí’ yizloh.
   man B. poss-horse 3sg.o-3sg.s-roped
   “Baa’ roped the man’s horse.”

With the possessive inflection bi- in (64b), there is a reversal of meaning from
(64a). The meaning change follows on the analysis given here, as shown in (65 a,b):

(65) a.  
   IP
    /\     
   /      \  
  VP     NP
 /  \    /  \  
NP  N   NP  V
  /  \    /  \  
Hastiin  N  yizloh
        /    
    yilíí’
   Baa’

b.  
   IP
    /\     
   /      \  
  VP     NP
 /  \    /  \  
NP  N   NP  V
  /  \    /  \  
Hastiin  N  yizloh
        /    
    Baa’  
       /    
    bilíí’

**Exercise 1**

Provide f-structures that correspond to these two c-structures, and explain the
meaning reversal. Is the pred the same? What is its lexical entry? Although we
have not analyzed the functions of NP-internal constituents, you can assume for
convenience that the possessor is the specifier of NP, and designate it simply as
poss in the f-structure. Assume further that the poss function is an optional argu-
ment of the nominal pred: ‘horse-of ⟨↑poss⟩’. (See Chapter 12.)

**Exercise 2**

The following pair of examples involve inflected postpositions (from Speas 1990,
p. 266):
(66) a. *Ashkii at’ééd yichi’i’ yálti’.*
   boy girl yi.to 3s-talking
   “The boy is talking to the girl.”

   b. *At’ééd ashkii bichi’i’ yálti’.*
   girl boy bi.to 3s-talking
   “The boy is talking to the girl.”

Provide c-structures and f-structures for (66a,b). Include the Pred and its lexical entry or entries.

*Hint:* Although yi- and bi- have different syntactic functions in their possessive and postpositional uses, their functional content (set of f-structure features) can be kept invariant across these uses by assuming that they take their functions from the morphological context. For example, position 4 of the V inflection specifies the Obj function for any morphemes that appear there; the inflected postpositional stem also specifies the Obj function for whatever morphemes are selected; but nominal stems specify the Spec (or Poss) function for their inflections. The subj and Top designators in (53) and (55) must then be expressed using inside-out functional uncertainty: \((… \|^\text{subj}) = ((… \|^\text{top})\); see Sections 4.8, 10.4, and 11.6 and Chapter 7.

Still further evidence for the topic status of the initial NP agreeing with bi- is given by Jelinek (1997).

In addition to the animacy hierarchy, Navajo provides evidence for a hierarchy of inherent lexical content:  

(67) **Hierarchy of inherent lexical content:**
null/incorporated pronominals > pronouns > common nouns

The choice of topic in Navajo is conditioned by the inherent lexical content of the topic designator as well as by animacy (Uyechi 1991). The basic idea is that those elements designated by reduced or null pronominals are inherently more topical than those designated by free-standing NPs, including pronouns:

(68) **Third-person topicality condition (part II):**
Expressions designating a third-person topic of the sentence must not be outranked on the hierarchy of inherent lexical content by a null or incorporated pronominal designating another third-person referent of the same clause.

---

33 This version of the hierarchy is due to Uyechi (1991, p. 441). Her hierarchy is a revision of Silverstein’s (1976) hierarchy, to take account of the difference between free-standing and incorporated pronominals in Navajo.
Formulating the third-person topicality condition to reference both the animacy hierarchy (50) and the hierarchy of inherent lexical content (67) enables us explain the contrast between (59), repeated here as (69a), and the same example without a free-standing object pronoun, given in (69b)\(^{34}\) (recall from (45) that \(b\)i is the independent form of the third-person pronoun).

(69)  a. *ashkii bì yi tỵ̉ịlṭṣá*
    boy her \(yí\)-saw
    “The boy saw her.”

   b. *ashkii yi tỵ̉ịlṭṣá*
    boy \(yí\)-saw
    “She/he saw the boy.”
    Not: “The boy saw him/her.” (Speas 1990, p. 314)

In (69a) ‘the boy’ is the subject and the pronoun ‘her’ is the object. The incorporated pronoun in (69b), in contrast, cannot be the object because the incorporated pronominal is highest on the hierarchy of inherent lexical content and so is required to be the topic by (68). (Recall from (53) that \(yí\)- is used when the clausal subject is identified with the topic.) Similarly, only one reading is available with \(b\)i- and a single NP argument in (70) (Speas 1990, pp. 216, 260):

(70)  *At’ée’d b-i ltsá.*
    girl \(b\)i-saw
    “The girl saw him/her.”
    Not: “He/she saw the girl.”

Under our analysis, \(b\)i- requires the subject not to be the topic (see (55)), but this fact is still consistent with interpreting the NP ‘the girl’ in (70) as a dislocated object topic resumed by the incorporated pronominal \(b\)i-. However, the latter interpretation would violate (68), because the null pronominal subject would outrank the dislocated topic on the hierarchy of inherent lexical content. Only if we interpret ‘the girl’ in (70) as the subject can we satisfy this condition.

### 8.3 Plains Cree and inverse agreement

It is instructive to compare an inverse agreement system with the topic condition effects (52) that we see in Navajo. Plains Cree is a member of Algonquian, perhaps the best-studied group of inverse agreement languages. In Algonquian morphology

\(^{34}\) This analysis is based on Uyechi (1991), though she explicitly discusses only its application to Navajo relative clauses. A similar idea is employed in Aissen (1999) within a more general theory of obviation (Aissen 1997). See Section 8.3 on Cree below.
there are direct and inverse verbal markers distinct from the person agreement inflections, as illustrated in (71):\textsuperscript{35}

(71) a. \(ni\- wi:\text{ci}b\- a\- : -na\- :n \- ak\)
    
    1  help  \text{DIR (1)PL (3)PL}
    “We help them.”

b. \(ni\- wi:\text{ci}b\ -iko\ -na\- :n \- ak\)
    
    1  help  \text{INV (1)PL (3)PL}
    “They help us.”

These examples illustrate a morphological property which is quite characteristic of inverse systems of agreement. Dahlstrom (1984, pp. 198–199) describes it as follows: “the affixes marking person and number features are not specified for subject and object. Instead, special suffixes called theme signs are used with transitive verbs to indicate which argument is subject and which object.”

The inverse markers of some Algonquian languages have been analyzed as involving a remapping of grammatical relations to semantic roles. On one such analysis (cf. Rhodes 1976 on Ojibwa), the first-person prefix \(ni\-\) in (71a,b) would invariably specify features of the subject; likewise, the third-person suffix \(-ak\) would specify object features. The direct theme marker (glossed \text{DIR} in (71a)) would link the \text{SUBJ} to the agent and the \text{OBJ} to the patient (or beneficiary), while the inverse theme marker (glossed \text{INV} in (71b)) would link the \text{SUBJ} to the patient/beneficiary and the \text{OBJ} to the agent.\textsuperscript{36} This analysis is diagrammed in (72):

(72) a. direct: \(ni\- ... \-a\- : -na\- :an \- ... \- ak\)

\begin{center}
\begin{tikzpicture}
\node (S) {S};
\node (O) [right of=S] {O};
\node (ag) [below of=S] {ag};
\node (ptlben) [right of=ag] {ptlben};
\draw (S) -- (ag);
\draw (O) -- (ptlben);
\node (help) [above of=S] {help};
\end{tikzpicture}
\end{center}

b. inverse: \(ni\- ... \-iko\ -na\- :an \- ... \- ak\)

\begin{center}
\begin{tikzpicture}
\node (S) {S};
\node (O) [right of=S] {O};
\node (ag) [below of=S] {ag};
\node (ptlben) [right of=ag] {ptlben};
\draw (O) -- (ag);
\draw (S) -- (ptlben);
\node (help) [above of=S] {help};
\end{tikzpicture}
\end{center}

However, Dahlstrom warns of the riskiness of arguing from morphology or discourse to syntactic conclusions: “a syntactic analysis cannot be motivated solely

\textsuperscript{35} Our analysis of Plains Cree is taken from Dahlstrom (1984). Vowel lengthening is indicated by a colon here, where Dahlstrom uses a raised dot, and plural is marked here as \text{pl}, where Dahlstrom has \text{p}.

\textsuperscript{36} A similar voice-changing model of inverse morphology for Mapudungun is described by Arnold (1994) within the framework of lexical mapping theory (Part IV).
by inflectional patterns and contexts of use. The analysis of inverse verbs must rest instead on syntactic evidence” (1984, pp. 105–106). She provides convincing evidence against the inverse mapping of syntactic functions to semantic roles (illustrated in (72b)) in Plains Cree: three syntactic tests for subject/object status converge on identifying the patient argument of transitive verbs, whether direct or inverse, as a syntactic object, and not a subject.\(^{37}\) Dahlstrom’s analysis, which she notes accords with that of most Algonquianists (including Bloomfield), is diagrammed in (73):

\[(73)\]

- **direct:** \( \text{ni-} \ldots -a: -na:an \ldots -ak \)

\[\text{s} \quad \text{O} \]

\[\text{help} \quad \langle \quad \text{ag} \quad \text{pt\(\text{ben}\)} \quad \rangle \]

- **inverse:** \( \text{ni-} \ldots -iko -na:an \ldots -ak \)

\[\text{s} \quad \text{O} \]

\[\text{help} \quad \langle \quad \text{ag} \quad \text{pt\(\text{ben}\)} \quad \rangle \]

Observe that (73) differs from (72) in that the s and o links to the roles do not differ between direct and inverse forms.

If we accept the syntactic arguments against remapping the grammatical functions to semantic roles in Plains Cree, how can we capture the inverse morphological pattern illustrated in (73)? Dahlstrom provides a simple model of this type of inflectional morphology. She assumes that the person inflections are unspecified for grammatical functions, and that the theme markers fix the person of one of the functions, allowing the others to be deduced by the general principles of uniqueness, completeness, and coherence. Her lexical entries for the verbal inflections in the examples of (71) are given here (with minor modifications for formal consistency with Chapter 4):

\[(74)\]

\[\text{-ni-} \]

\[(\downarrow \text{PERS}) = 1\]

\[\text{-na:an} \]

\[(\downarrow \text{NUM}) = \text{PL}\]

\[(\downarrow \text{PERS}) = _e 1\]

\[\text{-ak} \]

\[(\downarrow \text{NUM}) = \text{PL}\]

\[(\downarrow \text{PERS}) = _e 3\]

\(^{37}\) The tests are copying-to-object (anaphoric control of a finite clause subject by a matrix object), floating quantification, and control of secondary predication.
Pronoun Incorporation and Agreement

She explains: “The grammatical information may be combined using the same mechanisms which are needed for constituent structure. The grammatical features listed in the lexical entries of *ni-*,-*nai*, and -*ak* may be associated with subject or object by letting the annotation rule of ‘Assign GF freely’ apply to positions within the inflectional template of the verb.” Because the theme sign -*a:* or *iko*- already specifies person information about a fixed grammatical function, it constrains the functions that can be assigned to the other morphemes. Thus, “in *niwi:cih:na:nak*, the theme sign -*a:* indicates that the object is third person. Since the object is known to be third person, the first person affixes must be contributing information about the subject. If the first person argument were interpreted as the object, the resulting clash of features would rule out this f-structure.” Dahstrom states that this basic model (extended to include paradigmatic information) can account for the entire Cree verbal inflection system.\(^{38}\)

**Exercise 3**

Work out the morphological structure and f-structure implicit in Dahstrom’s analysis of the Cree examples (71a,b).

As Cree illustrates, inverse agreement systems characteristically split inflectional position from syntactic function. One and the same inflection may specify person/number information about the subject or the object, depending on the form of the verb. Navajo does not share this typical morphological property of inverse languages.

Yet Navajo and Cree do have a tantalizing typological similarity in their agreement systems (Jelinek 1990; Klaiman 1991). Part of what makes the Cree agreement system “inverse” is that although the subject outranks the object on the hierarchy of syntactic functions, the object may be more prominent on a distinct hierarchy of discourse participants which ranks first and second person above

\(^{38}\) For other person combinations of subject and object, different “theme” morphemes are used. For example, -*i*- is used with transitive active verbs for second-person subject, first-person object (Dahlstrom 1984, p. 47ff.).
third person, and proximate third persons (roughly, those salient in the discourse) above obviative third persons (those less salient, morphologically marked on nominals designating them). When the object is more prominent than the subject on this hierarchy, the verb must bear the inverse theme marker. Here the analogy to Navajo is close: when the Navajo third-person object is more prominent than the third-person subject on the animacy hierarchy, the bi-pronominal inflection must be used, dislocating any object NP to topic position. In this way the most “topical” NP (a dislocated object, else the subject) is highest on the animacy hierarchy. In neither Plains Cree nor Navajo does the grammatical function of the object change under the “inverse” condition where the object outranks the subject in person/obviation or animacy. In both, an “inverse” association of syntactic and discourse/ontological functions is morphologically marked.39

Problems

The reader may now wish to solve the problems “Person and number marking in Wambaya” and “Head-marking in K’ichee’” in Problem Set 4.

8.4 Two types of agreement: INDEX and CONCORD

As explained in the introduction to this chapter, verbal agreement morphology involves the same features as the pronouns from which that morphology derives historically: mainly the classificatory features of person, number, and gender. The person feature, in particular, illustrates the pronominal origin of agreement since that feature characterizes personal pronouns but not other words. In light of that observation, it is interesting to consider cases of grammatical agreement that do not include person among the features. For example, typological studies show that adjectives are much less likely than verbs to show person agreement (Stassen 1997). Illustrating one common pattern, French finite verbs agree in person and number, while adjectives agree in number and gender but not person:

(75) a. *Je suis belle.*
   I be.pres.1sg beautiful.fem.sg
   “I [female] am beautiful.”

   b. *Tu es belle.*
   you.sg be.pres.2sg beautiful.fem.sg
   “You [singular, informal, female] are beautiful.”

39 See Aissen (1999) for a formal articulation of the insight that the Navajo yi-/bi- alternation expresses obviation as found in Plains Cree.
Personless agreement inflection, such as French adjective inflection, is thought to derive historically not from the incorporation of pronouns but from other sources.\(^{40}\)

One source of gender agreement is from the incorporation of noun classifiers. Such classifiers, which in turn derive from semantically superordinate (or “generic”) common nouns meaning ‘man’, ‘woman’, ‘animal’, and so on, are a source of gender but not person agreement (Greenberg 1978; Reid 1997; Grinevald and Seifart 2004; Corbett 2006). For example, Reid (1997) posits the following probable stages in the development of gender agreement in the Australian language Ngan’gityemerri (southern Daly, Australia). First, we see generic-specific pairing of nouns, as in *gagu wamanggal* (‘animal wallaby’), where the generic term *gagu* (‘animal’) is a sort of proto-classifier introducing the more specific *wamanggal* (‘wallaby’). When the more specific noun occurs with a modifier, the generic term is used with both common noun and modifier, producing locutions like *gagu wamanggal gagu kerre* (‘animal wallaby animal big’). Then the generic word is phonologically reduced and cliticized to the head noun and its modifier. The result is a set of gender affixes realized on the noun and its modifiers, as in this example of masculine gender agreement:

\[(76)\]

\[
\text{Wa=}\text{ngurmumba wa=}\text{ngayi } \text{darany-fipal-nyine.}
\]

\[
\text{male=}\text{youth male=}\text{mine 3sg.s:aux-return-FOC}
\]

“My initiand son has just returned.” (Reid 1997, p. 216 (165))

Similarly, Greenberg (1978) suggests that demonstratives may be a source of gender marking on nouns, and outlines a process in which distal demonstratives become articles, which become semantically bleached over time and then fused to the noun. Common to these various scenarios for the origin of gender systems is the assumption that “the ultimate source of gender systems is nouns, more specifically nouns with classificatory possibilities such as ‘woman’, ‘man’, ‘animal’” (Corbett 1991, p. 312). In addition, some gender systems may have arisen as an epiphenomenon of case-marking patterns, as suggested by Luraghi (2011) for proto-Indo-European.

While personal pronouns are distinguished by the person feature, common nouns are not, and so the noun classifiers that derive from common nouns are not distinguished by person either.\(^{41}\) The absence of the person feature on classifiers

---

\(^{40}\) In some cases agreement derived from incorporated pronouns can lose the person feature over time. See Coppock and Wechsler (2010) on loss of the person feature in object agreement in Uralic languages.

\(^{41}\) The fact that classifiers lack person probably follows from the semantics of that feature. The person feature could not be a feature of classifiers because it does not carry descriptive content. On Kaplan’s
Pronoun Incorporation and Agreement

explains the lack of that feature on the agreement inflections that derive from classifiers.

This fundamental dichotomy between agreement inflection derived from personal pronouns and from other sources has consequences for the syntax of agreement as well. Person agreement can develop only where the structural relation between controller and target is a syntactic configuration that is conducive to pronoun incorporation. Roughly speaking, the rules of syntax must ensure that the canonical position of the controller DP is string-adjacent to the target word, assuming pronouns have the same distribution as other DP arguments. Unlike French, as exemplified in (75) above, in copula-less languages it is not unusual to find person marking on different main predicates, regardless of their part-of-speech category. For example, Turkish person inflection is marked on the main predicate regardless of whether it is a verb (a), an adjective (b), or a predicate nominal (c) (Kornfilt 1997, pp. 78–83):

(77) a. Ben oku-r-um.
I read-aor-1sg
“I read.”

b. Ben temiz-im.
I clean-1sg
“It is clean.”

c. Ben ögretmen-im.
I teacher-1sg
“I am a teacher.”

Since the clause lacks a copula, the subject is equally local to the predicate regardless of its syntactic category, making such structures suitable for pronoun incorporation. Other examples of syntactic structures that are conducive to pronoun incorporation include situations where a verb or preposition selects a pronominal object, where a complementizer is adjacent to the subject of the subordinate clause that it introduces, and where a possessed nominal is in construction with its pronominal possessor. Person agreement is found in all such conditions, including object person agreement on verbs and prepositions, complementizers agreeing with the embedded subject, and agreement of a possessed head nominal with its possessor (Baker 2008; Wechsler et al. 2010). The actual crosslinguistic situation is somewhat more complex, since pronominal clitics often have a different distribution from other full DPs (as evidenced by so-called clitic-climbing, for example)

---

(1977) theory, person carries descriptive content, but that content is relevant only to picking out the referent from the context of utterance; it plays no role in evaluating the utterance against a model. On the de se theory of person (Wechsler 2010), the first- and second-person features lack descriptive content entirely. They are not specified for reference to the speaker or hearer, but rather for self-reference by the speaker or hearer.
Pronoun Incorporation and Agreement

and because of other historical changes such as loss of the copula. The exact consequences of such conditions for the synchronic grammar of agreement are not well understood, but there are known to be broad typological syntactic differences between person-rich and person-poor agreement (Stassen 1997; Baker 2008).

Because of the difference in origin between pronoun-derived agreement inflection and agreement from other sources, the two varieties of agreement can pattern autonomously within the synchronic syntax. Within the representational formalism, this autonomy is captured by distinguishing two agreement features, INDEX for pronoun-derived agreement, and CONCORD for other types (Wechsler and Zlatić 2000, 2003; King and Dalrymple 2004; Dalrymple and Nikolaeva 2006; Kuhn and Sadler 2007; Wechsler and Hahm 2011; Wechsler 2011). Each of these attributes takes as its value an f-structure containing agreement features such as NUMBER, GENDER, PERSON, and CASE. The INDEX attribute, short for referential index, takes a value that determines coindexing relations for anaphoric binding of pronouns (see Sections 10.2 and 10.4): if two f-structures corresponding to nominals each include an INDEX attribute, then coindexation between the nominals is represented as sharing of the INDEX value (see Chapter 10). Making the value for INDEX a subsidiary feature structure containing PERSON, NUMBER, and GENDER features captures the anaphoric agreement between a bound pronoun and its antecedent: Mary admires herself/*himself/*itself (Pollard and Sag 1992, 1994).

(78)  
\[
\begin{align*}
&\text{PRED} \\
&PRED \quad \text{‘admirer (f SUBJ)(f OBJ)}
\end{align*}
\]

\[
\begin{align*}
&PRED \\
&PRED \quad \text{‘Mary’} \\
&\text{INDEX} \\
&\text{PERS 3} \\
&\text{NUM SG} \\
&\text{GEND FEM} \\
&\text{OBJ} \\
&\text{INDEX} \\
&\text{PRED \quad ‘pro’} \\
&\text{TENSE \quad PRES}
\end{align*}
\]

Binding of the anaphor by its antecedent is modeled by sharing of the INDEX value, so any features included in that value must be consistent.\(^{42}\)

As discussed in the introduction to this chapter, when an incorporated pronoun loses its ability to refer, which is modeled as loss of the [PRED ‘pro’] feature, the anaphoric agreement between the pronoun and its antecedent becomes grammatical agreement between a predicate and its argument. Assuming, as we did above, that the historical development of grammatical agreement is driven by the simple loss of the [PRED ‘pro’] feature, then this new grammatical agreement, like the

\[^{42}\text{Note that the INDEX attribute is used differently in Chapter 10, for purposes of simplifying the presentation of binding theory.}\]
anaphoric agreement from which it derives, involves sharing of the index value. Thus such pronoun-derived agreement is still index agreement.

The existence of two different agreement feature sets, index and concord, helps to explain the phenomenon of mixed agreement, where different agreement targets show different values for the same controller (Comrie 1975; Corbett 1983, 2006; Wechsler and Zlatić 2000, 2003; Kathol 1999). For example, the French second-person plural pronoun vous refers to multiple addressees, and also has an honorific use for a single addressee; this type of pronoun is sometimes called a “polite plural.” This French pronoun triggers plural on the verb, but the number on a predicate adjective depends on how many people it refers to. Thus, when used for honorific reference to one addressee, the result is mixed agreement, a plural verb but a singular adjective, as in (79a):

(79) a. Vous êtes loyal.
   you.pl be.pres.2pl loyal.masc.sg
   “You [singular, formal, male] are loyal.”

b. Vous êtes loyaux.
   you.pl be.pres.2pl loyal.pl
   “You [plural] are loyal.”

This case of mixed agreement can be understood as a consequence of the agreement feature specifications of vous. Pronouns are special in that they can serve as either targets or controllers of agreement. From their behavior as targets agreeing with their antecedents, we know that pronouns are specified for index features: as explained above, these are features of the referential index which are involved in anaphoric binding. Thus the [pers 2, num pl] features of vous are necessarily (at least) index features. Also, vous always determines second-person plural agreement on a reflexive pronoun that it binds, regardless of whether it refers to one or more than one addressee. Since pronouns bound by vous show the 2pl form, we know that its index features are 2pl. The pronoun vous has those formal features regardless of whether it refers to a single addressee, as in (79a), or a group, as in (79b).

In contrast, no principle requires pronouns to be specified for grammatical concord features. Assuming that French vous is unspecified for concord features, the lexical entries for the French words vous (‘you.pl’), êtes (‘are.2pl’), and loyal (‘loyal.masc.sg’) are as follows:

(80) a. vous D (↑ pred) = ‘pro’
   (↑ index pers) = 2
   (↑ index num) = pl

b. êtes V (↑ tense) = pres
   (↑ subj) = ↓
   (↓ index pers) = 2
   (↓ index num) = pl
Finite verbs such as *êtes* specify the INDEX features of their subjects, and pronouns are also specified for INDEX features, as explained above, so finite verbs agree with the lexical specifications of their pronominal subjects.

Now, what about the masculine singular CONCORD features indicated by the adjective *loyal* in (79)? The form of the adjective reflects the semantic number and gender of the subject: the cardinality (one, in this case) and biological gender (male, in this case) of the subject denotation, as shown in (79). However, French predicate adjectives are not, as a rule, specified for showing semantic agreement with their subjects. Adjectives normally agree with the lexically specified grammatical agreement features of the agreement controller. For example, when the controller is a grammatically plural noun such as *ciseaux* (‘scissors’), the adjective invariably shows plural agreement, regardless of whether it refers to a single pair of scissors or more than one:

(81) _Ces ciseaux sont géniaux/_∗génial! _
these.pl scissors.masc.pl are.pl brilliant.masc.pl/_∗brilliant.masc.sg _
“These scissors (one pair or multiple pairs) are cool!”

Predicate adjectives, like other agreement targets, show semantic agreement when the controller is lexically unspecified for the grammatical agreement features. The contrast between the behavior of *vous* and *ciseaux* as controllers of agreement suggests the following general principle of agreement (Wechsler 2011):

(82) **Agreement marking principle:**
Agreement is driven by a syntactic feature of the controller, if the controller has such a feature. If the controller lacks such a feature, then the target agreement inflection is semantically interpreted as characterizing the controller denotation.

Applied to example (79a), the agreement marking principle has the effect of imposing masculine, singular semantics on the subject denotation, since the adjective is marked for those (CONCORD) features while the word *vous* is not.44

---

43 The same applies to attributive uses of adjectives: *Pauvre vous!* (‘poor.masc.sg you’) could be addressed to a single male, while *Pauvres vous!* (‘poor.pl you’) is appropriate for multiple addressees.

44 The agreement marking principle can be implemented with disjunctive equations. For example, in the lexical entry for *loyal* in (80c), the equation \( \downarrow \text{CONCORD NUM} = \text{SG} \) would be replaced with a disjunction between the constraining equation \( \downarrow \text{CONCORD NUM} = c \text{ SG} \), and a semantic meaning constructor (Dalrymple 1999, 2001) that has the effect of giving singular semantics to the subject denotation.
Polite plural pronouns similar to French vous are found in many languages of the world (Head 1978), so we can test this theory against them. Person is an INDEX feature but not a CONCORD feature, and pronouns are necessarily specified for INDEX features but not necessarily for CONCORD features. This leads to the following prediction: a polite plural pronoun agreement controller determines plural number (i.e. syntactic rather than semantic agreement) on any agreement targets marked for person. This prediction is verified by studies of both Indo-European languages (Comrie 1975; Corbett 1983, p. 56ff.; 2000, pp. 193–194; 2006, pp. 230–232) and non-Indo-European languages (Wechsler 2011). Person agreement targets reflect the grammatical (plural) number of polite plural subjects, while nonperson targets are split, showing grammatical agreement in some languages and semantic agreement in others. The fact that person-rich agreement inflections always register the grammatical features of a pronominal agreement controller supports the view that such agreement, along with actual pronouns, operates in an autonomous system, formalized here with the INDEX feature bundle.

**Exercise 4**

Provide c- and f-structures for (79a,b) and (81). For (81) you may assume that ciseaux is specified as masculine third-person plural within both the INDEX and the CONCORD f-structure values.

**8.5 Conclusion**

Agreement derives historically from a variety of sources. The type of agreement that derives from the incorporation of pronouns has special properties that set it apart from other forms of agreement, a bifurcation captured in the formal theory by the two features INDEX and CONCORD.

The phenomenon of pronoun incorporation strikingly illustrates one way in which morphology competes with syntax within our framework and theory. Morphologically bound pronouns may pre-empt syntactic constituents from c-structure subject or complement positions. However, as the semantic and other pronominal features of these bound pronouns erode, they lose this pre-emptive power and begin to co-occur with external constituents in argument positions, thus functioning as grammatical agreement markers. Phonologically bound syntactic pronouns – clitics – undergo a similar process (as suggested by Givón 1976), but as soon as they provide only redundant grammatical information, economy of expression imposes pressure on them to change, either by differentiating their features or by undergoing reanalysis with their host and losing their status as independent syntactic constituents. Thus, it seems that economy of expression imposes
a pressure both to prune away informationally empty syntactic phrases and to elaborate words.

Further reading and discussion

A range of evidence in Navajo supports the analysis of bi- (in contrast to yi-) as a pronominal inflection, or incorporated pronoun. The analysis is not unproblematic, however. One problem not mentioned by Speas (1990) or Uyechi (1991) is the fact that the NP linked to bi- can be questioned. The following examples illustrate this possibility:

(83) a. hálá líc’ nabítlo’
   who.Q horse 3.3.P.throw
   “Who got thrown off the horse?” (Schauber 1979, p. 117)

   b. hálá Jáan bítloá
   who.Q John 3.3.P.see
   “Who was it that John saw?” (Schauber 1979, p. 220)

Normally topics cannot be questioned in place (*Who, he loves you?); this fact formed part of the evidence given in Section 8.1 for the pronominal status of the Chichewa object marker, in contrast to the subject. Bresnan and Mchombo (1987) show that questioning of topics is possible in cleft constructions, however, where the focus is external to a relative clause (Who is it that loves you?). The relative element is topical and permits co-occurrence with a pronominal object marker. There is no evidence for a syntactic cleft of this sort in the Navajo examples (83), but it is possible that the Navajo question words may allow similar presuppositions of referentiality. Schauber (1979, p. 220) comments that example (83b) may differ in meaning from the parallel yi- example in (84), as reflected by the difference in the translations of the two:

(84) Jáan hálá yiyítloá
    John who.Q 3.3.P.see
    “Whom did John see?” (Schauber 1979, p. 197)

Thus questioning of bi-linked nominals may be consistent with their topical status, if Navajo interrogative words can be interpreted as referential, as discussed above in connection with weak crossover. There is some indication that this might be the case, in the appearance of the topic enclitic /-sha’l on question words as in (63).

Another problem noted by Barss et al. (1989, pp. 321–322) is that in certain bi-marked postpositional constructions with conjoined NPs, “the ‘topic’ is not fully
extracted from its clause in syntax.” Speas (1990, p. 269ff.) discusses this problem further, suggesting that in certain constructions (the “conjunctive postposition”) bi- may differ from its other uses. It is possible that bi-, like yi-, alternates between a pronominal argument and an agreement marker, and that other factors force the pronominal alternative in certain situations.

Finally, Navajo bi- has been widely analyzed as a voice marker, either passive (Comrie 1989, p. 193) or inverse (Klaiman 1991; Jelinek 1990, 1997). In both these types of voice analyses, it is assumed that the NP linked to bi- is syntactically a subject, not a topical dislocated object; the analyses differ in that the agent is expressed as a demoted or oblique argument with the passive, and as an object with the inverse. The passive analysis does not satisfactorily explain the relations of a voice marker bi- to the independent pronoun bi and to the postpositional and nominal inflections. These nonverbal inflections pose difficulties for the inverse analysis, too. For their inverse analysis of Jicarilla Apache, Sandoval and Jelinek (1989) analyze all possessive and postpositional bi- inflections as inverse markers of complex transitive verbs made up of the verb and its nominal object or postpositional complement. Thus in (64b), the possessive bi- on the nominal object ‘horse’ would be treated as an inverse object marker of a complex transitive verb ‘rope horse’. While complex verbs may well exist in Navajo as in other languages, this analysis seems implausible as a general explanation of the distribution of bi-, for transitive verbs often form complex predicates with their objects and other complements, but they seldom, if ever, do so with their agent subjects (Chapter 1). Yet possessive bi-inflections can appear on subject NPs in Navajo (see (47)).

Also telling against the voice analyses of bi- is the observation that the fourth-person object inflection behaves as an incorporated pronoun, exactly like the third person (Uyechi 1990). Both the subject ji- (which appears in position 5 in the verbal morphology) and object ha- fourth-person inflections refer to humans or personified animals. (Note that the fourth-person object inflection ha- resembles the fourth-person independent pronoun ho.) Uyechi (1990) cites the following data in support of this analysis:

(85) a. ‘at’édé ‘ashkii jiztal
     girl boy ji-kicked
     “The girl$_4$ kicked the boy$_3$."

45 Suppose, for example, that all Navajo main clauses had to have a topic. Then, by the third-person topicality condition given above, if a third-person subject were lower on the hierarchy than a third-person object, the subject could not be the default topic, and that would force the pronominal alternative of bi-. The scope of the topicality constraint might not extend over certain subsidiary arguments, such as the conjunctive postposition construction, accounting for variations in the domain in which bi- had to be pronominal.

46 According to Uyechi (1990), the fourth person “is similar to third person in that it refers to someone outside the realm of the speaker and the hearer but it is unique in that its referent must be human or an anthropomorphized being; it is also similar to first and second person in that the referent is understood unambiguously by the speaker and hearer in the context of discourse.”
b. \( '\text{ashkii} '\text{at}'\text{éed} \text{haztal} \)  
boy girl \( ha \)-kicked  
“The boy\(_4\), the girl\(_3\) kicked him\(_4\).”

(86) a. \( '\text{at}'\text{éed} \text{li}' \text{jiztal} \)  
girl horse \( ji \)-kicked  
“The girl\(_4\) kicked the horse\(_3\).”

b. \( * \text{li}' '\text{at}'\text{éed} \text{haztal} \)  
horse girl \( ha \)-kicked  
“The horse\(_4\), the girl\(_3\) kicked him\(_4\).”

(87) a. \( * \text{li}' '\text{at}'\text{éed} \text{jiztal} \)  
horse girl \( ji \)-kicked  
“The horse\(_4\) kicked the girl\(_3\).”

b. \( '\text{at}'\text{éed} \text{li}' \text{haztal} \)  
girl horse \( ha \)-kicked  
“The girl\(_4\), the horse\(_3\) kicked her\(_4\).”

(88) a. \( * \text{li}' \text{dzaanéez} \text{jiztal} \)  
horse mule \( ji \)-kicked  
“The horse\(_4\) kicked the mule\(_3\).”

b. \( * \text{dzaanéez} \text{li}' \text{haztal} \)  
mule horse \( ha \)-kicked  
“The mule\(_4\), the horse\(_3\) kicked it\(_4\).”

This pattern of data immediately falls out of the analysis of the fourth-person subject as an agreement marker with optional [\textit{pred} ‘\textit{pro}’] and the fourth-person object as an incorporated pronoun with obligatory [\textit{pred} ‘\textit{pro}’], together with the assumption that both are [\textit{human} +]. Many languages have pronouns restricted to humans, but it seems less plausible to assume that Navajo has two voice morphemes with identical syntactic consequences associated with different animacy hierarchies.

These facts suggest that it may be a mistake to identify the pronominal inflections of Navajo as voice markers signaling a remapping of the grammatical relations of transitive verbs.
9 Topicalization and Scrambling

The previous chapter described one way in which morphological words may determine the same kinds of functional structures as syntactic phrases. There we saw how pronominal inflections of a head can specify a complete pronominal f-structure for dependents of the head and, further, how the progressive erosion of these functional specifications gives rise to “pro-drop” and grammatical agreement phenomena. In the present chapter we examine a different way in which inflectional morphology determines the same kinds of functional structures as syntactic categories, through dependent-marking. (If the reader has not yet done so, this would be a good point to read Sections 4.8 and 4.9.)

9.1 English topicalization

Consider the English c-structure given in (1):¹

(1) 

![Diagram of the c-structure](image)

¹ Trees are “pruned” in accordance with the economy of expression principle (Section 6.5).
The endocentric principles of structure–function association for English tell us that *Ann* has the *top* or *foc* function, that the sentential complement to *think* has a complement function, and that *I* and *he* have the *subj* functions of their respective *f*-structures. However, the *f*-structure of the sentential complement is incomplete, because the verb *likes* requires an *obj*. Furthermore, the matrix *f*-structure violates the extended coherence condition (Chapter 4), because the *top* is not integrated into the *f*-structure. The topic must be identified with some element which is functionally integrated. The default identification of *top* with *subj* cannot be appealed to here, because the subjects are syntactically expressed in their canonical phrase structure positions, and cannot be identified with the *top* without violating functional uniqueness.

How does English secure completeness and coherence in such cases? The language has meager morpholexical resources for specifying syntactic functions: head-marking pronominal inflections are absent, a zero pronominal is available only for the subjects of nonfinite verbs (as in control constructions – see Chapter 13), and except for personal pronouns, which bear the vestiges of Germanic case inflections, the language is morphologically caseless. Thus, given the typology of the language within the endocentric principles of structure–function association proposed in Chapter 6, it seems natural for English to utilize a structural means of function identification: the presence of a *c*-structure gap, to which is anchored a connecting chain of functions to the *top* in *f*-structure.

Recall from Chapter 4 that our formal model of extraction makes use of inside-out functional uncertainty by stating simply that a gap in the *c*-structure is identified in *f*-structure with a higher discourse function (*df* here refers to *top* or *foc)*:

\[
\text{(2) Principle for identifying gaps:}
\]

\[
\text{Associate } \text{XP} \rightarrow e \text{ with } ((x \uparrow) \text{df}) = \uparrow.
\]

\[2\text{ We take the functional specification in (2) to be annotated to the empty string dominated by XP. English (and some other Germanic languages) impose the additional restriction on (2) that for df } = \text{top, XP = DP/NP (see below).}
\]

Let us recall how this principle applies to the example of topicalization given in (1), which was briefly discussed in Section 4.8:

---

2 The set membership symbol can be used in functional uncertainty; see Chapter 4, footnote 25. For example, *Where did you see Sandy?* involves extraction of a member of a set-valued *adj(unct)*; in this case the equation in (2) would be realized as \((\text{adj } \in \uparrow) \text{focus} = \uparrow \text{ (i.e. x } = \text{ adj } \in).\) See Section 4.9 for more on set-valued grammatical functions.
The functional schema associated with the gap NP in (3) comes from the principle for identifying gaps (2). By uniformly instantiating this schema in the same way as all the other functional schemata provided by the other principles of structure–function association, and solving the identity as outlined in Chapter 4, we arrive at the f-structure in (4):

For our second illustration of this model of extraction, let us use an example of CP topicalization, as discussed in Chapter 2:³

³ Note that the copula *was* serves as the extended head of [vp *sick*]; see Section 7.2.
Again, the principles of structure–function association for English tell us that the adjoined CP is TOP, the PP is a complement function (determined to be an OBL_{θ} by the preposition and the lexical properties of the verb *talk*), and the DP/NP gap is an OBJ of the preposition. Again, the principle for identifying gaps (2) adds the information that the TOP f-structure can be identified with the OBL_{θ} OBJ f-structure. Consequently, the f-structure in (6) is a complete and coherent solution to the functional description of (5), with inessential details omitted (it would be a useful exercise for the reader at this point to check how the f-structure for (5) is derived):

(6)

```
f: [TOP h: [“that he was sick”]
  SUBJ [“we”]
  OBL_{θ} [OBJ]
  PRED ‘talk-about (f SUBJ)(f OBL_{θ} OBJ)’]
```

The fact that there is a mismatch of c-structure category type between CP and DP/NP in (5) is no problem for f-structure identification of the topic and prepositional object functions. The CP is never moved from the DP/NP position, as in (7), but is simply generated in place by the principles of c-structure:

(7) *We didn’t talk about that he was sick.*

It is natural to ask how the empty categories in this theory satisfy the endocentricity condition of Chapter 7, which requires that every lexical category have an extended head. It is not difficult to see that the topicalized phrase itself serves as the extended head of the gap: it is mapped into the same f-structure and it c-commands the gap without dominating it. No closer phrase has these properties.

Further constraints of various types can be imposed on the possible paths \( x \) that connect the DF to the syntactic function of a gap, but constraints on extraction are not our concern here. Rather, we are interested in the typological difference underlying the extraction model of topicalization and an alternative scrambling model.

### 9.2 Russian topicalization

Languages need not employ extraction to identify a DF with a non-DF function, if they make use of nonconfigurational means of function specification. Russian, for example, employs both configurational and case-marking principles of function
Topicalization and Scrambling

Russian is an internal subject language, meaning it has two subject positions, in S and as specifier of IP. In our framework, S is the sister of I, where I is the category of finite verbs and V is the category of infinitives. King (1995) argues that in Russian the specifier of IP has the top function; by our default identification of subject and topic (Chapter 2), this position is therefore also a subject position. Two examples are given in (8) and (9):

(8)

```
IP
  \_ DP
     \_ ja
        \_ I.NOM
             \_ budu
                 \_ V
                     \_ S
                          \_ VP
                                           \_ V
                                                \_ Čitat'
                                                    \_ N
                                                         \_ P
                                                             \_ knigu
                                                                  \_ book.ACC

[I]P I D P ja I NOM I P I D P budu will.1SG V S VP V Čitat' read.INF N P knigu book.ACC
```

“I will read a book.”

(9)

```
IP
  \_ DP
     \_ ja
        \_ I.NOM
             \_ Čitala
                 \_ read.PST.3SG FEM.
                     \_ S
                          \_ VP
                                           \_ N P
                                                \_ knigu
                                                                  \_ book.ACC

[I]P I P D P ja I NOM I P I P Čitala read.PST.3SG FEM. S VP N P knigu book.ACC
```

“I was reading a book.”

---

4 The analysis of Russian given here follows (King 1993, 1994, 1995), with a minor modification to fit the present framework: we assume S where King has a VP-internal subject.

5 We assume here that Russian pronouns and demonstratives belong to the category DP, while common nouns are N. Economy of expression forces the minimal c-structure for NPs without determiners; so the objects of the verb are NPs and not DPs in (8) and (9).
The existence of an I position for finite verbs outside of VP is supported by the contrast in (10) in colloquial Russian:

(10) a. *Ja [učit’sja v novoj škole] slyšal, on budet.  
    I [study-INF in new school] heard he will  
    “I heard that he will study in a new school.”

    I [went to school] said (that) he  
    “I said that he had gone to school.”

As in (2), only maximal projections can be extracted. The finite verb–object sequence constitutes not such an XP but an I’, as we see in (2). In contrast, the infinitive verb–object sequence does constitute a maximal VP, as we see in (8).

Further evidence for a distinct category of the finite verb in Russian comes from the interaction of negation and conjunction. According to the IP/VP analysis, if we conjoin an infinitive verb with its complement as in (11), we are conjoining VPs:

(11) 

```
         IP
        /   \
   IP     V
 /     \   
ja     budu
I.NOM   will.1SG

       VP
      /   \   
    VP    CONJ
       /     \   
pisat’ pis’ma i citat’ knigi
   write.INF letters and read.INF books
```

“I will write letters and read books.”

---

6 King (1995, pp. 28–30) cites these examples from Yadroff (1992). Comrie (1973, p. 295), however, notes an example from recorded colloquial Russian speech of extraction of a finite verb and its object out of a čto (‘that’) complement, leaving a PP complement behind:

(i) *No ja ix postavila pomnju čto v škaf.  
    But I them PERF.put.PAST.3SG,FEM remember.PRES.1SG that in cupboard  
    “But I remember that I put them in the cupboard.”

This could be an instance of extraction either of a finite VP (contrary to the V-to-I analysis) or of an IP (consistent with the V-to-I analysis). In either case, the PP would have to be scrambled away from the extracted constituent. The position of the complement subject would indicate which node is extracted, but that cannot be determined from this example because one of the finite subjects is unexpressed. Only the V-to-I analysis is consistent with both (10) and (i).
But if we conjoin a finite verb with its complement as in (12), we are conjoining I’s:

(12)

```
             IP
            /\  
           /   \  
   DP       VP
     \      /  
      ja   CONJ
       I.NOM  I
        S     S
      pisala  čitala
   write.PST  read.PST
     NP      NP
    pis’ma   knigi
    letters  books
```

“I was writing letters and reading books.”

Now the negative proclitic *ne* attaches to finite verbs and not infinitives, with scope over the VP. One signal of the scope of negation in Russian is the “genitive of negation” – within the scope of negation, an accusative object can bear genitive case instead. Under the IP/VP analysis, *ne* attaches to I and not V. Hence it is predicted that a single *ne* will suffice to negate the conjunction in (11) but not in (12), and this difference should show up in the possible case-marking of the objects. This prediction is borne out:

(13) a. *Ja ne budu pisat’ pisem i čitat’ knig.*
    I not will write.inf letters.gen and read.inf books.gen
    “I will not write letters and read books.”

b. *Ja ne pisala pisem i čitala knig.*
   I not write letters.gen and read books.gen
   “I did not write letters and read books.”

c. *Ja ne pisala pisem i ne čitala knig.*
   I not write letters.gen and not read books.gen
   “I did not write letters nor read books.”

See King (1994, 1995) for further evidence in support of the IP/VP hypothesis for Russian.\(^7\) This analysis of the interaction of the genitive of negation with

---

\(^7\) Strictly speaking, King’s evidence from negation shows only that the finite verb is a distinguished category for the negative proclitic, not that the finite verb must appear outside of the VP in declarative sentences. However, King shows that a class of uninflected verbs called “predicate adverbs” – e.g. *možno* (‘can’), *nado* (‘must’) – can be generated in V, I, or C.
coordination follows immediately from the theory of coordinate structures of Peterson (2004), based on Bresnan et al. (1986). We need only assume that the proclitic ne is lexically associated with a conditional equation requiring the object to be genitive if there is an object (see Section 4.6 for the definition of conditional equations). When ne attaches to the I outside of the conjoined VPs in (11), this grammatical attribute is a grammatical property of the f-structure of the main clause and distributes across the conjoined VP f-structures, deriving (13a). In contrast, when ne attaches to the I inside the left conjunct of (12), its lexical attributes specify properties of f-structure of the left conjunct only, deriving the contrast between (13b) and (13c). As Peterson (2004) emphasizes, these differential distributive properties are fundamental consequences of the architecture of LFG, requiring no special extensions to the formal framework.

Given the structures in (8) and (9), our endocentric principles of function specification, with the specified parameter settings for Russian, will identify the initial DP as a df and the final NP as obj in both of these examples; for concreteness, let us take the initial DP to be top. To secure completeness and coherence, a subject is required. A default principle identifying the top with subj will not suffice in Russian, because the specifier of IP position may be filled by a nonsubject:

(14)

```
NP
| IP
|     I
|   Eugenija Onegina
|   Eugene Onegin.ACC
|   napisal
|   PERF.write.PST.3SG.MASC
|   Pushkin
|   Pushkin.NOM
```

“Pushkin wrote Eugene Onegin.”

Russian solves this problem by using case (dependent-marking) principles of function specification in addition to configurational principles. In particular, the following two principles hold in Russian (among others):\(^8\)\(^9\)

(15)

\[ (↓ \text{case}) = \text{nom} \Rightarrow (↑ \text{subj}) = ↓ \]
\[ (↓ \text{case}) = \text{acc} \Rightarrow (↑ \text{obj}) = ↓ \]

---

\(^8\) See Neidle (1988), King (1995), and Bloom (1999) for discussions of the syntactic distribution of other Russian cases within the general LFG framework.

\(^9\) Argument functions in Russian are positionally quite free, but there are some restrictions on their distribution. For example, a dative experiencer can only bind a subject-oriented reflexive from the canonical “subject position” (Wechsler 1995).
These principles can be applied to (11), (12), and (14) to associate grammatical functions with the top NP: nominative case yields the sub\textit{b} function and accusative case yields the obj function. Because both configurational and non-configurational means of function association are simultaneously employed by the language, double functions are associated with a single constituent. Thus the f-structure of (14) will be as in (16):

\[
(16) \quad f:\begin{array}{l}
\text{TOP} \quad [\text{“Eugene Onegin”}] \\
\text{OBJ} \\
\text{PRED} \quad \text{write}\langle(f \text{ SUBJ})(f \text{ OBJ})\rangle' \\
\text{SUBJ} \quad [\text{“Pushkin”}] 
\end{array}
\]

Even though the object is displaced from the canonical (endocentric) object position, it is nevertheless successfully associated with the object function by the non-configurational means of (16). However, this means of function association is possible only within the region of c-structure which is mapped into the f-structure of the verb or other predicator; otherwise the principles of completeness and coherence could not be satisfied. Hence, this kind of function specification, which does not involve extraction, is bounded by the functional domain of the predicator. This type of “reordering” must therefore be local. In contrast, extractions, which employ a connecting chain of functions anchored to a gap, are not necessarily bounded in this way.\textsuperscript{10}

While the specifier of IP can be a top or foc, phrases adjoined to IP are topics in Russian.\textsuperscript{11} Observe now the differences between the parallel English and Russian examples of topicalization in (17) and (18):

\[
(17) \quad \begin{array}{c}
\text{IP} \\
\text{VP} \\
\text{we} \\
\text{sold} \\
\text{e} \\
\text{on the stairmaster}
\end{array}
\]

\textsuperscript{10} The phenomenon of extraposition or detachment of constituents from a predicate complement into a higher clause may represent a distinct type of ordering phenomenon involving functional uncertainty without gaps (Matsumoto 1992, 1996a,b, 1998; Kaplan and Zaenen 1989a). Compare the English example \textit{John took up exercising recently on the stairmaster}: the taking up is recent, the exercising is on the stairmaster, but \textit{on the stairmaster} appears in the matrix clause outside of the gerund phrase \textit{exercising...} which it modifies. This phenomenon departs in various ways from the two types of topicalization processes considered here.

\textsuperscript{11} See King (1994, 1995) for details. Multiple adjoined topics are allowed by the schema \(\downarrow \in (\uparrow \text{TOP})\) (Section 4.9), which creates a set of f-structures as the value of the top attribute.
“The old boat, we sold.”

Given our typological hypotheses (Chapter 6), the empty category representing the gap is essential in the English structure (17) to provide a means of identifying the topicalized DP with the obj function. In Russian, in contrast, an extraction gap is not necessary, because the language has an additional, morphological means of function specification. This is not to say that English has no case morphology, merely that the case morphology English does have plays a different role in its syntax than case does in Russian. English relies on structural means of syntactic function specification rather than morphological means such as those illustrated in (15). Otherwise we would find that pronouns – the sole case-marked forms in English – would scramble, contrary to fact:

(19) *He her saw.

Thus, case morphology is not necessarily sufficient to license scrambling.

9.3 Economy of expression

Let us carefully examine the effects of economy of expression in the two cases above. We have assumed (Chapter 6) that all c-structure categories are optional and are present only if required by general principles such as completeness or coherence. We have further hypothesized that the presence or absence of c-structure gaps in the English and Russian examples of topicalization, illustrated in (17) and (18), is typological. Russian has no need for the empty category in its clause-internal topicalizations, because it employs lexocentric principles of function specification in addition to the purely configurational endocentric principles. English, in contrast, cannot do without the endocentric principles. Empty categories are pressed into service in English as a “last resort,” to secure completeness and coherence when there is no other means of function specification available.
What allows the occurrence of an empty category in the example of English topicalization (17) but excludes its occurrence in the example of Russian topicalization (18) is the principle of economy of expression, repeated here:

\[(20) \quad \text{Economy of expression:} \]

All syntactic phrase structure nodes are optional and are not used unless required by independent principles (completeness, coherence, semantic expressivity).

It follows from (20) that every syntactic node in c-structure must add new information to the f-structure. (Recall that the relative information provided by a category \( C \) and its context \( C' \) can be compared by means of the lattice of f-structures; see Chapter 5.) Economy of expression rules out the empty NP in (21), since the information added by the empty NP – that there is an obj – is already provided by the initial NP, through the case-marking principles of function specification:

\[(21) \quad \text{staruju lodku} \quad \text{old. ACC boat. ACC} \]

In this way Russian contrasts with English. Vestigial case-marking does exist in English, but (we hypothesize) it does not have the typological role of function specification that we find in Russian and other languages. If it did have this typological role, then the case-marking itself would be sufficient to associate a pronoun with its syntactic function, regardless of its configurational position in the c-structure. Phenomenologically, the result would be pronoun “scrambling” in English – that is, the optional appearance of pronouns in multiple positions outside of the endocentric structures where their functions would be configurationally defined.

As we saw in Chapter 8, the same principle rules out an empty category for instances of null or incorporated pronominals. In these cases the inflected verb or other head fully specifies the function and contents of a pronominal argument. Given the principle of economy of expression, the redundancy of an empty phrase structure category in such cases is sufficient to eliminate it.

This discussion offers some insight into the typological shift that a language may undergo when it loses its case system and abandons the dependent-marking
schemata for function specification. When the case system has eroded to a sufficient extent, the f-structure information carried by words (i.e. the case features) is no longer recoverable. At this point, case-based principles of function specification cannot be employed. The loss of these principles will leave scrambled structures functionally disconnected (violating coherence and completeness). As a result, the language may shift typologically to more rigid word orders and a greater reliance on endocentric principles of function specification – as appears to have happened in the history of English.

Of course, languages may take other avenues of change. The word order flexibility we see in Russian is generally shared by the Slavic languages, among them Bulgarian and Macedonian, which have lost case-marking on nouns. However, in Bulgarian and Macedonian, clitic doubling is associated with the noncanonical word orders (and pronouns are case marked). This point is illustrated by the contrast in Bulgarian between (22a,b) (Siewierska and Uhlířová 1998, p. 108):

(22) Bulgarian:
   a. Tanja vidja Marija.
      Tanja saw Marija
      “Tamja saw Marija.”
   b. Tanja ja vidja Marija.
      Tanja her saw Marija
      “Marija saw Tanja.”

Here clitics apparently serve as head-marking specifications of argument functions; see Jaeger and Gerassimova (2002) for further discussion of Bulgarian clitics from an LFG perspective.

Problems

The reader may now wish to solve the remaining problem in Problem Set 4 (“Subject agreement in West Flemish”).

9.4 Topicalization versus scrambling

An important question is how topicalization differs from scrambling under the present theory. Both processes order constituents out of their canonical (endocentrically defined) argument positions. Topicalization involves a constituent appearing in a fixed prominent position, usually sentence- or clause-initial. In contrast, scrambling involves the ordering of argument constituents in a variety of medial adjoined positions. As illustrated in (23), English lacks scrambling:

---

(23) English:
   a. Tanja saw Marija.
   “Marija saw Tanja.”
   b. Tanja her saw Marija.
   “Tanja saw Marija.”

---

The reader may now wish to solve the remaining problem in Problem Set 4 (“Subject agreement in West Flemish”).
(23) a. Ann and Louise, Roger doesn’t talk about. (topicalization)
b. *Roger Ann and Louise doesn’t talk about. (scrambling)
c. *Roger doesn’t Ann and Louise talk about. (scrambling)
d. Roger doesn’t talk about Ann and Louise. (canonical word order)

If English made use of lexocentric function specification, it would be possible to derive such scrambling structures in the way illustrated in (24):

(24)

In (24) we have the object DP adjoined to the VP, which is not a position for objects by the endocentric principles of Chapter 6, but in a position for optional annotation of the adjunct function. However, the dependent-marking lexocentric principles of Chapter 6 do allow free annotation of DPs with case conditionals, which can specify the f-structure function as illustrated. Because English lacks such lexocentric function specification, examples like (24) are not possible.

One might think initially that the absence of scrambling in English follows from the absence of lexocentric function specification. That is part of the story, but not all of it – for nothing in our theory thus far would rule out using extraction to mimic scrambling. For example, we could associate a DF with medial adjunct positions such as those in (23b) and (23c); then the gap identification principle (2) could identify these DFs with the prepositional object, satisfying completeness and coherence. The structure in (25) illustrates this general point:

(25) *We the old boat sold.
The theory of Chapter 6 associates DFs with specifier of FP positions, which are prominent in the tree structure of clauses. The same theory also associates nonargument functions (including DFs) with adjunct positions; for example, a topicalized NP is an IP adjunct DF in English in Section 9.1, example (3), and is an IP adjunct of Russian in Section 9.2, example (18). However, the theory does not express the fact that DF adjuncts are more prominent than other adjuncts: they appear in fixed positions, either at the edge of the clause preceding other maximal projections, or adjacent to the head (as with pre- or postverbal focus). Let us state this generalization as a further constraint on the structure–function mapping theory of Chapter 6:

\[(26) \quad \text{Clause-prominence of DFs:} \]

- DF adjuncts must be clause-prominent, occurring either at an edge of the clause or adjacent to the head of the clause.

In conjunction with the rest of the theory developed in Chapters 6–9, the clause-prominence of DFs explains the absence of scrambling in English.

Another consequence of (26) within the present theory is that extraction antecedents (“gap fillers”) do not scrambling. If a language employs gaps for extractions, then it lacks other resources to identify the argument functions of the extracted element. Hence, these functions can only be recovered by the principle for identifying gaps (2), which targets a DF; DFs, however, are restricted in their distribution by (26) to prominent fixed (nonscrambling) positions.

The clause-prominence of DFs has another consequence. In the present theory almost all function specification is local to a single clause. This follows from the structure–function mapping theory, which specifies only the functions within a single functional domain. The possibilities for designating functions across clauses are quite limited. One is the principle for identifying gaps (2), which allows for nonlocal identifications of clause-internal functions with DFs in a higher clause, as we saw in the case of English topicalization (Section 9.1). Another possibility is functional control (Chapter 12), where a head may identify the subj of its complement. These are the only nonlocal (clause-crossing) GF specifications permitted by the present theory, and both involve identification with the grammaticalized discourse functions DF: subj, top, and foc. Thus, the only function specifications which cross clausal boundaries are those which designate DFs.

Now, as we have

---

12 Clause prominence may be achieved by means other than position. For example, prosody plays a role in many languages, such as Hungarian (Mycock 2006, 2010; Mycock and Lowe 2013).

13 Individual languages can parametrically select among the positions for specific DFs permitted by (26); for example, in English top and foc would be available for left IP adjuncts (yielding topizations) and foc for right VP adjuncts (yielding heavy NP shift, or right focus, complements: She gave to each of us our own autographed photo), but not for V adjuncts, left VP adjuncts, or I’ adjuncts.

14 The locality of function specification is a property of the substantive linguistic (meta)theory over formal grammars which is proposed here; it is not an inherent limitation in the formal architecture of
just remarked, these syntactic functions are more salient than all others, in that
crosslinguistically they appear in prominent structural positions. In this way they
are distinguished from scrambling structures in our theory. Scrambling must lex-
ocentrically specify all argument functions occurring in medial (nonprominent)
adjunct positions. It follows then that while topicalization and other extractions
(such as *wh*- questions) may or may not cross clauses (depending on what con-
straints are imposed on the inside-out variable in (2)), scrambling must always be
local to the clause:

\[(27) \text{Locality of scrambling:}\]
\[\text{Extractions may cross clauses, but scrambling is clause-bounded.}\]

9.5 Detecting empty categories

According to the present theory, empty categories in c-structure will appear only
where other means of function specification are not available, because they are
a “last resort” penalized by economy of expression. English, lacking lexocentric
resources for function specification, uses empty categories for nonsubject extrac-
tions within a clause and for all extractions across clauses.\(^{15}\) Scrambling lan-
guages, in contrast, do not use empty categories for extractions within a clause,
because of the availability of alternative lexocentric means of function specifi-
cation. But even in these languages, empty categories may be used as a last resort
in just those situations where lexocentric function specification is unavailable −
namely, in nonlocal extractions.

Is there an empirical means of testing this theory? A clue is provided by an
observation originally due to K. P. Mohanan (Mohanan 1981, 1982b, 1983; Bres-
nan 1984, 1994a, 1995b, 1998): in Malayalam, linear order constrains the bind-
ing of overt pronouns, but not null pronouns. This pattern is illustrated in (28)–
(31), from Bresnan (1998, p. 62). Each example is provided with a schematic
representation of its annotated c-structure.\(^{16}\) Examples (28) and (29) show binding
from a quantified subject into an object relative clause. In (28) the subject

\(^{15}\) Some subject extractions within a clause − such as the topicalized CP construction discussed in
Chapters 2 and 6 − utilized the default identification of *subj* and *top*, thereby removing the need for
an empty category subject, by economy of expression.

\(^{16}\) In all the examples, the overt pronoun has both a collective interpretation (implying that a single
woman was involved with a group of children) and a distributive interpretation (implying that different
women were involved with different children). When the overt pronoun is omitted, a null pronoun-
ential interpretation arises, with either the collective or distributive reading. Note that the examples are
Topicalization and Scrambling

precedes the object, and in (29) the object precedes the subject. The generalization is that the overt pronoun may not precede its binder, while the null pronoun may:

\[(28)\]

\textbf{a.} \\
\begin{tikzpicture}
  \node (subject) {Subject} ;
  \node (verb) [below right of=subject] {Verb} ;
  \node (object) [below right of=verb] {Object} ;
  \node (qpi) [below right of=verb] {Relative} ;
  \node (head) [below right of=object] {Head} ;
  \node (pron) [below right of=subject] {...pron/zero,...} ;
  \node (sentence) at (subject -| pron) {Sentence} ;

  \draw[->] (subject) -- (verb);
  \draw[->] (verb) -- (object);
  \draw[->] (verb) -- (qpi);
  \draw[->] (object) -- (head);
  \draw[->] (subject) -- (pron);

\end{tikzpicture}

\textbf{b.} \textit{in\textasciitilde{n}\ o\textasciitilde{o\textasciitilde{r}}oo ku\textasciitilde{t}\textasciitilde{ti}yum sahaayiccu} \\
today each child.N helped \\
\[\text{[in\textasciitilde{n}ale (aw\textasciitilde{r}e/awanawane) s\textasciitilde{k}a\textasciitilde{a}ricc\textasciitilde{a} s\textasciitilde{t}\textasciitilde{r}\textasciitilde{k}\textasciitilde{a}le]}\] \\
yesterday (they.A/he.REDUP.A) scolded.REL woman.A \\
“Today each child helped the women who scolded him, yesterday.”

\[(29)\]

\textbf{a.} \\
\begin{tikzpicture}
  \node (object) {Object} ;
  \node (verb) [below right of=object] {Verb} ;
  \node (subject) [below right of=verb] {Subject} ;
  \node (qpi) [below right of=verb] {Relative} ;
  \node (head) [below right of=subject] {Head} ;
  \node (pron) [below right of=subject] {...*pron/zero,...} ;
  \node (sentence) at (object -| pron) {Sentence} ;

  \draw[->] (object) -- (verb);
  \draw[->] (verb) -- (subject);
  \draw[->] (verb) -- (qpi);
  \draw[->] (subject) -- (head);
  \draw[->] (object) -- (pron);

\end{tikzpicture}

\textbf{b.} \textit{[in\textasciitilde{n}ale (*aw\textasciitilde{r}e/*awanawane) s\textasciitilde{k}a\textasciitilde{a}ricc\textasciitilde{a} s\textasciitilde{t}\textasciitilde{r}\textasciitilde{k}\textasciitilde{a}le]}\] \\
yesterday (they.A/he.REDUP.A) scolded.REL woman.A \\
\textit{in\textasciitilde{n}\ o\textasciitilde{o\textasciitilde{r}}oo ku\textasciitilde{t}\textasciitilde{ti}yum sahaayiccu} \\
today each child.N helped \\
“Today each child helped the women who scolded him, yesterday.”

In (30) we see binding from a preposed object (accusative) quantified NP into a subject (nominative) relative clause that follows it. In (31) the object binder follows the subject it binds into. While both the overt and the null pronoun can be bound in (30), in (31) the overt pronoun cannot be bound preceding the binder, but the null pronoun can:

\[\text{starred only on the bound interpretation; the overt pronoun is grammatical if interpreted as referring to others.}\]

\[\text{17 Here and throughout this section, “binding” refers to the interpretational dependence of a (nonreflexive) personal pronoun on a quantifier or interrogative expression (i.e. variable-binding operators). The relations of reflexive pronouns and other “bound anaphors” to their antecedents is discussed in Chapters 10 and 11.}\]
Again, the overt pronoun must not precede the quantifier that binds it, while a null bound pronoun may. This generalization holds regardless of the relative hierarchical prominence of binder and bound. Thus, it is pure linear order that constrains pronominal binding by quantifiers in Malayalam:

(32)  **Binding generalization for Malayalam:**

A pronoun cannot precede its binder.

Why are only overt pronouns and not null pronouns affected by (32)? One could of course simply stipulate this result as a special property of null pronouns. But Mohanan observes that this result already follows from the LFG assumption that null pronouns are functional elements without any c-structure expression. Linear order is a relation native to c-structure, not f-structure. If null pronominals are not represented in c-structure at all, then their lack of linear order relations follows from the basic architecture of LFG. Malayalam belongs to a language type in which null pronominals are provided as a lexical default to core arguments of verbal argument structures (Mohanan 1981; Bresnan 1982a; Simpson 1983a; Hale 1983; Austin and Bresnan 1996); see Chapter 13. From the principle of economy of expression it then follows that empty categories cannot represent these
null arguments in c-structure. Hence, they cannot bear linear order relations to c-structure constituents.

In short, by completeness and coherence all pronominals, whether overt or null, are represented in f-structure; but by economy of expression and lexical integrity, only some are represented in c-structure. Hence f-structure is the natural domain of binding relations. Exactly how then can c-structure relations such as linear order exert any influence on binding? They do so through the correspondence mapping between c-structure and f-structure. We can determine the linear order relations of two f-structure constituents (such as a binder and a pronominal) very simply by looking at their correspondents in c-structure to determine which one is rightmost. This is the intuitive content of the formal relation of f-precedence (Kameyama 1985; Bresnan 1984, 1994a, 1995b, 1998; Dalrymple 2001): 19

\[
\text{(33) Definition of f-precedence:}
\]
Given a correspondence mapping \( \phi \) (defined as in Chapters 4 and 5) between a c-structure and its f-structure, and given two subsidiary f-structures \( \alpha \) and \( \beta \), \( \alpha \) f-precedes \( \beta \) if and only if the rightmost node in \( \phi^{-1}(\alpha) \) precedes the rightmost node of \( \phi^{-1}(\beta) \).

In other words, we simply look at the inverse images in c-structure of two f-structure constituents to see which one has the rightmost exponent: that one will be f-preceded by the other. 20 A null pronominal which has no c-structure expression at all will fail to f-precede anything. Condition (34) therefore explains why null pronominals are not excluded from binding in Malayalam, where overt pronouns are:

\[
\text{(34) Precedence condition on pronominal binding:}
\]
The domain of a binder excludes any pronominal that f-precedes it.

Malayalam null pronominals are not an isolated case. In Korean, Japanese, Mandarin, and South Min it has also been shown that linear order constrains pronominal binding and that null pronominals mitigate the binding constraints that hold for overt pronouns (Choi 1996, 1999; Kameyama 1985; Cole 1974). 21

---

18 An interesting issue is what additional information is provided by overt pronouns that prevents their elimination in favor of null pronominals. Crosslinguistically, null and overt pronominals differ in topic anaphoricity and agreement features (Bresnan 2001a).

19 Dalrymple and King (2013) offer a recent comprehensive discussion of f-precedence in light of the topic of nested and crossing dependencies. Their analysis is based on a notion of anchors, which derives from the psycholinguistic work of Pickering and Barry (1991) and Pickering (1993); Nadathur (2013) is a further exploration of these ideas.

20 See Section 7.2 for further discussion of the inverse image of the \( \phi \) function.

21 Note that pronominal inflections (Chapter 8) are not considered null pronominals in our theory, because they have overt morphological exponents in c-structure, as morphological head-marking. See “Further reading and discussion” section in this chapter.
When the correspondence between f-structures and c-structure constituents is one-to-one, f-precedence (33) reduces to simple linear order in the string. However, when two discontinuous constituents correspond to the same f-structure, f-precedence relations become less transparent. Observe, for example, that in (35) the f-structure for the quantifier everyone corresponds to discontinuous c-structure constituents, consisting of the contents of the adjunct to IP and complement of VP:

(35)

In (35) the f-structure quantifier [“everyone”] is realized in c-structure positions both preceding and following the pronoun. Applying the definition (33) to (35), we see that the subject possessor [“his”] f-precedes the topicalized object [“everyone”], because the rightmost node in the inverse image of [“his”] (namely, [his]_{DP}) is to the left of the rightmost node in the inverse image of [“everyone”] (namely, [everyone]_{DP}). Hence the pronoun f-precedes the binder. Here, then, is an empirical consequence of the presence of an empty category in c-structure: it can reverse the apparent linear order relations of pronouns and binders. This is called the “crossover effect” (see the “Further reading and discussion” section at the end of this chapter).

In scrambling languages which, like Malayalam, have the precedence condition (34), our theory predicts that operator binding should be allowed clause-internally in sentences equivalent to that shown in (35), because the empty category is eliminated by economy of expression in local contexts where it is not needed to identify grammatical functions. In such cases, the relative f-precedence relation of the binder and pronoun constituents reduces to their simple linear order in the string; binding can occur as long as the pronominal is not ordered to the left of the binder. If an empty category were required in these sentences, it would lead to a violation of the precedence condition, and operator binding would be ungrammatical.

Hindi provides an empirical test of these predictions. Hindi is a scrambling language and, like Malayalam, imposes the precedence condition (34) on the binding of pronominals by quantifiers, interrogative words, and other variable binding
Topicalization and Scrambling

operators (according to the analysis of Bresnan 1994a, 1995b, 1998, based on Gurtu 1985, Mahajan 1990, Dayal 1994, and Dwivedi 1994). In fact, clause-internal reorderings in Hindi do give rise to pronominal binding effects that differ from what is predicted by extraction configurations like (35) (Gurtu 1985; Mahajan 1990; Dayal 1994; Dwivedi 1994). Consider the Hindi example in (36) from Mahajan (1990):22

(36) \[kis-ko/sab-ko, uskii, babin pyaar kartii thii?\]
who-(DO)/everyone-(DO) his sister-(SUB) love do.imp.f be.pst.f

“Who/Everyone was loved by his sister?/.”
Lit.: “Who/everyone (did) his sister love?/.” (Mahajan 1990, p. 25)

In (36) the pronoun does not f-precede its binder, satisfying the prominence principle (43), so it is not excluded from the operator’s binding domain, defined in (44). If the fronted binder were associated with a gap, the structure would be similar to (35) and the pronoun would f-precede the operator, preventing binding.

Unlike Malayalam, Hindi has both scrambling and crossclausal extractions. Extracting a constituent out of its clause eliminates the locality of function specification. To secure completeness and coherence, under the present theory, the binder must therefore have a corresponding empty category within the lower clause, which anchors the nonlocal function identification in accordance with the principle for identifying gaps (2). The result is that, by (33), the empty category will belong to the inverse image of the binder under the correspondence mapping. The grammaticality of the resulting sentence depends on where the pronoun occurs in the structure. If the pronoun appears in the upper clause as in the following example from Mahajan (1990, pp. 39, 41), its position f-precedes the operator and the sentence is ungrammatical:

(37) \*[kis-ko/sab-ko, uskii, babin-ne socaa [ki raam-ne [e], who-(DO)/everyone-(DO) his sister-(SUB) thought that Ram-(ESUB) dekhaa thaa]?
seen be.pst

“Who was it that his sister thought that Ram had seen him?/”

“Everyone was such that his sister thought that Ram had seen him.”

If, however, the pronominal belongs to the same clause as the gap corresponding to the extracted constituent, no binding violation occurs, as expected, because within the clause the relative order of the constituents is not fixed; scrambling varies the possible orders of the gap with respect to the pronominal within the

22 Mahajan’s own theory of the Hindi binding patterns does not directly involve linear order; linear order is encoded in c-command relations. See Bresnan (1998) for comparative discussion and review of order-free theories of operator binding.
clause, and binding entails no precedence violation. This accounts for another Hindi pronominal binding pattern, illustrated in (38) (Mahajan 1990, p. 42):

\[(38) \quad [kis-ko/sab-ko, \quad raam-ne \quad socaa \quad [ki \quad [e], \quad uskii, \quad bahin-ne \quad who-(EDO)/everyone-(EDO) \quad Ram.(SUB) \quad thought \quad that \quad his \quad sister-(SUB) \quad dekhaa \quad thaa]? \]

seen \quad be.pst

“Who \_i did Ram think was seen by his \_i sister?”

“Everyone \_i, Ram thought was seen by his \_i sister.”

Not all languages make use of a precedence condition on pronominal binding. In Chichewa, complements follow their heads; but Chichewa allows the subject to be ordered before or after the VP, as we saw in Chapter 8. Regardless of linear order, the subject can bind into the object as in (39a,b), but not vice versa as in (40a,b) (Bresnan 1998):

\[(39) \quad a. \quad Mu-nthu \quad á \quad lí \quad yënse\_i, \quad á-ma-lemekézá \quad ma-kóló \quad áke\_j, \quad 1-person \quad 1 \quad every \quad 1 \quad s-pres.hab-respect \quad 6-parent \quad 6 \quad poss.iii.sg

“Every person \_i respects his \_j parents.” (possibly \(i = j\))

b. Á-ma-lemekézá \quad ma-kóló \quad áke\_j, \quad mu-nthu \quad á \quad lí \quad yënse\_i, \quad 1 \quad s-pres.hab-respect \quad 6-parent \quad 6 \quad poss.iii.sg \quad 1-person \quad 1 \quad every

“Every person \_i respects his \_j parents.” (possibly \(i = j\))

\[(40) \quad a. \quad Ma-kóló \quad áke\_j, \quad á-ma-lemekézá \quad mu-nthu \quad á \quad lí \quad yënse\_i, \quad 6-parent \quad 6 \quad poss.iii.sg \quad 6 \quad s-pres.hab-respect \quad 1-person \quad 1 \quad every

“His \_i parents respect everyone \_j.” (\(i \neq j\))

b. Á-ma-lemekézá \quad mu-nthu \quad á \quad lí \quad yënse\_i, \quad ma-kóló \quad áke\_j, \quad 6 \quad s-pres.hab-respect \quad 1-person \quad 1 \quad every \quad 6-parent \quad 6 \quad poss.iii.sg

“His \_i parents respect everyone \_j.” (\(i \neq j\))

The operator binding condition in Chichewa is based on syntactic rank, as defined in (41) and (42):

\[(41) \quad \textbf{Rank condition on pronominal binding:}

The domain of a binder excludes any pronominal contained in a constituent that outranks the binder.

\[23\] The function of a scrambled empty category can be determined by applying to it the lexocentric case principles of function specification; these principles associate a syntactic function with a constituent conditional upon the case attributes of the constituent in f-structure. Although an empty category of course lacks any functional attributes in itself, it corresponds to the same f-structure unit as the binder, through which its case attribute appears.
We define syntactic rank as in (42):\(^\text{24}\)

\[(42) \quad \text{Definition of syntactic rank:}
\]

Given the functional hierarchy
\[
\text{SUBJ} > \text{OBJ} > \text{OBJ}_\theta > \text{OBL}_\theta > \text{COMPL} > \text{ADJUNCTS},
\]
\(\alpha\) outranks \(\beta\) if \(\alpha\) and \(\beta\) belong to the same f-structure and \(\alpha\) is more prominent than \(\beta\) on the functional hierarchy, or if \(\alpha\) outranks some \(\gamma\) that contains \(\beta\).

According to this definition, the subject outranks the object and every subfunction of the object in f-structure. Thus in (39) the quantified subject can bind the possessive pronoun in the object, regardless of their relative linear order. Conversely, when the possessive pronoun is part of the subject, as in (40), it is excluded by (41) from being bound by a quantified object. Kiswahili is another Bantu language like Chichewa which has an order-free condition on operator binding of pronominals (Bresnan 1998).

What do the precedence condition (34), found in Malayalam and Hindi, and the syntactic rank condition (41), found in Chichewa and Kiswahili, have in common? It appears that there is a fundamental unifying principle constraining pronominal binding relations in f-structure (Bresnan 1998, p. 75):

\[(43) \quad \text{Prominence principle:}
\]

A binder excludes from its domain any personal pronouns more prominent than it.

\[(44) \quad \text{The domain of a binder is the minimal clause or predication structure containing it (formally modeled as the minimal f-structure).}
\]

Binder and bindee are both represented in parallel, nonhomogeneous structures, which model different dimensions of linguistic substance. Linear order is a prominence relation native to c-structures (which model the ordering of overt, perceptible expressions). Syntactic rank is a prominence relation native to f-structures, which model the grammatical relations among all syntactic functions, whether expressed or unexpressed.\(^\text{25}\) Because the linked parallel structures of this framework can mismatch in the ways illustrated, the prominence principle translates into distinct relations which do not necessarily converge. An element may be of low syntactic rank and at the same time highly prominent in the linear order, or

\[\text{24}\] The complement functions xcomp and comp are here grouped together as compl; see Chapter 6 footnote 15.

\[\text{25}\] Thematic prominence is native to a-structures, which model the grammatically expressible participants of eventualities. Interactions of thematic prominence with pronominal binding are noted in Jackendoff (1972) and many subsequent references including Bresnan (1998). For further references, see Chapters 11 and 14.
it may be of the highest rank but unexpressed and therefore lacking in any linear order relations at all. It has been hypothesized that languages select their binding conditions by adopting these universal but conflicting dimensions in different combinations or prioritizations (Bresnan 1998; Choi 2001).

An interesting illustration of the latter possibility comes from German. German has been argued to have both precedence and syntactic rank conditions on operator binding of pronouns (Haider 1989; Choi 2001; Berman 1997). The following are examples of German scrambling in subordinate clauses.

(45) a. daß jeder, seine, Mutter mag
that everyone.nom his mother.acc likes
“that everyone likes his mother”

b. daß jeden, seine, Mutter mag
that everyone.acc his mother.nom likes
“that his mother likes everyone”

c. daß seine, Mutter jeder, mag
that his mother.acc everyone.nom likes
“that everyone likes his mother”

d. * daß seine, Mutter jeden, mag
that his mother.acc everyone.acc likes
“that his mother likes everyone”

The only example which lacks a bound reading is (45d). The Hindi equivalent of (45c) would not permit binding, but in German a pronoun can precede its binder within the same clause as long as the constituent it is contained in does not have greater hierarchical prominence than the binder. Binding is possible in (45c) because the binder is a subject and the preceding pronoun is contained in an object. In (45d), the binder is an object and the preceding pronoun is contained in a subject, which outranks the binder on the functional hierarchy. Thus we have the following binding condition:

(46) **Precedence-rank condition on pronominal binding:**

A pronominal that both f-precedes a binder and is contained in a constituent that outranks the binder is excluded from the domain of the binder.

Syntactic rank is defined as before by (42).

---

26 There is some speaker variation in the exact prominence conditions applicable; some speakers only have a subject/nonsubject asymmetry, while others show asymmetries with multiple objects as well. See Choi (2001), Berman (1997), and Bresnan (1998) for discussion and references.

27 This account is based on Bresnan (1994a, 1995b, 1998), Choi (1996, 1999, 2001), Berman (1997), and discussions between Berman and Bresnan in the fall of 1997.
To see clearly how this condition applies to the examples in (45), consider the structure of (45b):

(47) shows *seine Mutter* in the subject (specifier of IP) position, with the accusative object *jeden* adjoined to the IP. The endocentric and lexocentric principles of function specification will yield full annotations, including those shown in (48):

The precedence-rank condition on operator binding (46) does not exclude the possessive pronoun *seine* in (48) from the binding domain of the quantifier *jeden*. The reason is that although the pronoun is contained in the subject, which does outrank the object binder, the pronoun fails to precede that object. Exclusion in German requires high prominence along the dimensions of both precedence and syntactic rank. Binding of *seine* by *jeden* is therefore possible in (48). Example (45c) has the same c-structure, except that the roles of ‘his/her mother’ and ‘everyone’ are interchanged. Again, the pronoun fails to meet both prominence conditions and is not excluded from the domain of the binder.

Clause-internal topicalization and question formation in German show exactly the same gapless pattern of operator binding that we see with scrambling in (45) (Berman 1997):
This result is in accordance with our theory: because dependent-marking function specification can apply to NPs/DPs in any position within the clause, economy of expression will exclude gaps for any of the clause-internal NPs/DPs, whether they are ordered according to scrambling, topicalization, or question formation.

Now, in German as in Hindi, clause-internal and crossclausal reorderings have been reported to give rise to different pronominal binding effects (Haider 1989; Frey 1993; Berman 1997). When topicalization or question formation in German crosses a clause, the present theory predicts that a gap must be present in the lower clause to permit the identification of the within-clause function of the preposed constituent. When this gap follows a pronoun argument of the matrix verb, it alters the f-precedence relations of the binder and pronoun, and the pronoun will be excluded from the domain of the binder by (46):

(50)  *Jeden/Wen_i mag seine_i Mutter, habe sie getröstet.
      everyone.acc/whom.acc said his mother.nom has she consoled

     Lit.: *“Everyone, his mother said she consoled.”/
       *“Whom, does his mother say she consoled?”

The possessive pronoun seine both f-precedes the binder (by virtue of preceding the object gap left by extraction of the binder) and is contained in a constituent (the matrix subject) which outranks the binder as object, because the subject is higher on the functional hierarchy than the clausal complement which contains the object.

But in this case, the pronoun is already outside the binding domain of the operator, which has been defined in (44) to be the minimal clause or predication structure that contains the operator; here that is the lower clause. The domain
constraint is motivated independently of extraction by synonymous examples like the following:28

(51)  a.  * Seine, Kinder wissen, daß jeder nun heimgeht.
    his children.NOM know that everyone now goes-home

   b.  * Daß jeder nun heimgeht, wissen seine Kinder.
      That everyone now goes-home, know his children.NOM

Thus the operator domain already excludes German, shown by (50), as it does the corresponding Hindi case (37), independently of the prominence principle (43) in each language.

In contrast, an extracted binder can bind a pronoun within the subject of the complement clause it is extracted from in German, just as in Hindi, because the pronoun is within the domain of the operator and prominence is not violated:

(52)  Jeden/Wen sagt sie, habe seine Mutter getröstet.
      everyone/whom said she has his mother consoled
      Lit.: * “Everyone, she said his mother consoled.”/
      “Of whom did she say that his mother consoled him?”

Prominence is not violated in German because the gap can be positioned within the complement clause before the bound pronoun, so that (46) is not violated.

Finally, let us consider English as a Germanic language without scrambling. The following examples are parallel to the examples (49) of topicalization in German:29

(53)  a.  Everyone should like his mother. [possibly \( i = j \)]

   b.  * Everyone, his mother should like. [\( i \neq j \)]

   c.  His mother, everyone should like. [possibly \( i = j \)]

   d.  * His mother should like everyone. [\( i \neq j \)]

In English, unlike German, clause-internal topicalization of an object binder over a subject constituent containing a possessive pronoun, as in (56b), prevents binding. Given that English is not a scrambling language, this pattern is exactly what we expect from the precedence-rank condition on operator binding (46). The lack of bound interpretations in (53b,d) has a uniform explanation: the pronominal both f-precedes the binder and is contained in a constituent which syntactically outranks the binder. In (53b) the pronoun his is contained in a constituent, the

---

28 The observation about (44) and the examples in (51a,b) are due to Judith Berman (personal communication, December 5, 2000 and October 26, 2012).

29 As noted in Bresnan (1998), judgments of the English data by some other researchers vary from those reported in Bresnan (1994a, 1995b). The present account is both a reanalysis and re-evaluation of the relevant English data.
subject, that outranks the object *everyone*. Here *everyone* is extracted from its within-clause position as object of the verb *likes* by topicalization, as illustrated in (54):

\[(54)\]

\[
\begin{array}{c}
\text{everyone} \\
\downarrow \\
\text{his mother} \\
\downarrow \\
\text{should} \\
\downarrow \\
\text{like} \\
\end{array}
\]

Hence there is a gap represented by an empty DP/NP in the object position, and the f-structure operator is expressed by a discontinuous constituent, made up of the contents of the adjunct to IP and complement of VP. In (54) the pronoun f-precedes the binder.\(^\text{30}\)

Given that English and German share the precedence-rank condition on binding (46), the differing binding patterns of topicalized quantifiers can be traced directly to the presence of the gap in English and its absence in German:

\[(55)\]
\[
\begin{array}{c}
a. \quad \ast \text{Everyone, his mother likes.} \\
b. \quad \text{Jeden mag seine Mutter} \\
\quad \text{everyone likes his mother.}
\end{array}
\]

“Everyone is liked by his mother.”

Lit.: “Everyone, his mother likes.”

If the quantifier *jeden* (*everyone (accusative)*) were identified with a gap in (55b), the possessive pronoun would fail the constraint on operator binding, just as the English example does in (54). But this, the extraction analysis of (55b), is ruled out by economy of expression, because of the availability of the nonconfigurational means of function specification. Without a gap, *jeden* under this analysis is a single

---

\(^\text{30}\) Note that in (53c) the possessive pronoun f-precedes the quantifier, even though the topicalized phrase containing the pronoun does not f-precede the quantifier: the topicalized object is a discontinuous constituent with two exponents, but the possessive pronoun within it is not discontinuous. Though *his* f-precedes its quantifier binder, it is not contained in a constituent which outranks that binder: instead, the subject *everyone* outranks the object *his mother*. Binding is therefore not ruled out by (46).
Topicalization and Scrambling

continuous constituent which the pronoun cannot f-precede. Binding is therefore possible.

Exercise

Draw the annotated c-structure and the f-structure for the German example (55b). Explain in detail why the pronoun does not f-precede the binder in (55b) but does in (55a). Hint: Consider the analysis of German word order in Problem Set 4.

Further reading and discussion

The crossover effect

It is often difficult or impossible for a wh-phrase to cross over a coindexed pronoun, a description that assumes the wh-phrase is moved from a base position. This is called the “crossover effect” (Postal 1968, 1971; Wasow 1972). In strong crossover (56b), the pronoun c-commands the wh-trace:

(56)  a.  Who\textsubscript{i} e\textsubscript{i} thinks he\textsubscript{i} is strong?
     Asks for the set of all x such that x thinks x is strong

b.  * Who\textsubscript{i} does he\textsubscript{i} think e\textsubscript{i} is strong?
     Asks for the set of all x such that x thinks x is strong

In weak crossover (57b), the pronoun does not c-command the wh-trace. Violations of weak crossover are typically deemed in the literature to be “weaker” than violations of strong crossover (hence (57b) is “less ungrammatical” and thus marked with ?*, while (56b) is marked with *):

(57)  a.  Who\textsubscript{i} e\textsubscript{i} loves his\textsubscript{i} mother?
     Asks for the set of all x such that x loves x’s mother

b.  ?* Who\textsubscript{i} does [his\textsubscript{i} mother] love e\textsubscript{i}?
     Asks for the set of all x such that x’s mother loves x

This was extended to also explain the difficulty of binding in (58), on the assumption that the quantifier everyone would have to move covertly to a higher position in order to derive the desired logical form:

(58)  * His\textsubscript{i} mother loves everyone\textsubscript{i}.
     Intended meaning: For every person x, x’s mother loves x.
For more on the LFG approach to crossover effects presented in Section 9.5, Bresnan (1998) is recommended. There are many additional sources of variation in judgments of weak crossover examples in English and other languages; see Bresnan (1994a, 1995b, 1998) for relevant discussion and references.

Dalrymple et al. (2001, 2007) argue for eliminating all recourse to empty categories in LFG by using “outside-in” functional uncertainty rather than the inside-out version employed in the present framework. (See Chapter 4.) They have redefined the operator binding conditions given here to account for the varying precedence effects on operator binding, although their particular proposals differ empirically in some respects and they reject some judgments given here and elsewhere in the literature about the clause-internal effects of linear order on operator binding.

A more important consideration is that the present theory attempts to derive differences in operator binding patterns across languages from the typology of function identification, which is grounded empirically in the perceptible phenomena of word order, morphological exponence, and null anaphora discussed in this and previous chapters. Precedence effects on operator binding differ between English and German, for example, because English relies more heavily on rigid c-structure to identify grammatical functions than does German: German is a scrambling language and English is not.

Two types of null pronominals

In some languages it has been argued that null pronominals pattern with overt pronouns with respect to linear ordering constraints on binding. In Navajo, for example, null pronominals seem to show a precedence effect for noncoreference (Platero 1974, 1978). But there is an obvious typological difference between Navajo and the Malayalam-like languages discussed in the text above. Navajo, as we saw in Chapter 8, has pronominal inflections. These are overt morphological exponents of f-structure pronouns, expressed in c-structure as head-marking morphology. Hence, according to our theory, the latter null pronominals are not actually “null” at all, but have c-structure correspondents – not empty categories, which are ruled out by economy of expression, but the pronominal inflections themselves. Bresnan (1998) argues that it is these morphological exponents whose linear order relations determine pronominal binding in Navajo. In contrast, Malayalam has no verbal agreement morphology, but allows its direct argument functions (subjects and objects) to be unexpressed, giving rise to a definite pronominal interpretation. Formally, the null pronominals of Malayalam are simply analyzed as default f-structure arguments provided to the nucleus of the verb, as noted above. The same is true for the other languages of this type. See Section 13.2 example (38) for a conditional constraint on null subjects of this kind, which can also serve as the basis for a constraint on null objects. See Bresnan (1998) for further discussion.
Generalization to operator complexes

The term “operator” is commonly used for both quantifiers and interrogative words. Operators in this sense have a special property with respect to the binding theory. In English, but not all languages, an operator binder can inherit the syntactic rank of an operator complex it is embedded in. A simple characterization of “operator complex” is that it is a phrase that “pied pipes” (Ross 1967) with an operator, as illustrated in the following example:

(59)  
Operator

Whose brother’s friend did you visit?

Operator complex

What counts as an operator complex varies across languages and may be somewhat variable across speakers of the same language. Common English operator complexes include phrases whose specifiers are (true) variable-binding quantifiers (e.g. every woman, no man, what book), possessors (e.g. no man’s children, whose sister’s friend), and prepositional phrases dominating operator-complex objects (e.g. to every woman). In the case of simple NP (or DP) operators, such as who, whom, everyone, and no one, which are not dominated by pied piping material, we can take the phrase itself to be its own operator complex.

The crucial property of operator complexes is this: an operator O which by itself does not outrank a pronoun can bind that pronoun if O belongs to an operator complex that does outrank the pronoun. This phenomenon is illustrated in (60) and (61), where the binder in each of the (a) examples does not outrank the pronoun it binds, but the complex it is contained in does.

(60)  
a. Everyone’s mother loves his cute ways.
b. Everyone’s mother loves her free time.

(61)  
a. Whose mother loves his cute ways?
b. Whose mother loves her free time?

---

31 Some material in this section is taken from Bresnan (1994a).
32 In Malayalam (Mohanan 1981), in Chinese (Higginbotham 1980), and in Hungarian (Kiss 1987), it appears that an operator complex is limited to the operator phrase itself.
33 It is possible that every, which, and the other variable-binding operators are “unselective” quantifiers or polyadic operators over all of the predicates in the operator complex:

(i) every man’s mother: (\(\forall x, y\))(\(x\) a man)(\(y\) the mother of \(x\)) \(\rightarrow \ldots\)
It is straightforward to generalize the relation of outranking to operator complexes:\(^{34}\)

(62) If \(O\) is an operator, \(O\) outranks \(B\) if \(O\)’s operator complex outranks \(B\).

Finally, note that ordinary DP specifiers which are not operators are not affected by (62). This accounts for the contrasts in (63) noted by Wasow (1979) and referred to in subsequent literature as “secondary crossover” (cf. Postal 1993, Safir 1996):

(63) a. John,\(_i\)’s mother, his,\(_i\) friends adore.
    b. * Everyone,\(_i\)’s mother, his,\(_i\) friends adore.
    c. * Whose,\(_i\) mother do his,\(_i\) friends adore?

**Other factors**

Other factors are known to affect operator binding, including thematic prominence, intonation, and focus structure. See Bresnan (1994a, 1998) for further discussion and references.

---

\(^{34}\) Bresnan (1994a) has an operator inherit the domain rather than simply the rank of its operator complex. This broader generalization is not taken here because of differences in the linear order effects of operators and their operator complexes.
Part IV

On Functional Structures: Binding, Predication, and Control

Introduction

In the preceding chapters of Part III – on endocentricity and its alternatives (Chapter 6), head positioning (Chapter 7), pronominal incorporation (Chapter 8), and scrambling (Chapter 9) – we have seen that hierarchical phrase structure is diminished or pre-empted in varying ways by the presence of rich morpholexical specifications. After this exploration of phrase structure variation, we now turn to functional structure.

F-structure models the abstract (not always overtly expressed) predication relations that grammars systematize. One overt index of abstract subject–predicate relations is the binding of reflexive pronouns, which is the topic of Chapters 10 and 11. Chapter 12 takes up the LFG model of predication and functional control, Chapter 13 distinguishes anaphoric from functional control, and Chapter 14 outlines the lexical mapping theory of how skeletal f-structures are projected from argument structures. The LFG literature on these topics is too large to permit full discussion here of all of the various theoretical developments and empirical results. Instead, the aim of Part IV is to enable the reader to understand the fundamental issues that have guided work in LFG and to read critically the LFG literature.
The binding theory of transformational generative grammar refers to a selected class of phrase structure positions (argument and nonargument positions), a relation of relative prominence among them (c-command), a typology of the elements that enter into binding relations (anaphors, pronominals, referring expressions), and designated regions of phrase structure within which the binding relations hold for these elements (e.g. governing category). All of the definitions of the theory presuppose the configurational design of universal grammar (Chapter 1). In LFG, in contrast, binding theory is defined at the level of functional structure (and argument structure – Chapter 14), because anaphors, pronominals, and referring expressions are not uniformly represented in c-structure positions across languages or even within the same language, as we have seen.

10.1 Basic concepts

The basic concepts of binding theory in LFG abstract away from phrase structure. In place of argument and nonargument positions in phrase structure, we have argument and nonargument functions (Chapter 6). In (1) the functions are arranged according to the functional hierarchy, with the subj as the most prominent function:

(1) Functional hierarchy:

```
subj > obj > objθ > oblθ > compl > adjunct
```

Note that this hierarchy excludes grammaticalized discourse functions topic and focus. These are the only syntactic functions which are not directly associated with a pred by the coherence condition (Chapter 4): to satisfy coherence, they must be identified with one of the functions on the functional hierarchy (1).

---

1 The complement functions xcomp and compl are grouped together as compl; see Chapter 9, footnote 24.
In place of c-command, a relation of relative prominence on phrase structure,\(^2\) we have syntactic rank, a relation of relative prominence on functional structure based on the functional hierarchy (1) (Chapter 9):

\[(2) \textbf{Syntactic rank:}\]

\[A \text{ locally outranks } B \text{ if } A \text{ and } B \text{ belong to the same f-structure and } A \text{ is more prominent than } B \text{ on the functional hierarchy (1). } A \text{ outranks } B \text{ if } A \text{ locally outranks some } C \text{ which contains } B.\]

The concept of syntactic rank can be formalized using the concept of inside-out functional uncertainty (Section 4.8). See Section 10.4 below.

In place of governing category, defined in terms of X’ theory,\(^3\) we have the concept of the nucleus of an f-structure:

\[(3) \textbf{Nucleus:}\]

\[\text{Given an f-structure } f, \text{ the nucleus of } f \text{ is the subset of } f \text{ consisting of the pred element and all of the elements whose attributes are functions designated by the pred.}\]

In other words, a nucleus is the subset of an f-structure consisting of its pred and argument functions, and omitting any nonargument functions. This characterization of nucleus is equivalent to saying that the nucleus is the complete and coherent subset of \(f\), using coherence and not extended coherence (Chapter 4).\(^4\)

Finally, to characterize the typology of elements that enter into binding relations, we will assume the attributes of (personal) pronouns shown in (4). Here pers, num, gend, and nucl(ear) are the actual f-structure attributes of the types which were abbreviated by the metaclassifications agr and bind referred to in Chapter 8. Thus, in (4) agr and bind are not attribute names but simply metaclassifications which show the groupings of types of features. The feature values shown belong to the pronoun she:

\[(4) \begin{bmatrix}
\text{agr} \\
\text{bind}
\end{bmatrix} = \begin{bmatrix}
\text{pers} & 3 \\
\text{gend} & \text{fem} \\
\text{num} & \text{sg}
\end{bmatrix} = \begin{bmatrix}
\text{nucl} & - \\
\text{index} & i \\
\text{pred} & \text{‘pro’} \\
\text{case} & \text{nom}
\end{bmatrix}\]

---

\(^2\) C-command is defined in Chapter 7; several variant definitions are possible.

\(^3\) The governing category has gone through many formulations; for present purposes it can be thought of as the minimal sentential or nominal category that properly contains the element under consideration.

\(^4\) The reader may have questions about the nuclei of prepositional phrases; see Section 12.3 for further discussion.
The feature \([\text{nuclear} +]\) is a lexical property of reflexive pronouns such as \textit{herself} and \textit{ourselves} as well as other reflexive pronouns and bound anaphors. The feature \([\text{nuclear} -]\) is a property of nonreflexive personal pronouns. Ordinary (nonpronominal) nominals will lack this feature, and can be characterized by a negative existential constraint \(\neg (\uparrow \text{nuclear})\) in their lexical specifications; this requires that there be no value for a \text{nuclear} attribute in the f-structure.\(^5\) \text{nuc} will be an abbreviation of \text{nuclear}. Nuclearity cannot be reduced to coindexing; see Section 11.5 and references therein.

We will begin with a preliminary version of binding theory which, although it is inadequate, illustrates certain essential concepts of a binding theory within the architecture of LFG. Notwithstanding the inadequacies of this theory, the exercise of reformulating it in the present framework is useful. It shows why the asymmetrical coreference patterns generated by principles A–C (see below) occur in the varying c-structure types discussed in Part III.

10.2 A toy binding theory

\textit{toy:}
1: an artifact designed to be played with \([\text{syn}: \text{plaything}]\)
2: a nonfunctional replica of something else (frequently used as a modifier);
   “a toy stove”
3: a copy that reproduces something in greatly reduced size
   \([\text{syn}: \text{miniature}]\)
   (from WordNet)

Our toy binding theory is modeled on the textbook binding theory of generative grammar.\(^6\) It is based on the conception of the binding relation as given in (5):

\begin{equation}
(5) \quad \text{A binds B if A outranks B and A and B are coindexed. B is bound/free if some/no A binds B.}
\end{equation}

For this binding theory it is assumed that there is an \textit{INDEX} attribute whose value determines coindexing relations. The \textit{INDEX} attribute is lexically specified by

\(^5\) Culy (1996) gives evidence for a pronominality feature independent of our binding features, which could also serve to mark pronominality on nominal types.

\(^6\) See Lasnik (1989, ch. 1) for an overview of the various reformulations of binding theory within the configurational design of grammar. Büring (2005) provides an updated and more comprehensive discussion that also takes semantics into account.
nominals heading referring expressions, and the values are feature structures containing *person*, *number*, and *gender* features. We will designate *index* values by variables $i$, $j$, and $k$. Coindexing between two referring elements, such as a pronoun and a proper name, represents (intended or stipulated) coreference (see Section 10.3 below). Thus, we formulate the bind relation as in (6):

\[(6) \quad A \text{ binds } B \text{ if } A \text{ outranks } B \text{ and } (A \text{ index}) = (B \text{ index}).\]

In the f-structure (7), the *subj* binds the *obj*, but the *obj* does not bind the *subj*. Binding requires both coindexing and outranking; the *subj* outranks the *obj*, but not conversely (this binding relation is rejected as ill-formed by principle C, as we will see below):  

\[(7) \quad \begin{array}{c}
\text{PRED} \quad '{\ldots}' \\
\text{CASE} \quad \text{NOM} \\
\text{PERS} \quad 3 \\
\text{GEND} \quad \text{FEM} \\
\text{NUM} \quad \text{SG} \\
\text{NUCL} \quad - \\
\text{INDEX} \quad i \\
\text{PRED} \quad '{\text{Ann}}' \\
\text{GEND} \quad \text{FEM} \\
\text{NUM} \quad \text{SG} \\
\text{INDEX} \quad i
\end{array}\]

We will use the convention of referring to f-structures with double quotes around the English word they correspond to, with the index value simply subscripted. For example, the subsidiary subject and object f-structures of (7) will be abbreviated as in (8):

---

7 Pronoun–antecedent agreement in person, number, and gender is not accounted for in this chapter. One approach to anaphoric agreement, which is presented in Section 8.4 above, assumes that the value for the *index* feature is an f-structure containing the *pers*, *num*, and *gend* features. In order to simplify the formal presentation of anaphoric binding, that account is not adopted in this chapter; instead, the *index* takes a simple variable as its value, as described above.
Given this conception of binding, it is straightforward to state the binding principles given in (9a–c). A definition of the binding principles in the formal constraint language of Chapter 4 will be given in Section 10.4:

(9) a. **Principle A:**
A nuclear (reflexive) pronoun must be bound in the minimal nucleus that contains it.

b. **Principle B:**
A nonnuclear pronoun must be free in the minimal nucleus that contains it.

c. **Principle C:**
(Other) nominals must be free.

These binding principles are named after those of the configurational binding theory (Chomsky 1981) and have much the same effect for English, as we will now see.

The following examples illustrate principle A:

(10) a. Ann$_i$ saw herself$_i$.

b. *Ann$_i$’s father saw herself$_i$.

c. *Herself$_i$ yawned.

d. *Ann$_i$ thinks that herself$_i$ is great.

In (10a), Ann$_i$ saw herself$_i$, the sentence is well-formed because the reflexive object herself is bound by the subject Ann in its nucleus: the subject outranks the object and is coindexed with it (we use square brackets to enclose our double-quoted expressions introduced in (8) to emphasize that they are f-structures):

---

8 This binding theory is somewhat oversimplified, in that there are certain asymmetries in the binding domains of reflexives and pronominals that are not captured. These are considered further below.
In (10b), *Ann’s father saw herself*, Ann is coindexed with the reflexive, but does not outrank it, so the reflexive is not bound in its nucleus:

(12)

Note the reason that Ann does not outrank the reflexive object in (12). Because Ann is a subfunction of the subject Ann’s father, it is not a member of the same f-structure as the reflexive object, nor is it a member of the same f-structure as any constituent that contains the reflexive object; hence it cannot be taken as the outranking element $A$ in our definition (2).

In (10c), *Herself yawned*, the reflexive subject is not bound by any element of its nucleus, for no function outranks the subject:

(13)

Finally, in (10d), *Ann thinks that herself is great*, the reflexive subject is bound, but it is not bound in its nucleus, which includes only the f-structure of the embedded complement.

Principle A accounts for cases of nonsubject binding of reflexives as well. Just as the subject outranks the complement and adjunct functions in (1), so the

---

9 Here we are taking the possessor function, designated POSS in LFG, to be the Spec of DP analogous to the SUBJ as the Spec of IP. The possessor outranks complements of nominals. We are also assuming that there is a lexical possessor template augmenting the lexical forms of nominals to take a possessor argument: ‘mother’ ⇒ ‘mother-of(↑poss)’, etc. See Section 13.2, (29), for an example of a lexical possessor template.
object outranks the restricted object (OBJ₀), allowing examples like I showed Annᵢ herselfᵢ (in the mirror).

Principle B of (9) accounts for examples such as (14a–c).

(14)  a. *Annᵢ saw herᵢ.
     b. Annᵢ saw herᵢ, mother.
     c. Annᵢ thinks that sheᵢ is great.

Example (14a) is ill-formed under the given binding relation because the pronominal object her is bound by the subject Ann within its nucleus. Example (14b), in contrast, is allowed, because the possessor her does not occur in the same nucleus as the subject Ann. A nominal containing a possessor is mapped into its own nucleus, as seen in (12). Similarly, (14c) is allowed because the pronominal she occurs in a separate nucleus from its antecedent (namely, the nucleus of the embedded complement), where it is free as required by principle B.

It is evident that principles A and B as formulated above predict a complete complementarity between reflexive and nonreflexive pronouns within a nucleus: in any given pronoun–antecedent configuration, either the reflexive or the nonreflexive pronoun can be bound, but not both. Now consider (15a,b), where the possessive pronoun can be bound to the subject antecedent, but the possessive reflexive is ungrammatical:

(15)  a. Mary admires her mother.
     b. *Mary admires herself’s mother.

Assuming that the possessor is the most prominent function in the nominal nucleus, serving as the “subject” of the DP or NP, possessive reflexives are predicted not to exist by the binding theory above: for if the possessive pronoun her in (15a) is free to refer to Mary by virtue of being contained within the subsidiary nucleus corresponding to the object DP, then in (15b) that same nucleus would prevent herself from being bound to Mary, which lies outside it. However, there are languages which allow reflexive (nuclear) possessive pronouns in this situation; Faltz (1985, p. 201) cites Tagalog and Turkish as examples. Moreover, there is another possible explanation for the ungrammaticality of (15b): there could simply be a morphological gap in the case paradigm for reflexive pronouns. While personal pronouns have nominative, accusative, and genitive forms in Standard English (e.g. he, him, and his, respectively), the reflexive pronouns lack nominative and genitive cases: neither do distinct forms appear for these cases (e.g. *herself, *himself’s); nor do reflexives occur where these cases are required, as shown by (15b) and by examples like *Mary thinks herself is great.¹⁰

¹⁰ Possessive expressions like her own and their own may be used to convey a reflexive meaning, but they are not bound anaphors themselves, because they need not have an antecedent within the sentence, as in Her own mother agreed, I prefer to hear your own versions of what happened.
To solve this problem, an asymmetry is introduced into the definition of the domain for binding principles (Huang 1983). We can capture this asymmetry as follows in the present framework. Instead of requiring that a reflexive or pronoun be bound or free simply in its minimal nucleus, as in (9), we now require that it be bound or free in the minimal nucleus which could satisfy its binding requirements in principle. For a free form, this would simply be the minimal nucleus containing it. For a bound form, this would be the minimal nucleus containing it and another function that outranks it (a potential binder). We call this the minimal complete nucleus. We will simplify slightly by taking that potential binder to be a subject outranking the pronoun.\(^{11}\)

Now in (15a), the minimal nucleus in which the pronoun \textit{her} could be free is the minimal nucleus containing it, which is just the f-structure with the attributes of the object \textit{her mother}. In (15b), in contrast, the minimal nucleus in which a genitive reflexive (ignoring the morphological gap in English) could be bound in principle is the minimal nucleus containing it and a subject outranking it. The f-structure of the object DP of the verb contains no such potential binder for a reflexive possessive, but the larger nucleus for the sentence does contain one: namely, the subject. Hence, a possessive reflexive would be bound in the larger f-structure. In general, when a reflexive is the highest-ranking function of a nucleus, its binding domain will be the next most inclusive f-structure nucleus that contains a potential binder.

This revised version of principle A predicts that reflexive subjects can exist, but only when they are bound to an argument of a higher nucleus. In English, reflexive subject pronouns do occur in nonfinite clauses, as shown in (16a–c):\(^{12}\)

\begin{equation}
\begin{aligned}
(16) \quad & a. \text{ I don’t want myself getting stuck with all the work.} \\
& b. \text{ Mary wanted more than anything else for herself to be the one chosen.} \\
& c. \text{ What John would prefer is for himself to get the job. \hspace{1em} (Pollard and Sag 1992) }
\end{aligned}
\end{equation}

So far, so good. But why then are reflexive subjects ungrammatical in English finite clauses? This fact could be attributed to the absence of a nominative form of the reflexive pronoun, as noted above:

\begin{equation}
\begin{aligned}
(17) \quad & * \text{ Mary is afraid that herself will get stuck with all of the work.}
\end{aligned}
\end{equation}

The idea that morphological case can constrain the distribution of reflexive pronouns in this way is supported by Maling (1984). She shows that the failure of the

\(^{11}\) This is an adaptation of Dalrymple’s (1993) formalization of “minimal complete nucleus.” See Section 10.4.

\(^{12}\) The infinitival examples are best with some emphasis on the reflexive subject, possibly because of the availability of a control construction with the same meaning as the reflexive example without emphasis: \textit{Mary wanted more than anything else to be the one chosen, What John would prefer is to get the job.}
Icelandic reflexive pronoun to appear in subject position in subjunctive clauses can be attributed to a morphological gap: Icelandic lacks nominative reflexive forms. Icelandic has both non-nominative subjects and nominative objects (Zaenen et al. 1985; see also part 2 of Problem Set 5). Interestingly, the reflexive pronoun can appear in the position of the former but not the latter:

(18) \[ Húni sagdi a sér, pætti vænt um mig. \]
\[ \text{she.NOM said that self.DAT was.SUBJN fond of me.ACC} \]
\[ \text{“She said she was fond of me.”} \]

(19) \[ * \text{Honum líkar sig.} \]
\[ \text{he.DAT like.PRES self.NOM} \]
\[ \text{“He likes himself.”} \]

This pattern is exactly what the morphological gap proposal would predict. Although nominative reflexives are lacking in English, Icelandic, and many of the Indo-European languages to which they are related, such reflexives do exist elsewhere. K. P. Mohanan (1982a, p. 179), for example, cites the following case of long-distance reflexivization in Malayalam (the Dravidian language discussed in Chapters 3 and 9), in which both the pronoun \( \text{awan} \) and the reflexive \( \text{taan} \) are in the nominative case:

(20) \[ kuṭṭi ammayoott[a[taan/awan aanaye nulli eṇṇa] paraṇṇu. \]
\[ \text{child mother self.NOM/he.NOM elephant pinched that said} \]
\[ \text{“The child told the mother that self/he pinched the elephant.”} \]

(In Chapter 11 we discuss the finite domain parameter, which restricts reflexive binding to the minimal finite clause, allowing reflexivization into infinitival complements. This parameter provides an additional possible account of the contrast between (16) and (17).)

For all these reasons, we will revise the elementary binding theory (9) to incorporate the binding asymmetry between nuclear and nonnuclear pronouns. We will adopt a version of Dalrymple’s (1993) definition of the asymmetry:\(^{13}\)

(21) Principles of the (toy) binding theory
   a. **Principle A:**
      A nuclear (reflexive) pronoun must be bound in the minimal nucleus that contains it and a subject outranking it.
   b. **Principle B:**
      A nonnuclear pronoun must be free in its minimal nucleus.
   c. **Principle C:**
      (Other) nominals must be free.

---
\(^{13}\) Many variants are possible, having subtle empirical differences, which we will not pursue here. See Dalrymple (1993) for some further discussion of empirical consequences.
With this modification relevant to principles A and B, let us now turn to principle C. Principle C is illustrated by (22a–c):

\[(22)\]
\[a. \: \ast \: \text{She}_i \text{ saw } \text{Ann}_i.\]
\[b. \: \ast \: \text{She}_i \text{ saw } \text{Ann}_i’s \text{ mother.}\]
\[c. \: \ast \: \text{She}_i \text{ thinks that } \text{Ann}_i \text{ is great.}\]

In (22a) the nominal \textit{Ann} must be free, which means that there cannot be a coindexed element that outranks it; but the subject \textit{she} is such an element, so the binding relation of the sentence is rejected. Exactly the same holds in (22b): the subject \textit{she} outranks the possessor of the object, and so cannot be coindexed with it, making it a forbidden binder. Again, the same applies to (22c).

This familiar binding theory accounts for most of the well-known paradigm of examples within English, and in its configurational versions it has been widely adopted. In its present formulation, it has the advantage of explaining certain effects that do not fall out of the configurational formulation, such as the lack of contrast between (23a,b):

\[(23)\]
\[a. \: \ast \: \text{I convinced } \text{her}_i \text{ that } \text{Mary}_i \text{ should be my domestic partner.}\]
\[b. \: \ast \: \text{I proposed to } \text{her}_i \text{ that } \text{Mary}_i \text{ should be my domestic partner.}\]

In (b) \textit{her} fails to c-command \textit{Mary}, because the PP is a branching node that dominates \textit{her} and not \textit{Mary}, but the noncoreference effect is the same as in (a). The preposition in (b) functions to mark an oblique complement of the verb, and in this case the extra structural embedding created by the PP over the NP is irrelevant to the noncoreference condition, which looks only at the functional relation. Another advantage is that it extends to more or less configurational languages without the imposition of rigid constituent structure requirements, such as the presence of a VP where there is language-internal lexical and syntactic evidence against it, for example the absence of “pro-VP” expressions (e.g. \textit{do so} in English) and the failure of a verb and its complements to behave as a unit under word order variations.

Despite its textbook status, the familiar binding theory (21) is problematic. One reason for its inadequacy is typological: principles A and B provide too impoverished a typology of anaphoric elements (reflexives and pronouns) to explain the variety of anaphoric binding systems found across languages. In addition to nuclear and nonnuclear pronouns, languages have subjective/nonsubject pronominals, logophoric pronouns, and pronominals bound by the argument having the semantically most prominent role in the argument structure – all of which have

---

14 The problem posed by such examples is observed by Reinhart (1983b, p. 179) and Bach and Partee (1980, p. 13). See Chapter 12 for further relevant discussion regarding prepositional phrases.

10.3 Principle C

The idea that nominals are bound by elements that are coindexed with them creates obvious problems with identity statements (Evans, 1980): why does *My mother is Marie Antoinette* not violate principle C? But even if one were to exempt all identity statements from the binding theory, principle C still rules out such perfectly good English sentences as (24a,b):

(24) a. Ann, told Mary that Ann’s mother is a spy.
   b. I know what John and Bill have in common. John thinks that Bill is terrific and Bill thinks that Bill is terrific. (Evans 1980: p. 356)

While English generally avoids repetition of coreferent lexical nominals, the presence of the “bound” nominal in these examples is required to avoid ambiguity. In Malayalam, Thai, and Vietnamese, nominals may appear much more freely in bound positions. Example (25a) is from K. P. Mohanan (1981), and (25b,c) are from Lasnik (1989, p. 153):

(25) a. moohan, moohante, bhaaryaye nulli
   M.NOM M.GEN wife.ACC pinched
   “Mohan pinched Mohan’s wife.” Malayalam

b. coon khit wàà coon chalaàt
   John thinks that John is smart
   “John thinks that John is smart.” Thai

c. John tin John sè thàŋg
   J. believes J. will win
   “John believes John will win.” Vietnamese
It is interesting to observe that in the corresponding sentences with pronouns binding the nominal, coreferential readings are much harder to get in all four languages (K. P. Mohanan 1981; Lasnik 1989, p. 154):

(26)  

a. She, told Mary that Ann,’s mother is a spy. \((i \neq j)\)  
b. I know what John and Bill have in common. John thinks that Bill is terrific and he, thinks that Bill, is terrific. \((i \neq j)\)  
c. *awan, moohante, bhaaryaye nulli*  
pronoun.nom M.gen wife.acc pinched  
“He, pinched Mohan,’s wife.” \((i \neq j)\) Malayalam  
d. *khāw, khít wàà cøn, chàlaát*  
he thinks that John is.smart  
“He, thinks that John, is smart.” \((i \neq j)\) Thai  
e. *Nó, tin John, sê thàng*  
he believes J. will win  
“He, believes John, will win.” \((i \neq j)\) Vietnamese

From these facts we might conclude that while languages vary in their conditions on binding relations among nonpronominal referring expressions, the universal core of principle C asserts that nominals must be “pronoun-free” – that is, must not be bound by a pronoun (Lasnik 1989, p. 154). That this, too, is inadequate is indicated by the existence of well-formed examples such as the following (Bolinger 1979; McCray 1980). In each of these cases, a proper name is coreferential with a pronoun that binds it in the sense of principle C:

(27)  

a. She, was told that if she wanted to get anywhere in this dog-eat-dog world, Mary, was going to have to start stepping on some people.  
b. The teacher warned him, that in order to succeed Walter, was going to have to work an awful lot harder from now on.  
c. It was rather indelicately pointed out to him, that Walter, would never become a successful accountant.  
d. It obviously surprises him, that John, is so well liked.  
e. What did John, do? He, did what John, always does – he, complained.

These examples cannot be distinguished from principle C violations such as (26a) on the basis of their syntactic structure. For example, the c-structure of (27a) clearly has the subject pronoun c-commanding the coreferential NP:
What seems to determine their acceptability, according to Bolinger (1979) and McCray (1982), is that the preference in choosing between coreferential pronouns and lexical nominals depends on what is important to the speaker, as conveyed in theme–rheme organization. The subject, as the default topic, has a special role in this organization, but one which can be overridden.\(^{15}\)

These considerations all suggest that coreference is a relation that is not strictly subject to syntactic principles. This is the conclusion that both Evans (1980) and Reinhart (1983a,b) argue for: syntactic constraints on binding should not be about coreference relations among nominals in general, which are subject to pragmatic strategies and theme–rheme organization, but about the relation of referential dependence between pronominal elements and their antecedents (or binders in a semantic sense). How can pronominal binding in this sense be distinguished from pragmatic coreference? Reinhart’s (1983b) proposal is that true binding creates sloppy identity effects. An example is given in (29):

(29) Every woman admired her mother, and every girl did, too.

There are several possible readings of this sentence. In the strict identity reading, the mother of some particular woman – call her Mary – who was admired by every woman was also admired by every girl. The strict interpretation can be expressed as the property of \(x\) in which \(x\) admired her (\(=\) Mary’s) mother; the referent of

\(^{15}\) Sells (1987b) discusses these examples in terms of the discourse-based concept of “anti-logophoricity.”
the pronoun *her* is strictly fixed for both conjuncts. In the sloppy identity reading, in contrast, every girl admired her own mother, and in doing so was doing the same thing as every woman in the first conjunct. “The same thing” in this case can be expressed as the property of *x* in which *x* admired *x*’s mother. In this way the binding of a pronoun by a quantifier gives rise to a sloppy identity reading; the referent of *her* is not strictly fixed for both conjuncts, but sloppily varies with the antecedent. Reinhart (1983b) shows that the same is true for ordinary nonquantificational NPs, and argues that this fact can be explained if such NPs can also semantically bind pronouns. Thus (30) is ambiguous in the same way as (29):

(30) Mary admired her mother, and Susan did, too.

In the strict readings Susan admires Mary’s or someone else’s mother, who is also admired by Mary; in the sloppy reading, Susan admired her own mother.

Sloppy identity is a necessary condition of semantic binding, but not a sufficient one. To see this, we must first distinguish bound pronouns from what Evans (1980, p. 339) dubs **E-type pronouns**:

(31) a. Few congressmen admire only the people they know.
   (bound pronoun)

   b. Few congressmen admire Kennedy, and they are very junior.
   (E-type pronoun)

An E-type pronoun refers to a set or individual defined by its quantifier phrase antecedent, but not bound by that antecedent. E-type pronouns can be distinguished by the following tests. First, they lie outside the normal binding domain of their antecedents; thus, in (31b) *they* and *few congressmen* lie in separate sentential conjuncts, and could even occur in separate sentences. Second, one can sensibly ask what the E-type pronoun refers to, but this question is not sensible for quantificational binding. In (31b), for example, *they* refers to the congressmen that admire Kennedy; in (31a), in contrast, the reference of *they* cannot be fixed because it varies with the interpretation of the quantifier. Third, replacing the quantifier in the antecedent of an E-type pronoun by *no* renders the E-type pronoun nonsensical, but the bound pronoun continues to be interpretable:

(32) a. No congressmen admire only the people they know.
   (bound pronoun)

   b. ?? No congressmen admire Kennedy, and they are very junior.
   (E-type pronoun)

Fourth, E-type pronouns yield different entailments from bound pronouns. They are interpreted, roughly speaking, as resumptive definite descriptions: “the congressmen who admire Kennedy” in the case of (31b). See Heim (1990) and Elbourne (2005) for a review of semantic issues concerning E-type pronouns.
It seems, then, that E-type pronouns are not bound pronouns. Interestingly, though, E-type pronouns also give rise to sloppy identity effects:

(33) Every man who owns a donkey beats it, and every man who owns a mule does, too.

The sentence in (33) can mean that every man who owns a mule beats the mule that he owns. Yet in the left conjunct *it* has all the earmarks of an E-type pronoun, so that pronoun is not bound in Evans’s and Reinhart’s sense.\(^{16}\) Hence, while sloppy identity may be a necessary condition of pronoun binding, it is not a sufficient condition.

The important point made by both Evans (1980) and Reinhart (1983b) is that binding relations in the sense of referential dependence are much more narrowly constrained than coreference relations, and are subject to a syntactic condition. Observe that quantifier scope alone is insufficient to define the domain of possible pronominal binding. In (34a), for example, the quantifier phrase object *every candidate* can have scope over the subject *someone*, yielding the reading that for every candidate there were some, possibly different, voters. But in (34b) we see that the same object cannot easily bind a pronoun contained in the subject (Reinhart, 1987, p. 131):

(34) a. Someone voted for every candidate.
   b. ?? His friends voted for every candidate.

Thus, while it is undoubtedly necessary for a pronominal to lie within the semantic scope of the quantifier phrase that binds it, this condition is not sufficient. A syntactic condition that the pronominal lie in the syntactic domain of its binder is also required.

Further, if we go back to the Bolinger–McCray examples (27) violating principle C and replace the NP by a quantifier phrase, no binding relation is possible:\(^{17}\)

(35) a. *She was told that if she wanted to get anywhere in this dog-eat-
dog world, every woman in the group was going to have to start
stepping on some people.
   b. *The teacher warned him that in order to succeed everyone was
going to have to work an awful lot harder from now on.
   c. *It was rather indelicately pointed out to him that each man would
never become a successful accountant.
   d. *It obviously surprises him that no one is so well liked.

---

\(^{16}\) Reinhart (1987) extends her definition of binding to “specifier binding” in an attempt to assimilate E-type pronouns to bound pronominals.

\(^{17}\) If we replace the singular pronouns in examples (35a,b) with plural pronouns *they* or *them*, coreference seems possible, with the coreferent NP designating a group. The singular pronouns rule out the group reference and so require binding.
Because these quantifier phrases are not referring expressions, both binding and coreference are ruled out in (35). When we reverse the quantifier phrases and the pronominals where possible in (35), we place the latter in the binding domains of the former, and binding is possible:

(36)  

a. Every woman$_i$ in the group was told that if she wanted to get anywhere in this dog-eat-dog world, she$_i$ was going to have to start stepping on some people.

b. The teacher warned everyone$_i$ that in order to succeed he$_i$ was going to have to work an awful lot harder from now on.

c. It was rather indelicately pointed out to each man$_i$ that he$_i$ would never become a successful accountant.

d. It surprises no one$_i$ that he$_i$ is well liked.

What is the domain in which personal pronouns can be bound, then? Evans (1980, p. 341) proposes that a pronoun can be bound by a quantifier phrase only if it precedes and c-commands the pronoun. In contrast to Evans, Reinhart (1983b) proposes that the binder only c-command the pronoun, dropping the precedence requirement of Evans’s formulation. Both Evans and Reinhart restrict themselves to English data; but we saw in Chapter 9 that a pronoun is excluded from the domain of a binder if the pronoun is more prominent than the binder along any of several dimensions that vary crosslinguistically (linear order, syntactic rank, or both, as well as thematic prominence). We will assume that the domain of pronominal binding is defined as in Chapter 9 for personal pronouns (that is, pronouns that bear no positive binding constraints such as [nucl +]). The definition is repeated here:

(37) **Prominence principle:**

A binder excludes from its domain any personal pronouns more prominent than it (as defined in Chapter 9).

The domain of a binder is the minimal clause or predication structure containing it (formally modeled as the minimal f-structure).

Within this domain, any additional negative constraints lexically specified by the pronoun apply as defined in Section 10.4 below. The restriction of the prominence principle (37) to nonreflexive pronouns is supported by divergences in the binding properties of reflexive and nonreflexive pronouns. For example, f-precedence is a prominence condition on the binding of personal pronouns but not reflexives in a number of languages; Malayalam is an example (K. P. Mohanan 1982a).

Are these considerations sufficient to eliminate principle C altogether? It would seem so at first sight: if construed as a condition on coreference, principle C has the counterexamples discussed above, especially sentences of the McCray–Bolinger type (27), which suggest that it is a matter of theme–rheme organization rather than of grammar. If construed as a condition on referential dependence (semantic
binding), many cases that were covered by the old principle C simply fall out of the prominence-based domain constraints on semantic binding discussed in Chapter 9. The failures of binding in (35), for example, all involve pronouns that both precede and (are contained in constituents that) outrank the quantifier phrase; the pronoun therefore cannot be bound by the quantifier phrase, and it makes no sense for the quantifier phrase to be bound by the pronoun.

However, there are other sources of referential dependence besides binding, such as control (Chapters 12 and 13), which indicate a need for a version of principle C. Consider the examples in (38); (38a) implies that the referent of her, if it is the one who visited Sally’s farm, is not Sally:

(38)  a. Visiting Sally’s farm disturbed her.
     (her ≠ Sally if her = the visitor)
     b. Visiting Sally’s farm disturbed her friends.
     (possibly her = Sally)

In an example like (38a), under the interpretation that the referent of her is the visitor, the understood subject of visiting is referentially dependent on its controller her, which is taken to be coreferent with Sally; hence the subject of visiting is indirectly referentially dependent on Sally. The binding domain constraints on referential dependence do not explain the contrast in (38a,b). But principle C does explain it, because the understood subject of visiting outranks the object of visiting: hence this subject cannot corefer with the object. If the controller of the subject is her, as in (38a), then principle C is violated; if the controller is her friends, as in (38b), there is no violation of principle C.

The version of principle C that we adopt here derives from Evans (1980). Evans (1980, p. 358) proposes a condition which states that a pronoun cannot be referentially dependent on a nominal if the pronoun precedes and c-commands the nominal. Translating this into our framework (dropping the precedence condition, which is inapplicable to null pronouns, as we saw in Chapter 9), we can state the following “anti-binding” condition, which is hypothesized to be universal:

(39)  Anti-binding:
      A pronominal cannot be referentially dependent on a nominal that it asymmetrically outranks.

According to the anti-binding condition, the pronouns in (27a–d) are not referentially dependent on the nominals in their domain, although they corefer with

18 Note that the control relation is one of referential dependence, for a quantifier can control an understood subject even in a configuration where direct binding of a pronoun by the quantifier is not possible:
(i) ??His, visiting Sally’s farm disturbed everyone,
(ii) Visiting Sally’s farm disturbed everyone.

19 This condition is given in Bresnan (1994a).
these nominals. On the other hand, the controlled subject of (38a) is (indirectly) referentially dependent on the object, and so is excluded by anti-binding.

Further reading and discussion

The present theory of binding, as we have seen, depends crucially on the functional hierarchy, in terms of which we have defined the f-structure relation of syntactic rank. But as part of a “survey of functional approaches to definite NP anaphora,” Reinhart (1983a, pp. 103–106) argues against a relational theory of noncoreference or anti-binding patterns based on the concept of a hierarchy of functions similar to the one proposed here, i.e. (1). Her basic claim is that such a theory does not explain asymmetries in argument–adjunct coreference relations which depend on the exact phrase structure positions of the argument and the adjunct. For example, she claims that subjects and objects contrast in the possibility of referring to phrases within sentence-level adjuncts, because the subject c-commands these adjuncts, while the object in VP does not:

(40) a. *Shei was last seen when Lolai graduated from high school.
   b. I saw heri last when Lolai graduated from high school.

Similarly, the contrast in (41a,b) Reinhart attributes to the point of phrase structure attachment of the PP, sentential in (a) and verb-phrasal in (b):

(41) a. People still regard himi highly in Carteri’s home town.
   b. *Roslyn met himi in Carteri’s home town.

Finally, she points out that the grammatical relations of phrases do not change when they are preposed, although their c-command relations do. Hence, rank-based functional accounts fail to explain contrasts like those in (42a–c):

(42) a. *With Beni’s peacock feather hei tickled Rosagainly.
   b. With Beni’s peacock feather, Rosa tickled himi gently.
   c. *Rosa tickled himi gently with Beni’s peacock feather.

The with phrase in (42c) is a VP adjunct, which is c-commanded by both subject and object. When this PP is preposed to sentence-initial position, it continues to be c-commanded by the subject, accounting for the ungrammaticality of (42a), but is no longer c-commanded by the object, accounting for the grammaticality of (42b).

However, a closer examination of the data shows that the generalizations they seem to support rather elegantly are false. First, compare (40a) with the following example from Bolinger (1979, p. 302):

(43) Hei’s impossible, when Beni gets one of his tantrums.
The small capitals indicate a pitch peak in the intonation contour of the sentence. Here the subject can be coreferential with an NP in the temporal adverbial clause that it c-commands. Next, compare (41b) with (44):

(44) (Everyone knows that) his wife first met him in the little town of Plains, Georgia, where President Carter grew up.

Here the object can be coreferential with an NP embedded in the locative phrase that it c-commands. Finally, compare the preposed adjuncts in (42a) with (45):

(45) With the peacock feather that Ben had brought with him all the way from Urbana, Illinois, he began to tickle Rosa gently.

There is no difference in c-command relation between the subject and the preposed PP in (42a) and (45), yet the latter is perfectly acceptable.

These examples suggest that c-command is not the true source of the noncoreference effects in examples like (42)–(45). Instead, we must take into account the linear order of constituents, whether they contain given or new information, and the pragmatic effects of using nouns or pronouns. Several related proposals for the cases of English noncoreference considered here have been made by Kuno (1975), Bickerton (1975), and Bolinger (1979) from a functionalist perspective. See also Levinson (1987, 1991) for relevant commentary.

10.4 Formalization of the binding constraints

The grammatical binding constraints we have examined ([nuclear +] and [nuclear −]) can be expressed in the formal constraint language of LFG as lexical properties of pronouns and nominals (Dalrymple 1993). The basic idea is that a pronoun or nominal can lexically specify its binding requirements by means of inside-out designators of the form (46):

(46) \(((\text{DomainPath} \uparrow) \text{Antecedent})\)

The interpretation of this designator can be seen schematically in (47). This diagram depicts a pronoun with a lexical designator of the form (46) occurring in a tree structure as a D contained within a larger sentence structure S. The f-structure for S contains an antecedent. Where this antecedent comes from in the tree structure does not matter: among other possibilities, it could be realized as a pronominal inflection of the verb or auxiliary (Chapters 7 and 8), as a scrambled

---

20 The contrast between examples like (42a) and (45) is observed by Lakoff (1976, pp. 278–279).
21 We have adapted Dalrymple (1993) to the version of binding theory discussed here.
NP in a noncanonical subject position (Chapter 9), or as an NP marked as the subject by agreement or case in a language lacking a VP (Chapters 6 and 7):

(47)

The expression (DomainPath †) is a schema for an inside-out functional uncertainty designator (Section 4.6). It will designate an f-structure through which there is a path (determined by the attributes of the DomainPath) leading to the instantiation of †. In (47) the functional schema of the pronoun is part of its lexical entry. The † will be instantiated as usual to refer to the f-structure of the mother node of the pronoun. Thus, in (47) ((DomainPath †) Antecedent) will be instantiated as ((DomainPath f₂) Antecedent). What does this expression refer to in (47)? Because there is a path of attributes in f₁ to f₂, it is true that f₁ = (DomainPath f₂). Because (f₁ Antecedent) = f₃, we can infer that ((DomainPath f₂) Antecedent) = f₃. Of course, another choice of DomainPath might yield a different antecedent for f₂. In this way, an inside-out functional schema can designate possible antecedents for pronouns.

In general, the positive ([nuclear +]) and negative ([nuclear −]) binding requirements will have the structure in (48):²²

(48)

a. Positive (nuclear) binding constraint:
   ((DomainPath †) Antecedent INDEX) = († INDEX)

b. Negative (nonnuclear) binding constraint:
   ((DomainPath †) Antecedent INDEX) ≠ († INDEX)

(48a) is true if there exists an antecedent satisfying the requirements of the equation. The negative equation in (48b) is true if there is no antecedent accessible from the given DomainPath which is coindexed with the pronoun or nominal bearing the constraint.

A further general property of these binding constraints is that the pronominal f-structure must be outranked by the antecedent f-structure. This condition is expressed by requiring the DomainPath to have a top attribute GF which is

²² This is a simplification of Dalrymple’s (1993) binding constraints, which refer to the semantic projection of the f-structure rather than to the INDEX attributes of the toy binding theory.
dominated on the functional hierarchy (1) by the antecedent. We call this the “f-structure DomainPath condition:”

\[ (49) \textbf{F-structure DomainPath condition:} \]

All DomainPaths in positive and negative binding constraints (48) must be constructed so that: (i) Domain Path = GF \( \alpha \) for some possibly empty attribute string \( \alpha \); (ii) Antecedent = GF'; and (iii) GF' > GF in the functional hierarchy (1).

These definitions are applied as follows. Consider the sentence *Mary likes her mother* with f-structure illustrated in (50):

\[
(50) f: \begin{bmatrix}
\text{SUBJ} & \text{[“Mary”]} \\
\text{TENSE} & \text{PRES} \\
\text{PRED} & \text{‘like \langle (f \text{SUBJ})(f \text{OBJ}) \rangle’} \\
\text{OBJ} & g: \begin{bmatrix}
\text{POSS} & f': \text{[“her”]} \\
\text{PRED} & \text{‘mother-of \langle (g \text{POSS}) \rangle’} \\
\end{bmatrix}
\end{bmatrix}
\]

The f-structure of the pronoun *her* in (50) will have a binding constraint of the general form in (48b). If we take the DomainPath from *her* to be OBJ POSS, then \((\text{OBJ POSS } f') = f\), which is the outer f-structure. \((f \text{SUBJ})\) designates the Antecedent f-structure. So Antecedent = GF' = SUBJ, GF = OBJ, and \( \alpha = \text{POSS}. \)

Now consider the sentence *Mary likes her* with f-structure illustrated in (51):

\[
(51) f: \begin{bmatrix}
\text{SUBJ} & \text{[“Mary”]} \\
\text{TENSE} & \text{PRES} \\
\text{PRED} & \text{‘like \langle (f \text{SUBJ})(f \text{OBJ}) \rangle’} \\
\text{OBJ} & \text{[“her”]} \\
\end{bmatrix}
\]

Here DomainPath = OBJ, and \( \alpha = e \) is empty. Thus GF = OBJ, and Antecedent = GF' = SUBJ.

To capture the minimality restriction, constraints can be imposed on those f-structures which are the values of the attributes in the DomainPath (Dalrymple 1993, p. 128ff.). Such “off-path constraints” are notated with \( \rightarrow \) which is instantiated by the value of the attribute it is annotated to. Consider the expression in (52):

\[
(52) (\text{GF}_1 f) \rightarrow (\rightarrow \text{PRED})
\]

Here \( f \) is some f-structure that is the value of the attribute \( \text{GF}_1 \). In the off-path constraint, the expression \( \rightarrow \) stands for the f-structure that is the value of \( \text{GF}_1 \), which is \( f \). It requires that \( f \) not contain the attribute \text{PRED}; that is, the off-path

---

\[ ^{23} \text{The minimality condition to be given below will ensure that the binding constraint does not wrongly reject *Mary* as a possible antecedent for *her* in this example.} \]

\[ ^{24} \text{Off-path constraints are defined in Section 4.8.} \]
constraint requires \( \neg(f \text{ pred}) \). Off-path constraints permit the checking of properties of intermediate f-structures along the upward path to the antecedent. In particular, the constraint \( \neg(\uparrow \text{ pred}) \) is a negative existential constraint which can be associated with each attribute in the DomainPath, excluding the bound/free element’s own f-structure.

Given off-path constraints, we can now formally define the minimal nucleus condition which was motivated in the discussion leading to the revised principles of the (toy) binding theory (21):

\[ \text{(53) Minimal nucleus condition:} \]

A binding constraint designator \((GF \alpha \uparrow GF')\) in a nuclear (respectively, nonnuclear) binding constraint is subject to the minimal nucleus condition only if: (i) \(GF\) and \(GF'\) are argument functions; and (ii) when the attribute string \(\alpha\) is nonempty, upon setting \(\alpha = xa\) for some attribute \(a\) and possibly empty string of attributes \(x\), the off-path constraint \(\neg(\rightarrow \text{ subj})\) (respectively, \(\neg(\rightarrow \text{ pred})\)) holds for every attribute in \(GF \times\).

The restriction that both the antecedent and the top of the DomainPath be argument functions \(AF\) ensures that the domain of binding is a nucleus. We will see how a minimality restriction works below in the discussion of (56):

\[ \text{(54) Nuclearity constraints:} \]

a. A nuclear pronoun is lexically specified

\[ (GF \alpha \uparrow GF' \text{ INDEX}) = (\uparrow \text{ INDEX}), \]

subject to the minimal nucleus condition (53).

b. A nonnuclear pronoun is lexically specified

\[ (GF \alpha \uparrow GF' \text{ INDEX}) \neq (\uparrow \text{ INDEX}), \]

subject to the minimal nucleus condition (53).

Examples (55) and (56) illustrate the application of these constraints. Notice that all of the concepts are applicable to the f-structure without reference to the c-structure realization of the functions:

\[ \text{(55) a. (Her sister, she scorns.) ...Herself, she admires.} \]

b. F-structure of Herself, she admires:

\[
\begin{array}{c}
\text{TOP} \quad \text{[“herself,”]}\\
\text{TENSE} \quad \text{PRES}\\
\text{SUBJ} \quad \text{[“she,”]}\\
\text{PRED} \quad \text{‘admire((f SUBJ)(f OBJ))’}\\
\text{OBJ} \quad \text{[“herself,”]}\\
\end{array}
\]

\[ \text{c. Nucleus of admires:} \]

\[
\begin{array}{c}
\text{SUBJ} \quad \text{[“she,”]}\\
\text{PRED} \quad \text{‘admire((f SUBJ)(f OBJ))’}\\
\text{OBJ} \quad \text{[“herself,”]}\\
\end{array}
\]
The f-structure “herself,” satisfies the nuclear pronoun condition because it is a nuclear pronoun bound by “she,” in the nucleus shown in (55c). Referring to (54a), $\alpha = e$, $\text{GF} = \text{OBJ}$, $\text{GF}' = \text{SUBJ}$, and $\text{SUBJ}$ and $\text{OBJ}$ are coindexed. The f-structure “she,” satisfies the nonnuclear pronoun condition because it is a nonnuclear pronoun and there is no element in the nucleus that binds it. Referring to (54b), we must make sure that there is no path to a coreferential outranking element. For $\alpha = e$, $\text{GF} = \text{SUBJ}$ and $\text{GF}' = \text{OBJ}$. $\text{SUBJ}$ and $\text{OBJ}$ are coindexed, but it is not the case that $\text{OBJ} > \text{SUBJ}$ on the functional hierarchy (1), so it remains true that there is no antecedent outranking “she,” and coindexed with it. No other coindexed element occurs in this f-structure.

Example (56) shows a violation of nuclearity:

(56) a. (Her sister, she knows we like.) ... *Herself, she knows we love.

b. F-structure of *Herself, she knows we love:

In this example there are two f-structures, $f$ and $g$, that contain “herself,” and three possible paths to f-structures containing antecedents: the short path from OBJ to $g$, the long path from OBJ to $f$, and the short path from TOP to $f$. If $\alpha = e$, we have the two possible short paths to an antecedent: $((\text{OBJ} b) \text{SUBJ})$ and $((\text{TOP} b) \text{SUBJ})$. The first path takes us to the inner f-structure $g$, because $(\text{OBJ} b) = g$. But $(\text{SUBJ INDEX}) \neq (b \text{ INDEX})$, so the nuclear binding condition (54a) is not satisfied. The second path takes us to the outer f-structure $f$, because $(\text{TOP} b) = f$. Here there is a subject coindexed with the reflexive: $(f \text{ SUBJ INDEX}) = (b \text{ INDEX})$. But TOP is not an argument function and so lies outside the nucleus of $f$; for this reason it fails to satisfy the condition on GF in (54a). Finally, we have the long path to an antecedent, taking $\alpha = \text{OBJ}$ and $\text{GF} = \text{COMP}$. Then $(\text{COMP OBJ} b) = f$ and $((\text{COMP OBJ} b) \text{SUBJ INDEX}) = (b \text{ INDEX})$. But this path fails to satisfy the restriction that if $\alpha$ is a nonempty string of attributes $xa$, then $\neg (\rightarrow \text{PRED})$ holds for every attribute in the string $\text{GF} x$. Here $x = e$ and $\text{GF} = \text{COMP}$, so $\rightarrow$ in the off-path constraint refers to $g$. It must then be true that $\neg (g \text{ PRED})$; that is, there is no PRED attribute in $g$. But in (56b), the value of COMP does contain a PRED, so the negative existential constraint is false, eliminating this path to an antecedent. Intuitively, the negative off-path constraints prune away paths that take the search for an antecedent too high up: as soon as such a constraint becomes false, we know that the key domain

\[^{25}\text{Even if “we,” were coindexed with “herself,” it would not agree in person and number, which would violate a general condition on anaphoric agreement (Chapter 8).}\]
attribute specified (pred, subj, or tense) occurs just below the current attribute in the path. We therefore know that we have gone outside the minimal f-structure needed, which could be the very f-structure that contains the key attribute which falsifies the off-path constraint.

Because of the structure-sharing property of f-structures, it may happen that a pronoun belongs simultaneously to more than one nucleus. An example would be a case of functional control (discussed in detail in Chapter 12). In (57) the subject of seem is identified with the subject of falling, which has the f-structure shown in (58):

(57) * Herself \_i seemed to Mary \_i to be falling.

(58) \[
\begin{array}{c}
\text{TENSE} \quad \text{PAST} \\
\text{PRED} \quad \text{‘seem((f OBL\_\theta) (f XCOMP))(f SUBJ)’} \\
\text{OBL\_\theta} \quad [\text{‘Mary}_i] \\
\text{XCOMP g:} \quad \text{SUBJ} \\
\quad \text{PRED} \quad \text{‘fall((f SUBJ))’} \\
\quad \text{ASPECT} \\
\quad \text{PROG}
\end{array}
\]

In such cases, the lexical binding features must be satisfied for each nucleus that the pronominal f-structure occurs in. Otherwise, (58) would be grammatical, for nuclearity as defined in (54a) requires only that there be some antecedent which satisfies the binding constraint. As the subj of the xcomp, “herself,” would find its binding constraint satisfied by the oblique “Mary,” which outranks it. Only if we also consider “herself” as the matrix subject can we see that it is not outranked by its antecedent.

This multiple satisfaction requirement is made explicit in (59):

(59) **Binding and structure-sharing:**
All lexical binding constraints of a pronominal must be satisfied for each nucleus that the pronominal occurs in.

This interpretation of binding is perfectly compatible with the grammaticality of (60), as the reader can verify:

(60) Mary \_i seemed to herself \_i to be falling.

It is a natural consequence of our defining pronominals for purposes of the binding theory as the elements of nuclei, i.e. as attribute–value pairs consisting of a nuclear GF and its value.

Finally, observe that a further consequence of nuclearity requiring the existence of an antecedent in the nucleus of the pronoun is to disallow examples like Myself, I admire him and As for herself, she admires him, where the reflexives occur as
external topics outside the nucleus of the sentence. Such examples do appear to be grammatical under contextually appropriate conditions. Because the external topics are contained in no nucleus, a possible explanation is that the distribution of reflexives when they belong to no nuclei is subject not to nuclearity but to other conditions such as viewpoint. We could capture this result if we wished to by conditioning the binding specifications on the existence of a nucleus containing the pronoun, using the conditionals defined in Section 4.6. But we will leave aside this and other refinements of English binding because our focus is more general.

---

11 Types of Bound Anaphors

A major deficiency of the toy binding theory of Chapter 10 is that it is based almost entirely on a conception of anaphoric binding that comes from English. Yet it turns out that among systems of bound anaphors across languages, English reflexives constitute a special case. As we have seen, English reflexives show local anaphoric dependencies, reflected in notions such as “clause-mate,” “minimal governing category,” “minimal nucleus,” and the like. But nonlocal reflexives occur in many languages, and these reveal other dimensions of anaphoric binding.¹

11.1 Dimensions of anaphoric binding

Three dimensions play a central role in anaphoric binding systems. These are: (i) the subjective dimension, which indicates whether or not the antecedent must be a grammatical subject; (ii) the nuclear dimension, which indicates whether or not the antecedent must lie in the same nucleus as the anaphor; and (iii) the logophoric dimension, in which the pronoun refers to one whose speech, thoughts, or feelings are represented in indirect discourse, from that person’s own point of view.²

These three dimensions define a space of possible anaphors. Reflexive and nonreflexive pronouns can be conceived of as points in this space by assigning them a positive, negative, or zero coefficient for each dimension. For example, the English reflexive pronoun *himself* is 0 subjective, + nuclear, 0 logophoric, while the

¹ The theory presented in the following sections is based on unpublished work by Bresnan et al. (1983).
nonreflexive pronoun him is 0 subjective, – nuclear, 0 logophoric. In other words, the English pronouns are degenerate in the subjective and logophoric dimensions, but are positively or negatively specified for nuclearity. This accounts for their complementary distribution in simple clauses. In contrast (as we will see), in the majority dialect of Icelandic (Maling 1982) the pronouns sig and hann are positively and negatively specified in the subjective dimension, respectively, and degenerate in the nuclear dimension, while sig – but not hann – is also specified for logophoricity. Finally, the West Niger-Congo language Ewe has a pure logophoric pronoun (yè- in the third person) which is morphologically distinct from the reflexive pronoun and contrasts with the anti-logophoric personal pronoun (e- in the third person) (Clements 1975).

There is a natural grammatical representation for our concept of a multidimensional space of anaphoric elements. Because these dimensions are mutually irreducible properties that vary with the choice of pronoun, it is natural to represent them by means of grammatical features into which language-particular anaphors are lexically decomposed. We may think of these features informally as [sbj], [ncl], and [log] (for “subjective,” “nuclear,” and “logophoric,” respectively) having positive or negative values. A pronoun that is degenerate in a dimension will be represented as unspecified for the corresponding feature. Different combinations and values of these features may be realized by different pronominal forms within and across languages. We define these features informally here:

\[
\begin{align*}
\text{subjective} & \quad – \quad \text{whether or not there must be a subject antecedent in the (minimal finite) clause} \\
\text{nuclear} & \quad – \quad \text{whether or not there must be an argument antecedent in the minimal nucleus}^6 \\
\text{logophoric} & \quad – \quad \text{whether or not the pronoun refers to one whose speech, thoughts, or feelings are represented in indirect discourse, from that person’s own point of view}
\end{align*}
\]

The parenthesized condition in the description of subjectivity is called the finite domain parameter. It is a condition on subjective binding in some but not all

---

3 This informal notation is based on the spatial analogy employed here. In the algebraic geometry of three-dimensional space, each point is assigned a triple of real-valued coordinates \((x, y, z)\), which are interpreted as coefficients of the three axes. Here we think of each pronoun as being assigned a triple of discrete coordinate values along the axes of subjectivity, nuclearity, and logophoricity. The spatial analogy is readily translated into our formal language of functional descriptions: 0 coefficients correspond to lack of an attribute.

4 English has also been observed to have a use of reflexive pronouns to express viewpoint (see Kuno 1975, 1987 and Zribi-Hertz 1989, among others), but it is much more limited than the systematic logophors found in West African languages (Clements 1975; Stirling 1993; Culy 1994).

5 See Strahan (2011a,b) for further discussion of Icelandic and micro-comparative analysis with other Scandinavian languages.

6 The minimal nucleus condition is asymmetric for bound and free pronouns as in Section 10.2.
languages. Subjectivity and logophoricity will be discussed in further detail below. Formal definitions of these concepts are discussed in Section 11.6.

11.2 Icelandic: subjective and anti-subjective pronouns

Reflexive and nonreflexive pronouns in Icelandic illustrate the subjective dimension of the binding space. The following two basic generalizations of Icelandic reflexivization are due to Thráinsson (1976a), who is assuming in this work the early transformational theory of reflexivization:

(2) Basic generalizations (Thráinsson 1976a):

i. Reflexivization is obligatory from a subject trigger within clauses and into infinitival clauses.

ii. Reflexivization from an object trigger is optional within clauses, and impossible into infinitival complements.

Maling (1982, 1984) has clarified that there are two dialects of Icelandic which differ with respect to generalization (2ii). In what seems to be the majority dialect of Icelandic, reflexivization from objects is impossible, whether into an infinitival complement or within a simple clause. The minority dialect is that described in (2ii), in which reflexivization from an object antecedent is restricted to simple clauses. These generalizations apply to the distribution of reflexives within a sentence that contains no more than one finite clause, as shown in (3) and (4). In (3) and (4) sig is a reflexive pronoun, and hann is a nonreflexive personal pronoun. We see that a reflexive cannot be bound to an antecedent outside of the finite clause containing the reflexive.

(3) Jón veit að Mária elskar *sig/hann.

= John knows that Mary loves self/him.

“John knows that Mary loves him.”

(4) Jón skipaði mér að raka sig/*hann.

= John ordered me to shave self/*him.

“John ordered me to shave him (John).”

7 This account assumes that a transformation, when its structural description is met by coreferential NPs, is triggered to replace one of them by a reflexive pronoun.

8 Also see Strahan (2011a,b).

9 The account is further simplified by ignoring cases of binding into phrasal predicate complements (Maling 1982). These are discussed in Chapter 12.

10 Subjunctive clauses differ, as discussed in Section 11.4.
At first sight, these generalizations appear quite different from the English system. The notion of "obligatory" reflexivization, in particular, seems to presuppose a system of rule application of the sort that is eschewed in modern constraint-based syntactic theories. Nevertheless, despite this striking difference in the observable binding behavior of Icelandic reflexives, the generalizations of (2) are immediate consequences of the binding theory, given the appropriate featural analyses of the Icelandic reflexive and personal pronouns. The reader is invited at this point to determine the featural analyses of the third-person accusative reflexive sig ('self') and personal pronoun hann ('him'):

(5) Featural analysis of Icelandic pronouns: (fill in)

\[
\begin{array}{c|c}
\text{sig} & \text{hann} \\
\hline
\end{array}
\]

Let us first consider generalization (2i). How can we express in our theory the property of obligatory reflexivization from a subject antecedent? Optional reflexivization from a subject would mean that both the reflexive sig and the nonreflexive hann could have the subject as antecedent. If reflexivization is obligatory from the subject, then the nonreflexive pronoun hann must not be able to take a subject antecedent. Hence, in terms of our theory, hann must be anti-subjective ([−sbj]). According to the interpretation of anti-subjectivity given in (1), it must then be true of hann that no subject binders can occur in its domain. Assuming that the finite domain parameter of (1) holds in Icelandic, we immediately account for the qualification "within clauses and into infinitival clauses" of (2i). What this means is that for hann, no subject binders can occur in the minimal finite clause portion of the domain. Outside of this restricted domain, hann should be free to have subject antecedents, and as the data below will illustrate, it is.

This featural analysis of the Icelandic nonreflexive definite pronoun hann has a further consequence that is remarkable from the point of view of English: it predicts that the pronoun is free to have nonsubject antecedents within its own nucleus. In other words, the so-called "disjoint reference" property of definite nonreflexive pronouns in English should not hold for the corresponding pronouns in Icelandic, and as we will see below, it does not.

Let us now consider generalization (2ii). In the majority dialect, as we noted above, reflexivization from objects is impossible, whether into an infinitival complement or within a simple clause. In terms of our theory, this means that sig is subjective ([+sbj]). In the minority dialect, there is a second use of sig which permits nonsubject antecedents within clauses, just as the English reflexive does. In terms of our theory, this sig is nuclear ([+ncl]). This analysis accounts for the fact that reflexivization from an object antecedent into an infinitival complement is impossible: the binders of this sig must be within its nucleus. It also accounts for the optionality of reflexivization from an object antecedent. Because the definite nonreflexive pronoun hann is [−sbj], nothing prevents it from having nonsubject
antecedents within its clause nucleus, as noted above. Hence, hann and the second sig will be alternatives in just this situation.

Our featural analysis thus far is summarized in (6). Below we will make an addition to this basic system:

(6)  
\[
\begin{align*}
\text{sig} &: [ +\text{sbj}] \\
\text{hann} &: [ -\text{sbj} ]
\end{align*}
\]

dialectal:

\[
\begin{align*}
\text{sig} &: [ +\text{ncl}]
\end{align*}
\]

These pronouns are third person. Icelandic has morphologically distinctive reflexive forms only in the third person. Sig is unmarked for gender and number; it has accusative (sig), dative (sér), and genitive (sín) forms, but no nominative form. As we remarked in Section 10.2, this appears to be a morphological gap rather than a syntactic one: Icelandic has oblique case-marked subjects, and it turns out that oblique reflexives can occur as subjects. There is also a possessive reflexive (sinn), inflected for number, gender, and all four cases. As for the pronoun hann, it is a masculine, nominative or accusative, singular form.

Further examples from Icelandic are given in (7). The % sign signifies that the form is grammatical in some, but not all, dialects. The reader is invited to explain the choice of pronouns and reflexives in each example on the basis of the subject binding theory above. In analyzing these examples, recall the assumption of anaphoric agreement (Chapter 8) and assume that pronouns must not disagree with their antecedents in person, number, or gender. Hence, the reflexive pronoun sig can have third-person binders only. Finally, note carefully what assumptions must be made about the understood subjects of the infinitives. These are controlled subjects, which will be the topic of Chapters 12 and 13:

(7)  
a.  
\[
\text{Ég spurði Harald, um hann} \text{ } _{(sjálfan)}/%\text{sig,}
\]
  “I asked H.-ACC about him$_1$-ACC self-EMPH/self$_1$-ACC
  “I asked Harold about himself.”

b.  
\[
\text{Haraldur, spurði mig um } *\text{hann}/\text{sig,}
\]
  “Harald asked me about himself.”

c.  
\[
\text{Haraldur, skipaði mér að raka } *\text{hann}/\text{sig,}
\]
  “Harald ordered me to shave him (Harold).”

\footnote{The word sjálfur (\text{self.NOM}) appears in the accusative (sjálfan) in (7a) and elsewhere; it is glossed as an emphatic marker. Maling (1982, pp. 285, 286) notes that it seems to be much less syntactically governed than the Norwegian selv discussed in the next section. Sjálfur may be used for disambiguation as well as emphasis, and although in some contexts it is “almost obligatory,” it is generally optional in Icelandic. See the discussion of emphatics in footnote 13 and Section 11.5 below.}
Types of Bound Anaphors

259
d. **Ég lofaði Haraldi að raka hann_i/*sig_i.**
   I promised H.-DAT to shave him_{ACC/selj}_{ACC}
   “I promised Harold to shave him.”

e. **Ég skipaði Haraldi að raka *hann_{sig_i}.**
   I ordered H.-DAT to shave him_{ACC/selj}_{ACC}
   “I ordered Harold to shave himself.”

Recalling the complex-appearing generalizations in (2), we see that they all follow from the simple system of (6). The core of the Icelandic system is opposition along the dimension of subjectivity. Thus the Icelandic system appears on a dimension orthogonal to that of the English system. This symmetry at the core of the Icelandic system is clause-bounded, occurring only within the minimal finite clause in accordance with the subjectivity finite domain parameter. This condition immediately accounts for (3) as well.

The pattern of Icelandic reflexives in subjunctive clauses differs from what we have seen so far, and will be discussed in Section 11.4 below.

### 11.3 Norwegian: subjective/nuclear pronouns

The Norwegian anaphoric binding system involves both subjectivity and nuclearity: subject anaphors can be nuclear (seg selv) or nonnuclear (seg), and there is an anti-subjective nuclear anaphor (ham selv). The resulting binding properties of Norwegian anaphors differ markedly from those of both the English system, with its simple contrast in nuclearity, and the Icelandic system, with its contrast in subjectivity in the minimal finite clause:\textsuperscript{12}

\[(8) \text{Featural analysis of Norwegian pronouns:}
\begin{align*}
\text{seg} & \quad \text{ham} \\
[+\text{sbj}] & \quad [-\text{ncl}] \\
[-\text{ncl}] & \quad \text{seg selv} \quad \text{ham selv} \\
[+\text{sbj}] & \quad [-\text{sbj}] \\
[+\text{ncl}] & \quad [+\text{ncl}]
\end{align*}
\]

There is also a local seg which has a different distribution, either occurring with a certain class of semantically reflexive lexical verbs such as vaske seg (‘wash

\textsuperscript{12} The present account of the Norwegian binding system is based on Hellan (1980, 1988), Bresnan et al. (1983), and Dalrymple (1993). This account is somewhat “idealized” (Lødrup 1999a), by abstracting away from other factors that influence reflexive binding in Norwegian, such as thematic prominence (Hellan 1988; Dalrymple and Zaenen 1991; Dalrymple 1993).
oneself') and *kle pà seg* (‘dress oneself’), or appearing with intransitive verbs such as *skamme seg* (‘be ashamed’) and *knytteseg* (‘get uptight’). Local *seg* is discussed in Section 11.5 below.

Like Icelandic, Norwegian has morphologically distinctive reflexive forms only in the third person. *Seg selv* and *seg* are unmarked for both gender and number; *seg* has genitive forms *sin* (common gender, i.e. masculine or feminine), *sitt* (neuter), and *sine* (plural), while the reflexives based on *selv*, like the English reflexive pronouns, cannot take genitive case. The pronouns *ham* and *ham selv* are masculine singular forms. We again assume that pronouns may not disagree in grammatical features of person, number, and gender with their antecedents; hence, *seg* and *seg selv* may have masculine or feminine, singular or plural antecedents, but not first- or second-person antecedents.

Norwegian instantiates in a morphologically distinctive way three of the four featural combinations of subjectivity and nuclearity. But the contrast between the nuclear reflexive pronoun component *selv* and the emphatic marker *selv* is not morphologically marked in Norwegian. The emphatic marker, however, is heavily stressed.\(^{13}\) We exclude both the emphatic *selv* and the local *seg* from the examples discussed in this section.

How are combinations of the binding features interpreted? The formal definitions are given in Section 11.6. Here we provide an informal description:

\[
\begin{align*}
(9) \quad [+\text{sbj}, +\text{ncl}] & \quad \text{The antecedent must be a subject in the minimal nucleus containing the pronoun.} \\
[+\text{sbj}, -\text{ncl}] & \quad \text{The antecedent must be a subject in the minimal finite domain outside of the minimal nucleus containing the pronoun.} \\
[-\text{sbj}, +\text{ncl}] & \quad \text{The antecedent must be a nonsubject in the minimal nucleus containing the pronoun.}
\end{align*}
\]

In all cases, the antecedent in question is assumed to outrank the pronoun.

Let us now consider five sentence structure types that illustrate the basic properties of this anaphoric binding system. These are given in (10a–e). The theory determines which of the alternative anaphors are grammatical in each structure. The reader is invited at this point to predict the distribution of stars from the featural analyses, given the antecedent relations indicated by the translations. It is helpful to take note of the person features of pronoun and antecedent, which are required to agree, and also note what the understood subjects of the infinitival

---

\(^{13}\) Levinson (1991, p. 131) details a number of criteria by which such emphatics or intensifiers may be distinguished from reflexive pronouns: “(a) there is a contrastive, contrary-to-expectation element; (b) there is a natural negative gloss, of the sort ‘and not anyone else’, ’and not the more expectable persons’; (c) the intensifier often plays a role in reference, by forcing a particular co-referential interpretation of a pronoun [footnote omitted]; (d) the intensifier could often be replaced with like effect by stress; (e) issues of scope arise according to placement.” Also see Y. Huang (2000).
complements are. This information is crucial for application of the binding theory (Andrews 1976, 1982, 1990a).

(10) a. Ola overgår seg selv/seg/ham selv/ham.
    O. surpasses
    “Ola surpasses himself.”

b. Ola bad oss snakke om seg selv/seg/ham selv/ham.
    O. asked us talk-INFIN about
    “Ola asked us to talk about him (Ola).”

c. Ola lovet meg å snakke om seg selv/seg/ham selv/ham.
    O. promised me to talk-INFIN about
    “Ola promised me to talk about himself.”

d. Vi fortalte Ola om seg selv/seg/ham selv/ham.
    We told O. about
    “We told Ola about himself.”

e. Ola vet at vi snakket om seg selv/seg/ham selv/ham.
    O. knows that we talked about
    “Ola knows that we talked about him (Ola).”

For the reader’s reference, the following table provides the judgments of the pronominal forms in these examples:

(11) | seg selv | seg | ham selv | ham |
    |--------|----|--------|----|
    | (10a) ✓ | * | * | * |
    | (10b) * | ✓ | * | ✓ |
    | (10c) ✓ | * | * | * |
    | (10d) * | * | ✓ | * |
    | (10e) * | * | * | ✓ |

11.4 Logophoricity versus subjectivity

Logophoric pronouns (Hagège 1974) morphologically distinct from both personal and reflexive pronouns are found in a number of West African languages (see Culy 1994 for a comprehensive survey, and Stirling 1993 for a thorough analysis of the differences between logophoricity, switch reference, and obviation). These pronouns are used to refer to one whose speech, thoughts, or feelings are represented in indirect discourse, from that person’s own point of view. In Ewe as in many other West African languages, a logophoric pronoun distinct from both the personal pronoun and the reflexive pronoun occurs (Clements 1975, p. 142):
The logophoric pronoun is itself a mark of indirect discourse, as we see from the following pair of contrasting sentences from Ewe (Clements 1975, p. 152):

(13) a. Kofi gblo na wɔ be yɛ-a-dyi ga-a na wɔ
   K. speak to pro that log-t-seek money-d for pro
   “Kofi, said to them that he, would seek the money for them.”

b. Kofi gblo na wo be: ma-dyi ga-a na ni
   I.will-seek money-d for you
   “Kofi said to them: I’ll seek the money for you.”

The complementizer *be* in these examples is a form of the verb ‘say’, which Clements shows retains some verbal properties. 14

14 Both Clements (1975) and Hyman and Comrie (1981) show that the antecedent of a logophoric pronoun need not be the subject of a clause, provided that the antecedent does indeed meet the condition of logophoricity. For example, Hyman and Comrie (1981, p. 22) give the following contrasting examples from Gokana (Nigeria):

(14) a. mɪn dɔ laɓeɾɛ gá kɔ aɛ dɔ-ɛ
   I heard Lebare mouth that he fell-LOG
   “I heard from Lebare, that he, fell.”

b. *mɪn kɔ nɛ laɓeɾɛ kɔ aɛ dɔ-ɛ
   I said give Lebare that he fell-LOG
   “I said to Lebare, that he, fell.”
In (14a) the logophoric pronoun (which is marked by the verbal suffix -ē) can have a nonsubject antecedent; in (14b) there cannot be a logophoric pronoun with the nonsubject antecedent. The contrast arises because in the first example, Lebare’s speech is represented, whereas in the second it is not.\(^{15}\)

Clements (1975) also shows that logophoric pronouns can have nonsubject antecedents in a dialect of Ewe (Ghana), provided that the antecedents designate the one whose speech or point of view is reported. In (15) the antecedent Kofi is contained in the object of the prepositional verb tso (Clements 1975, p. 160):

(15) Kɔmi xɔ agbalè tso Kofi gabɔ be wò-a-va me kpe na yè

K. receive letter from K. side that pro-T-come cast block for log

“Kwami got a letter from Kofi saying that he should come cast blocks for him.”

In the preceding examples, the logophor is used to express self reference by the one whose speech is represented in an indirect discourse. But logophors are also used in complements of verbs that designate emotions or cognitive states, or which take negated propositions or eventualities, as in the following Ewe examples (Clements 1975, pp. 164, 170):

(16) a. e-dzɔ dyi na Ama be yè-dyi vi
pro-straighten heart to A. that log-bear child

“It made Ama happy that she bore a child.”

b. Kofi nya be me-kpɔ yè
K. know that pro-see log

“Kofi knew that I had seen him.”

c. Kofi me-nya be me-kpɔ yè
K. neg-know that pro-see log

“Kofi didn’t know that I had seen him.”

In these cases, explicit self reference need not be involved. For example, (16a) could be true even if Ama did not say anything about her child and never referred to herself. Similarly, (16c) is true only if Kofi has no knowledge that the speaker had seen him; Kofi therefore cannot be the source of the information in the complement, and he cannot have been referring to himself as seen (or unseen) by the speaker. Nevertheless, logophoric reference to Kofi is possible. Here the logophor is used to show that the speaker takes Kofi’s point of view in expressing Kofi’s

\(^{15}\) Although Hyman and Comrie (1981) remark that verbal marking of logophoricity is unusual, Culy (1994, p. 1060) lists 32 languages having special forms to mark the logophoric domain (logophoric pronouns, addressee pronouns, or verbal morphology), of which six use verbal morphology. Stirling (1993, pp. 51–56) argues convincingly that the Gokana system involves true logophoricity, and not switch reference.
unawareness of the speaker’s observation of him. Similarly, in (16a) the logophor is used to show that the speaker takes Ama’s point of view in expressing Ama’s happiness about having borne a child. The generalization governing logophoricity, then, seems to be that the logophor expresses not necessarily self reference by the antecedent in an indirect discourse attributing speech, thoughts, or feelings to the antecedent, but reference by the speaker to the antecedent in such a discourse from the antecedent’s point of view (Sigurðsson 1990, pp. 318–321).

What does it mean precisely for the speaker to refer to someone from that person’s point of view? An elegant explication of this concept is in terms of the “assigned epistemic validator” of a discourse (“validator” for short): “the individual to whom the speaker linguistically assigns responsibility for the discourse in question” (Stirling 1993, p. 282). In “objective” discourse, the speaker herself takes responsibility for her statements and serves as their assigned epistemic validator. But in logophoric discourse, the speaker shifts validation for the statements to the logophoric referent. In (16c), for example, the speaker is identifying Kofi as the validator of the proposition that Kofi did not know that the speaker had seen Kofi. In effect, the speaker, call her S, is suggesting that Kofi would say, if you asked him: “I didn’t know that S had seen me.”

Logophoricity is not purely a matter of the semantics of viewpoint, however. There is a grammatical requirement for logophoric reference in Ewe: the presence of the complementizer be. Although (17a) is a paraphrase of (16a), it lacks be and does not allow the logophor. Embedding (17a) in a be clause permits the use of logophor, as illustrated by (17b) (the expression dzɔ dyi na … – literally ‘straighten heart to …’ – is an idiom meaning ‘make … happy’):

(17) a. ye/*yè wo vidyidyi-a dzɔ dyi na Ama
   “Her, having a child made Ama, happy.”

b. Ama gblɔ be yè wo vidyidyi-a dzɔ dyi na yè
   A. say that log gen child-bearing-d straighten heart to log
   “Ama, said that her, having a child made her, happy.”

The generalization that the Ewe logophoric pronoun must occur in a clause marked by the complementizer be suggests that be is a formal marker of indirect discourse.

Other languages lack the morphologically distinctive logophoric pronouns found in Ewe but nevertheless exhibit logophoricity. According to Clements,
logophoricity in Latin differs primarily from that in Ewe in being expressed by the reflexive pronoun rather than by a morphologically distinct pronoun type. In Latin examples like (18) (Cicero, *Epistulae ad Atticum* ii. 18, 3) the antecedent of the reflexive is sometimes called the “logical subject.”

(18) A Caesare ... invitor ... sibi ut sim legatus
   “I am invited by Caesar, to be lieutenant to him, (sibi).”

It is tempting to explicate the “logical subject” in such examples as an underlying syntactic subject, as proposed by Chomsky (1965, pp. 23, 70). But Clements cites other Latin examples showing that “a nominal standing in any relationship whatsoever to the main verb of the higher clause can be the antecedent of the ‘indirect’ reflexive, provided the semantic conditions (those appropriate to logophoric pronouns, as stated above) are met.” In (19), for example (Cicero, *Oratio pro Milone* 44), the antecedent of the reflexive (*Favonius*) is the source/validator of reported speech, expressed by a base-generated prepositional phrase:

(19) Vos ex M. Favonio audistis Clodium sibi dixisse ... periturum Milonem
   “you heard from M. Favonius, that Clodius has said to him, (sibi) that Milo was to die”

In (20) (Cicero, *Oratio pro Cluentio* 135), the antecedent is again the source/validator of the reported speech, but is expressed as the embedded possessor of the will:

(20) Elogium recitasti de testamento Cn. Egnatipatris ... idcirco se exheredasse filium
   “you cited the passage from the will of the elder Egnatius, (stating) that for this reason he, (se) disinherited his son”

In (21) (Livius 32, 1), the reflexive refers to the source/validator of the complaint, but is not directly expressed in the passage at all:

(21) Legati ab Ardea questi ... erant sibi in monte Albano Latinis carnem ... datam non esse
   “delegates from Ardea (i.e. from the Ardeans,) had complained that the flesh (of the animals sacrificed) on the Alban Mount had not been given to them, (sibi)”

Thus these Latin reflexives are better analyzed as logophors than as subject-bound anaphors.

Icelandic is similar to Latin in that its reflexive pronoun is also used logophorically, as we see in (22) (Thráinsson 1976a; Maling 1984; Sigurðsson 1990):
Types of Bound Anaphors

(22) *Haraldur* segir að *Sigga elski sig/hann*.
H.-nom says that S. loves-sbjn self/him
“Harold says that Sigga loves him (Harold).”

The subjunctive mood in Icelandic (glossed by -sbjn in (22)) is a grammatical marker of indirect discourse, serving a similar function to that of the complementizer *be* in Ewe (Maling 1984, p. 232). In contrast, our earlier example (3), parallel to (23), which barred reflexivization from an embedded finite clause, involved an indicative complement:

(23) *Haraldur* veit að *Sigga elskar sig/hann*.
H.-nom knows that S. loves-indic self-acc/him-acc
“Harold knows that Sigga loves him (Harold).”

The verb ‘know’ in Icelandic does not select the subjunctive mood, and so does not constitute part of an indirect discourse structure. It therefore bars logophoric reference, in contrast to the Ewe verb *nya* (‘know’) that we saw in (16), which can be part of an indirect discourse structure in Ewe. 19

Icelandic also differs from the languages described by Clements (1975) and Hyman and Comrie (1981) in that its logophoric pronoun is both logophoric and subjective. The grammatical subject condition and the logophoric condition must both be met simultaneously. This explains why the following examples from Maling (1984, p. 233) are ungrammatical for most Icelandic speakers: 20

(24) a. *Ég sagði Jóni* að *Maria hefði bodið sér*.
I told J. that M. had-sbjn invited self
“I told John that Maria had invited him (John).”

b. *Ég heyrði frá Jóni* að *Maria hefði bodið sér*.
I heard from J. that M. had-sbjn invited self
“I heard from John that Maria had invited him (John).”

In (24a) the antecedent meets neither the logophoric nor the subject condition, and in (24b) the antecedent meets the logophoric condition but not the subject condition. In (25a), in contrast, the antecedent meets the subject condition but not the logophoric condition, while in (25b) the antecedent meets both conditions

---

19 Some Icelandic speakers do allow logophoric reference with indicative complements of some predicates such as ‘know’ (Maling 1984; Sigurðsson 1990). In addition, there are Norwegian dialects which also use logophoric reflexives, though lacking a distinction between indicative and subjunctive mood in the verbal morphology (Aass 1979, cited by Maling 1984; Moshagen and Trosterud 1990).

20 Maling reports that no speakers accepted (24a) but two accepted (24b), consistent with John being the source/validator of the reported speech in (24b) but not in (24a). The latter two speakers might have a purely logophoric use of *sig*, dropping the subjective property.
Types of Bound Anaphors

(Maling 1984, pp. 232, 239)²¹ (the expression talin ... trú um is an idiom meaning ‘made to believe’, ‘convinced’).

   him-DAT was said that self-ACC lacked-sbjn ability
   “He was told that he lacked ability.”

   b. Honum, var talin trú um, að sig, vantaði
   him-DAT was convinced belief about that self-ACC lacked-sbjn
   hæfileika.
   ability
   “He was made to believe that he lacked ability.”

The crucial difference is that the antecedent’s speech, thoughts, or point of view are reported in the indirect discourse structure of (25b) but not in (25a). Predictably, the active counterpart of (25b) is ungrammatical because the antecedent meets the logophoric condition but is no longer a subject, as we see in (26) (the active here, like the passive in (25b), involves an idiom taldi ... trú um, which means ‘made ... believe’, ‘convinced ...’):

(26) *Ég taldi honum, trú um að sig, vantaði hæfileika.
    I convinced him-DAT belief about that self, lacked-sbjn ability.
    “I made him believe that he lacked ability.”

Examples like the following, cited by Maling (1984, p. 222) seem at first sight to contradict the subject condition on the logophoric reflexive:

(27) Skoðun Siggu, er að hana/sig, vanti hæ fileika.
    opinion Sigga’s is that she/self lacks-sbjn talent
    “Sigga’s opinion is that she (Sigga) lacks talent.”

Here the antecedent is the possessor of the NP ‘Sigga’s opinion’, and the reflexive occurs in the postcopular subjunctive complement of the nominal. However, as Maling (1984, p. 222) points out, “In some sense, Sigga is the ‘subject’ of [(27)] ... ; the NP Sigga’s opinion/belief behaves like a matrix clause Sigga believed that ... for the purposes of the antecedent–anaphor relations.” Given our assumption in Section 10.2 (see footnote 9) that the poss function is the most prominent grammatical function on the functional hierarchy within nominals, this intuition could be

²¹ Note that oblique case-marked subjects are a well-established feature of Modern Icelandic syntax (Andrews 1976, 1982, 1990a; Thráinsson 1976a,b; Maling 1984, 1990; Zaenen et al. 1985). See also Problem Set 5.
The focused postcopular CP ‘that she lacks talent’ is identified in f-structure with a complement function of the subject (cf; recall that CF abbreviates a class of functions, the nondiscourse argument functions – see Chapter 6):

\[
\begin{align*}
\text{f:} & \left[ \begin{array}{c}
\text{FOC} \quad [“that she lacks talent”] \\
\text{SUBJ} \quad \text{POSS} \quad \text{PRED} \quad \text{‘Sigga’} \\
\text{PRED} \quad \text{‘be (\text{f SUBJ})’}
\end{array} \right] \\
\text{g:} & \left[ \begin{array}{c}
\text{POSS} \quad \text{PRED} \quad \text{‘opinion-of (\text{g POSS})(\text{g CF})’} \\
\text{CF} \quad \text{PRED} \quad \text{‘be (\text{f SUBJ})’}
\end{array} \right]
\end{align*}
\]

This analysis unifies the postcopular CP ‘that she lacks talent’ into the f-structure of the nominal containing ‘Sigga’s opinion’, which is g in (29). The analysis predicts that the binding possibilities for (28) will be identical to those within a single NP-complement construction ‘Sigga’s opinion that she lacks talent’: this example is good because both the logophoric condition and the subject antecedent condition are met (taking the possessor to be the “subject” of the nominal). The possessor of the same nominal cannot bind the reflexive in a construction which does not represent the speech, thoughts, or feelings of the possessor, as shown by the following example from Maling:

(30) Søðun Siggu, fær mig til að halda að hana,/*sig, vanti opinn Sigga’s leads-INDIC me to think that she/*self lacks-SBJN” hæfileika.

“Sigga’s opinion leads me to think that she (Sigga) lacks talent.”

Here the finite ‘that’ clause is the complement of ‘think’, not ‘opinion’, and it represents the thoughts of the speaker, not Sigga.

\(^{22}\) The \text{FOC} annotation here is a characteristic of the particular construction and does not follow from the general principles of endocentricity given in Chapter 6.
A further very significant property of logophoric reflexives in Icelandic is their use to refer to antecedents in previous sentences in contexts of extended indirect discourse (Bresnan et al. 1983; Maling 1984; Sigurðsson 1990). The following example is from chapter 6 of Gestur Pálsson’s “Tilhugalif” (cited by Maling 1984, p. 239):

(31) [Hann] var að hugsa um, hvað hún yrði, hissa, þegar hún kem á færur næsta morgun, opnaði dyrnar og sæi sig á tröppunum; hún sæi sig ef til vill öldungs ekki fyrst, en stigi bara út, ofan á sig; ...  

“[He] was thinking how she would be surprised when she got up the next morning, opened the door and saw him (reflexive) on the steps; she would see (subjunctive) him (reflexive) perhaps not at first, but would just step (subjunctive) out, on top of him (reflexive); ...”

Even in extended indirect discourse, the subject condition appears to persist, as we see in the following minimal pair of examples (Joan Maling, personal communication):

(32) a. Foreldrar mínir sannfærðu mig um að ég hefði verið latur. Ég hefði átt að skrifa sér oftar.  

“My parents convinced me that I had been lazy. I should have written (subjunctive) them (reflexive) oftener.”

b. Af foreldrum mín um var ég sannfærður um það að ég hefði verið latur. Ég hefði átt að skrifa þeim/*þeim sér oftar.  

“By my parents I was convinced that I had been lazy. I should have written (subjunctive) them (*reflexive) oftener.”

In both (32a) and (32b) the logophoric condition is met in the extended indirect discourse, but only in (32a) is the logophoric antecedent also the subject of its clause.

The contrast between the Icelandic and the Ewe logophor can thus be represented in our informal description as in (33):

(33) Icelandic logophor: [+log, +sbl]  

Ewe logophor: [+log]

The formal interpretation of these features requires simultaneous reference to the representation of extended indirect discourse and, in parallel, the f-structure of the antecedent.\(^{23}\)

Recall from (6) in Section 11.2 that the Icelandic personal pronoun hann (‘him’) is anti-subjective within the minimal finite clause, but it is not anti-logophoric. For this reason, hann and sig are not in complementary distribution in nonclause-bounded contexts. They may each be used in the same domain; indeed, they may

\(^{23}\) See the references in Section 11.6.
both be used in the same domain at the same time (Bresnan et al. 1983; Maling 1984, pp. 238–239):

(34)  
\[ \text{John said that Mary had discovered that the doctor wanted to talk with him (John) about her.} \]

In (34) the reflexive is bound to John, establishing that all three embedded clauses (the middle clauses headed by ‘discovered’ and ‘wanted’ and the bottom clause headed by ‘talk’) constitute a domain for the binding of the logophoric reflexive. But at the same time the nonreflexive pronoun is bound to Mary, establishing that the personal pronoun need not be free within the domain in which the logophoric reflexive is bound. Further examples are shown in (35a–d). In (d) it is possible to have both a reflexive and nonreflexive pronoun bound to the same antecedent (this interpretation is assisted by the emphatic sjálfan; see footnotes 11 and 13 and Section 11.5):

(35)  
\[ \text{a. John says that Mary has discovered that I have talked with him (John) about her problem.} \]
\[ \text{b. John says that Mary believes that I have promised her (Mary) his (John’s) car.} \]
\[ \text{c. John said that his (John’s) children intended to visit him (John) for Christmas.} \]
\[ \text{d. Harold told me that I should not ask him (Harold) about himself.} \]
This evidence shows that the nonclause-bounded reflexives of Icelandic cannot merely be analyzed as analogues of English reflexives in a larger syntactic domain. It also clearly supports a central idea of our model, namely that binding properties are controlled by the lexical representations of pronominal elements along several independent dimensions.

As we have seen in Section 11.2, the anti-subjectivity of the personal pronoun induces the complementary distribution of subjective reflexive and personal pronouns within the minimal finite clause, and hence the apparent obligatoriness of reflexivization in this domain. A language which, unlike Icelandic, possessed an anti-logophoric personal pronoun \([-\log]\) would show “obligatory logophoricization.” Do such languages exist? Gokana is an example, as illustrated by the following pairs of sentences from Hyman and Comrie (1981, pp. 19, 21, 22):

\[(36)\]
\[\text{a. } a\varepsilon k\varepsilon a\varepsilon d\varepsilon \quad \text{he said he fell} \]
\[\quad \text{“He, said that he, fell.”} \]
\[\text{b. } a\varepsilon k\varepsilon a\varepsilon d\varepsilon-\varepsilon \quad \text{he said he fell-LOG} \]
\[\quad \text{“He, said that he, fell.”} \]

\[(37)\]
\[\text{a. } m\varepsilon n\varepsilon d\varepsilon l\varepsilon b\varepsilon r\varepsilon g\varepsilon k\varepsilon a\varepsilon d\varepsilon \quad \text{I heard Lebare mouth that he fell} \]
\[\quad \text{“I heard from Lebare, that he, fell.”} \]
\[\text{b. } m\varepsilon n\varepsilon d\varepsilon l\varepsilon b\varepsilon r\varepsilon g\varepsilon k\varepsilon a\varepsilon d\varepsilon-\varepsilon \quad \text{I heard Lebare mouth that he fell-LOG} \]
\[\quad \text{“I heard from Lebare, that he, fell.”} \]

The (a) examples of each pair show the personal pronoun, which cannot be co-referential with the logophoric antecedent of the (b) examples. Now Hyman and Comrie (1981) show that Gokana logophors are not subjective, and this point is illustrated by (37b). Hence the complementarity of personal and logophoric pronouns in (36a,b)–(37a,b) cannot be attributed to anti-subjectivity, but appears to stem from the anti-logophoricity of the personal pronoun. The personal pronouns of Ewe, in contrast, are not obligatorily anti-logophoric in all contexts or in all dialects (Clements 1975). In addition, an anti-logophoric pronoun distinct in form from the personal pronoun is reported in Adioukrou (Hill 1995).

These considerations also indicate that the binding properties of personal pronouns are often highly grammaticalized: they cannot be completely explained in terms of pragmatic avoidance of the referents of bound anaphors.\(^{24}\) Anti-logophoric, anti-subjective, and anti-nuclear pronouns all exist, each with a distinctive pattern of exclusion of possible antecedents, and they are not always

---

\(^{24}\) Although that could well be the historical origin of the negative binding constraints (Faltz 1985; Levinson 1987, 1991), as discussed in the next section.
complementary to positive binding elements as pragmatic avoidance would predict. This result is to be expected on our theory, because of the independence of the binding dimensions and the lexicality of the binding constraints. For the same reason, our theory also allows for languages without reflexives (the pronouns have no positive binding constraints) and for personal pronouns without negative binding specifications. Fijian is one example of a language that has been reported to lack reflexives (Dixon 1988, pp. 255–256); Dixon notes that personal pronouns are used to indicate coreference with coarguments of the same predicate. However, recent field work on Fijian has shown that although the language does use personal pronouns in some reflexive contexts, it also does have reflexives such as \textit{pro-gā} (‘\textit{pro-modif.emphatic}’) and \textit{pro-(gā)-vakai-pro} (‘\textit{pro-(modif.emphatic)-according.to-pro}’) (Park 2012):

\begin{enumerate}
\item[(38)]
\begin{enumerate}
\item[a.] O Josese\textsubscript{j} ā digi-taki koya\textsubscript{i} gā.
\textsubscript{det} J. \textsubscript{pst} choose-tr 3sg.obj modif.emphatic
\textquote{Josese voted for himself.}
\item[b.] Au\textsubscript{i} vana-i au\textsubscript{i} gā.
1sg.sbj shoot-tr 1sg.obj modif.emphatic
\textquote{I shot myself.}
\end{enumerate}
\item[(39)]
\begin{enumerate}
\item[a.] E\textsubscript{i}=vana-i koya\textsubscript{i} gā vakai koya\textsubscript{i}.
3sg.sbj=shoot-tr 3sg.obj modif.emphatic according.to 3sg.obj
\textquote{He shot himself.}
\item[b.] O Marika\textsubscript{i} cā-\textit{ti} koya\textsubscript{i} gā vakai koya\textsubscript{i}.
\textsubscript{det} M. hates-tr 3sg.obj modif.emphatic according.to koya\textsubscript{i}.
3sg.obj
\textquote{Marika hates himself.}
\end{enumerate}
\end{enumerate}

The Fijian facts are therefore considerably more subtle than originally reported by Dixon (1988). Old English is another language that has been reported to lack reflexives, discussed further below (Traugott 1972, pp. 88–99; Faltz 1985; Levinson 1991, p. 133ff.).

This discussion of the nuclear, subjective, and logophoric dimensions of anaphoric binding has taken us well outside principles A and B of the toy binding theory of Section 10.2. Conceptually, an anaphoric binding system – that is, a set of reflexive and nonreflexive pronouns with their specific anaphoric binding properties – is a set of points in a discrete space generated by the independent dimensions of subjectivity, nuclearity, and logophoricity. By simple changes of coefficients, we

\cite{25} The lexical binding constraints have so far been informally expressed by features $[\pm \text{ncI}], [\pm \text{sI}]$, and $[\pm \text{lO}]$. Recall, however, that these features are informal abbreviations for the formal definitions within the constraint language of LFG functional structures and their semantic representation (Sections 10.4 and 11.6).
can transform one system into another, creating complex variations in the observable binding behavior of elements of the systems. The complementary distribution of reflexive and nonreflexive pronouns is not an invariant property of this space; in fact, it can arise only in certain one-dimensional systems organized by simple symmetry.

**Further reading and discussion**

The term “logophoricity” has been extended by some authors (e.g. Reinhart and Reuland 1993) well beyond its use in marking indirect discourse, to refer generally to all kinds of nonlocal reflexivization, including emphatics and any kind of “point of view” indicators (Oshima 2006, 2007). For arguments against this extension and in favor of a more coherent analysis of logophoricity, see Culy (1994, 1997). Sells (1987a) argues that there is no such thing as logophoricity, it being decomposable into three further primitive roles predicated of discourse referents in discourse representation theory (DRT; Kamp 1981; Kamp and Reyle 1993; Kamp et al. 2011): source, self, and pivot. But as Stirling (1993, ch. 6) notes, Sells does not really provide an analysis of African logophoricity. Stirling (1993) does provide a formal analysis of African logophoricity within DRT, making use of only one primitive (the epistemic validator), and argues that her theory can be extended to non-African types of logophoricity as well, although she does not go into detail. She also notes that Sells’s DRT analysis runs into problems with the scope of negation, which are not encountered under her analysis.

Culy (1994) observes that “pure” logophoric languages, which have special logophoric pronouns, addressee pronouns, or verbal markers of the logophoric domain, are found only in Africa, and provides a typological survey in support of Stirling’s hierarchy of “logocentric” verbs (verbs that introduce logophoric contexts):26

\[(40) \quad \text{Logocentric verb hierarchy:} \ (\text{Stirling 1993, p. 259)} \\
\text{communication} > \text{thought} > \text{psychological state} > \text{perception} \]

Culy (1997) argues that logophoric pronouns are primarily markers of indirect discourse, which may come to have secondary uses to express point of view, while reflexive pronouns may also express point of view but are never logophoric. As we have already seen, Icelandic logophoricity is crucially dependent on indirect discourse, including extended (intersentential) indirect discourse, all being marked by subjunctive mood. Culy’s conclusions rest on a particular conception of “point of view” which does not seem applicable to Icelandic reflexives. He argues that in their core use as indirect speech markers, logophoric pronouns cannot express

---

Types of Bound Anaphors

point of view – first, because they are obligatory, and second, because they may have multiple occurrences in the same sentence. His conception of point of view (following Banfield 1982) is that it involves the narrator’s choice and cannot be “dictated” by the grammar, and so cannot be obligatory. Again following Banfield (1982), he assumes that there can be only one point of view per (nonquoted) sentence. Taking the second argument first, it is true in Icelandic that logophoric sig cannot occur within the same nucleus as another sig (Bresnan et al. 1983):

(41) * Haraldur, sagði mér að ég skyldi ekki spyrja sig, um
       H.-nom said me-dat that I not ask self about
       (sjálfan) sig,.
       self-emph self
       “Harold told me that I should not ask him (Harold) about himself.”

But that restriction seems merely to be a sign of the nonnuclearity of logophoric sig, for multiple occurrences are possible when they do not occur in the same minimal nucleus.27 In (42), for example, the adjectival predicate complement headed by ‘fond of’ comprises its own f-structure nucleus complete with subject (an xcomp in terms of Chapter 12):28

(42) Haraldur, sagði að séð þætti adeins vænt um (sjálfan) sig,.
       H.-nom said that self-dat seems-sbjn only fond of self-emph self
       “Harold said that he (Harold) seems fond only of himself.”

The same property holds of Ewe, which requires the reflexive base with a logophoric pronominal marker for clause-internal coreference between logophors (Clements 1975, pp. 142, 156). Icelandic simply lacks a nuclear logophoric pronoun to complement the use of its nonnuclear, subjective logophoric reflexive.

As for Culy’s first argument, it is unfortunately true that many categories which ought to be a matter of choice can be imposed by grammars – markers of humility, politeness, social level, and gender, for example29 – and some possible choices of semantic content are ineffable within a single sentence in particular languages.30 Whereas Culy takes obligatoriness to be an inherent property of logophors, in the present theory obligatory binding is a property of the system of pronouns, not of the logophor or anaphor by itself. Icelandic possesses an anti-subjective personal pronoun but no anti-logophoric pronouns; hence, subjectivity is obligatory and logophoricity is optional. Across languages, there is probably a strong tendency for a personal pronoun to take on an anti-binding constraint in the domain in which a bound pronoun appears, as the grammaticalization of a pragmatic principle

27 See also the discussion in Dalrymple (1993, p. 150ff.).
28 This example is from Bresnan et al. (1983); see Maling (1982) on predicate complements (xcomps) in Icelandic.
29 See Arka (1998) for a very interesting example in Balinese.
30 For example, English allows multiple wh-questions while Italian does not.
Types of Bound Anaphors

(Levinson 1987, 1991), so that in languages with pure logophoric, subjective, or nuclear pronouns, personal pronouns may be respectively anti-logophoric, anti-subjective, or nonnuclear. But when pronouns are as polyfunctional as the Icelandic reflexive sig, used for subjectivity as well as logophoricity, the personal pronoun need not be complementary to both functions (though it may be: see O’Connor 1993). Our examples (34) and (35a–d) also bear out that the personal pronoun in Icelandic is unmarked (neutral) for logophoricity, because it can have its antecedent within a logophoric domain and even corefer to the logophoric antecedent.

11.5 The typology of reflexives and the origins of nuclearity


There is a very interesting correlation between the binding constraints and the morphological form of reflexive pronouns, discovered by Faltz (1985). Restricting our attention to reflexives that occupy the syntactic positions of nominal constituents, as opposed to reflexives expressed by verbal morphology as in headmarking languages (Chapter 8), we find that these reflexives fall into two broad morphological types: simple and complex.

(43) Simple reflexives consist of a pronominal stem which may or may not be inflected for case and agreement features; Icelandic sig is an example.

Complex reflexives consist of (i) a pronominal head together with an emphatic constituent (e.g. Norwegian seg selv), or (ii) a compound of these two (e.g. English herself), or (iii) a noun root with a meaning such as ‘body’, ‘soul’, or ‘head’ together with a pronominal marker.

The correlation between morphological form and binding constraints is stated in our terms as follows:

(44) Reflexive-binding typology: (based on Faltz 1985)

i. Simple reflexives are [+sbj]

ii. Complex reflexives are [+ncl]

These generalizations appear to have no exceptions in Faltz’s (1985) typological survey, but there are exceptions to the reverse implications. Not all subjective
Types of Bound Anaphors

reflexives are simple; Norwegian’s *seg selv* is an example (see also Faltz 1985, p. 134ff.). Some nuclear reflexives are simple; Czech reflexives are an example (Toman 1991), being nuclear and subjective. These possibilities are easily accommodated by our theory.

Exceptions to the implications as stated in (44) have also been reported. A counterexample to generalization (44i) is Chinese *taziji*, which permits long-distance binding (and from nonsubject positions) despite being complex. Pan (1998) shows that *taziji* can be bound to a remote NP which is more prominent on a person/animacy hierarchy than all closer possible NPs, and argues that these properties of *taziji* can be explained in terms of neither logophoricity nor contrast and emphasis. Counterexamples to (44i) also exist: there are simple reflexives bound not to the subject but to the most prominent argument on the thematic hierarchy (Marathi is an example, according to Joshi 1989, 1993 and Dalrymple 1993). Nevertheless, it seems that a great majority of languages bear out the truth of (44i, ii) as an implicational generalization of typology.

The implications expressed in (44) point to an explanation of the origins of nuclearity. Part of the explanation is given by Faltz. He proposes that complex reflexives incorporating emphatics arise historically from grammaticalization of the markedness of coreference between coarguments of the same predicate (Faltz 1985, p. 241ff.; see also Comrie 1998). If a language lacks a reflexive pronoun, then an ordinary pronoun may be used for coreference, as in Old English (Traugott 1972, pp. 88–89; Faltz 1985, p. 239):

(45)  

swa hwa swa eadmedath  hine
 whoever  humiliate.pres him.acc
“whoever humiliates himself …”

As Faltz observes, the “Old English ancestor of the modern reflexive morpheme *self* was an NP emphatic *self* or *sylf*, which was placed after an NP and took endings marking gender, number, and case in agreement with it. Over time this morpheme was reinterpreted as a reflexive, thus providing English with its primary strategy” for reflexivization. The Old English *sylf* is directly cognate to the Modern German emphatic *selbst*, and we can see in the modern languages that the function of the emphatic is “as a warning to the hearer that the intended referent of that NP is unusual or unexpected” (Faltz 1985, p. 240). Comparing (46a) and (46b), for example, we see that the former is most naturally used in a context in which it is unexpected that John would have taken the blame:

(46)  

a. John himself took the blame.
   b. John took the blame.

If the unemphatic example (46b) is used in a situation where it is in fact unexpected that John would take the blame, “there is a chance that the hearer might think that the speaker was mistaken or that he heard the sentence incorrectly.” By using the emphatic in this situation, the speaker signals that he recognizes that it
is unexpected for John to be the referent, but it is nevertheless intended, “thereby making it easier for the hearer to believe that there has not been a mistake.” Levinson (1991) shows that this idea can be more precisely expressed within the theory of generalized conversational implicatures; this idea is further developed by Y. Huang (2000).

Faltz gives Modern German as another example of this markedness hypothesis. German has a subjective reflexive sich, which cannot be used to translate himself in the English example *Hans talked to Fritz about himself*, because the antecedent is not a subject. The nonreflexive pronoun could be used in this situation:

(47) \[Hans, sprach mit Fritz, über ihn,\]

H. spoke with F. about him

“Hans talked to Fritz about himself.”

However, a more likely reading of (47) would be that the referent of the pronoun is a person other than Hans or Fritz. “To indicate that it is the unlikely referent which is intended, namely Fritz, the speaker can use the emphatic:”

(48) \[Hans, sprach mit Fritz, über ihn, selbst.\]

H. spoke with F. about himself

“Hans talked to Fritz about himself.”

Faltz emphasizes that this strategy for signaling unexpected referents provides not a syntactic basis for anaphora resolution but merely a strategy intended to aid the hearer in finding the intended referent. The syntactic reflexive himself does provide a syntactic basis for anaphora resolution, by narrowing the possible antecedents to those which are coarguments or (in our terms) in the minimal nucleus. By comparing the nonsyntactic use of the emphatic with the syntactic reflexive, we can see that the latter is a grammaticalization of the former. Thus Norwegian, unlike German and Old English, generally requires the compound reflexive containing selv when coarguments corefer, as illustrated by examples like the following (cf. example (10d)):

(49) \[Vi foralte Ola, om ham selv/*ham.\]

we told O. about self/him

“We told Ola about himself.”

Recall that Icelandic appears to differ in this respect from Norwegian (see example (7a) and footnoes 11 and 13):

(50) \[Ég spurði Harald, um hann; (sjálfan).\]

I asked H,—ACC about him,—ACC (self-EMPH)

“I asked Harold about himself.”

31 Exceptions are discussed below.
Given that the unmarked situation is for coarguments of the same predicate to have distinct referents, it is natural in the absence of a reflexive strategy for an emphatic to be used specifically to signal that the more highly marked less expected situation (namely, coreference between coarguments) is present (Faltz 1985, p. 242). As confirmation for this markedness approach, Faltz makes the following important observation:

If we believe that the reason that it is natural for an emphatic to mark reflexive coreference is that such coreference is normally a marked situation, we would predict that the emphatic would not be used to mark the objects of verbs like wash or dress when they are coreferent with the subject, since for these verbs coreference is normal. But this is just what we find in the history of English. Well into the Middle English period it is easy to find examples like

(44)  
he cladde hym as a poure laborer  
‘He dressed as a poor laborer.’

in which a plain pronoun without self is used as the object of a normally reflexive verb. This may be compared to

(45)  
him self he hyng 
‘He hanged himself.’

in which self marks an object coreferent with the subject when the verb is not normally reflexive.

Faltz’s markedness account of the origin of complex reflexives based on emphatics plausibly explains why nuclearity should be associated with this type, but it leaves the third type of complex reflexive in (43) out of account. The latter consists of a noun root having a meaning such as ‘body’, ‘soul’, or ‘head’, together with a pronominal marker. An example from Fula is hoore-qam (‘head-my’) (Faltz 1985, p. 32):

(51)  
mi gaañi hoore-qam  
I wound.perf head-my

“I wounded myself.”

Obviously, the use of an emphatic marker to signal an unexpected (marked) referent does not explain the locality of binding associated with this reflexive type. To explain this case, Faltz (1985, pp. 247–248) makes the further assumptions that (i) the requirements of locality and subject-antecedency each serve to narrow down the possible referents of the compound reflexive, so some such binding constraint must be acquired during grammaticalization, and (ii) locality of binding

32 Although, interestingly, Moravcsik (1972) observes that noun root reflexive pronouns are often themselves used as emphatics, or “intensifiers.”
is “more easily acquired” than subject-antecedency. This may be so (Faltz offers no evidence), but there is another possible explanation for the binding locality of complex reflexives of the noun root type as illustrated by Fula in (51).

We have already seen in Section 11.3 that (idealizing somewhat) Norwegian seg and seg selv are in complementary distribution, seg being used for subject antecedents outside the minimal nucleus and seg selv for subject antecedents within it. However, this idealization is obtained by removing examples of local uses of seg within the minimal nucleus. Now, in some of these uses seg is simply a marker of intransitive or intransitivized verbs (Lødrup 1999a; see also Grimshaw 1982b, Zec 1985, Sells et al. 1987, and Problem Set 6). But Lødrup (1999a) shows that simple reflexives used in certain “physical contexts” are true arguments of their predicates. Examples are given in (52):

(52) a. *Hun vasket seg.
   “She washed herself.”

b. *Hun hadde skibukse på seg.
   “She wore ski pants.”

c. John satte Marit foran seg.
   “John put Marit in front of himself.”

d. *Hun dro dynen over seg.
   “She pulled the comforter over herself.”

The reflexive seg in the above examples contrasts with those in (53a,b), which are not “physical contexts” in Lødrup’s sense:

(53) a. *Hun beundrer seg selv/*seg.
   “She admires herself.”

b. *Hun snakket om seg selv/*seg.
   “She talked about herself.”

33 Following Faltz’s line of reasoning given above, it is a sign of grammaticalization – the formation of a complex reflexive – that selv is obligatory with seg in (53). In this respect Norwegian is unlike Old English and more like Modern English, as described by Faltz. But the use of seg selv in Norwegian, unlike Modern English herself, is not obligatory in the semantically reflexive contexts in (52). In this respect the Norwegian contrast between (52) and (53) resembles the Middle English contrast described by Faltz above.
“Physical contexts” are characterized by Lødrup as those in which “the physical aspect of a referent is in focus.” The examples he gives can be described as in (54):

(54) **Physical contexts** are those in which a person acts on or in relation to that person’s own body, locates something in relation to that person’s own body, or someone acts on a person by acting on that person’s own body.

Put another way, physical contexts are those in which the body of a person is salient: a person does something to (or in relation to) her own body, or is affected by something done to her own body. Reflexive seg in physical contexts allows semantically contentful modification (*Hun vasket hele seg* – ‘she washed all self’) and resists the existential construction, which is limited to intransitive verbs (*Det vasket/pisket/frottette seg en dame på badet* – ‘it washed/flogged/toweded self a lady in the-bathroom’). In contrast, detransitivizing seg differs in both respects, supporting the conclusion that seg in physical contexts is a true argument, Lødrup argues.

Among the varieties of evidence that Lødrup gives for the status of seg as a true argument in the physical context examples (52) is the fact that seg can occur if and only if arguments denoting inalienable possessions, characteristically body parts, can occur. Thus (55a,b,c) are parallel to (52a,b,d), while (56a,b) are parallel to (53a,b):34

(55) a. *Hun vasket ansiktet.*
   she washed the.face
   “She washed her face.”

   b. *Hun hadde ski på bena.*
   she had skis on the.feet
   “She had skis on her feet.”

   c. *Hun dro dynen over hodet.*
   she pulled the.comforter over the.head
   “She pulled the comforter over her head.”

(56) a. *Hun beundrer ansiktet.*
   she admires the.face
   “She admires her face.”

   b. *Hun snakket om ansiktet.*
   she talked about the.face
   “She talked about her face.”

---

34 Concerning the latter examples, Lødrup (1999a) notes that there are sentences in which “definite nouns denoting body parts have the syntax of ordinary nouns,” such as generics and hyponyms used in certain discourse contexts: *(Er det en del av kroppen din du liker godt?) Jeg liker ansiktet godt* – *(Is there any part of your body that you like well?) I like my face well.’ He cautions that this effect must be excluded by taking these examples as the first sentence of a discourse.
Lødrup shows that these inalienable NPs have much in common with the locally bound reflexive seg. For one thing, the possessors of NPs denoting inalienables must be syntactically realized. For cases of externally possessed inalienables, like those in (55a–c), this means that the inalienable requires an outranking syntactic antecedent. Hence, passivization with these examples is ungrammatical (Lødrup 1999a, p. 386, n. 17). The same, of course, is characteristic of locally bound anaphors. For another, the antecedent of the inalienable NP must occur in the local domain, another characteristic of locally bound anaphors:

Lødrup argues that once the conditions for binding an antecedent to an externally possessed inalienable are correctly stated, they will automatically apply to the binding of local seg in Norwegian, and explain why it differs from the subjective seg we have seen in Section 11.3. In other words, the binding theory of the locally bound simple reflexives is just the binding theory of inalienables. We give the following principle, slightly generalized from Lødrup (1999a):

(58) **Inalienable binding principle:**
An inalienable must be locally bound by its possessor in a physical context.

This formulation applies both to the above cases of subject-binding of inalienables and to object-binding (“possessor raising”) cases such as (59a,b):

(59) a. *Vi vasket henne over hele seg.*
We washed her over all herself
“We washed her all over.”

Lødrup’s formulation is that “an inalienable must be locally bound by a subject in a physical context,” with the footnoted proviso “In addition, inalienables must be allowed as nonthematic objects in secondary predications, and the possessor raising construction must allow object binders.” We generalize by replacing the condition “by a subject” with “by a possessor” in view of the noted examples of nonsubject binding, which are restricted to possessors. 

---

35 “Externally possessed” inalienables are those in which the possessor is not part of the same phrase as the inalienable. Some authors use the term “external possession” to refer only to instances of “possessor raising” like (59b). See Lødrup (1999a, p. 385, n. 9).

36 We will make the simplifying assumption that the domain of local binding is the minimal nucleus containing a subject, although there are subtle issues involved in distinguishing optional local PP arguments from adjuncts (which would lie outside the nucleus). It is unclear whether the PPs in examples like *Hun følte bak seg* (‘she felt behind herself’) are local adjuncts or local obliques. Similar examples in English occur with nuclear pronouns (Chapter 12).

37 Lødrup’s formulation is that “an inalienable must be locally bound by a subject in a physical context,” with the footnoted proviso “In addition, inalienables must be allowed as nonthematic objects in secondary predications, and the possessor raising construction must allow object binders.” We generalize by replacing the condition “by a subject” with “by a possessor” in view of the noted examples of nonsubject binding, which are restricted to possessors.
b. Vi vasket henne i ansiktet.
   We washed her in the face
   “We washed her face.”

The basis of the inalienable binding principle is semantic: physical contexts are those in which the possessor acts on or in relation to her body, or locates something in relation to her body, or where someone acts on the possessor by acting on her body. But these relations are characteristically expressed by a single lexical predicate (e.g. ‘wash’), or by a group of predicates forming a single complete nucleus (e.g. ‘have … on’, ‘put … on’). Their syntactic locality is a reflection of their semantic locality.38

We are now in a position to answer the question of why noun root reflexives such as that in Fula are locally bound. These reflexives are hypothesized to have undergone a process of grammaticalization described by Faltz (1985, p. 33) as follows:

First, there is a stage in which the language lacks a primary reflexive. Then, the word for “body”, “head”, “soul”, or some such, is used as the basis for a reflexive noun phrase. In the second stage, the word in question has two distinct semantic functions. On the one hand, it retains its original lexical meaning of “head” or whatever; but in addition it has the new grammatical function of indicating reflexive coreference as a result of weakening (hence widening) of the specific lexical meaning. Basque, Fula, and Malagasy are currently in this stage. A third stage would be the loss of the lexical meaning entirely, or, less drastically, the phonological separation of the reflexive from the lexical meanings, so that we end up with an exclusively reflexive stem in the language.

We see, then, that through grammaticalization, the lexical meaning of the inalienable widens metonymically from the self’s body or other inalienable possession to the self. The self remains its own inalienable possession, so the inalienable binding principle (58) still applies. But as the semantically local binding domain is

38 Lødrup shows that both inalienables and seg can serve as the objects of resultative constructions:

(i) Hun fikk øynene undersøkt av en lege.
   She got the.eyes examined by a doctor
   “She got her eyes examined by a doctor.”

(ii) Hun fikk seg undersøkt av en lege.
   She got self examined by a doctor
   “She got herself examined by a doctor.”

These examples show both the inalienable and the local reflexive seg occurring in true object positions where they are locally bound by the subject of the minimal nucleus. But it is not quite clear why these examples could not also perhaps be construed as extended physical contexts in which the possessor brings about something that affects her own body.
grammaticalized and replaced by the syntactically local domain which corresponds to it, the restriction to physical contexts is eventually dropped. The result is nuclearity.

To summarize, on the account sketched above, nuclearity is the grammaticalization of pragmatic and semantic properties of reference in simple predications. Most simple predications involve noncoreferential coarguments and invite pragmatic marking of coreference, which historically becomes grammaticalized along the lines proposed by Faltz (1985) and Levinson (1991). However, predications of actions on the body are different: these imply a coreference relation among coarguments, because the relation of the body to the self is inalienable. Lødrup (1999a) proposes his inalienable binding principle as an explanation for the local binding of simple reflexives in physical contexts in Norwegian (as well as Dutch), but this principle also offers an explanation – via grammaticalization – for the locality of binding of complex reflexives based on body parts across languages. We see, then, that local reflexives are not always complex, but complex reflexives are likely to be local if they derive historically from the grammaticalization of these pragmatic and semantic constraints on referring in simple predications.

As for (44i), the tendency for simple reflexives to be bound by subject antecedents without being restricted to a local domain, recall from (43) that simple reflexives are based on a pronominal stem. Faltz (1985, p. 224) remarks that in his typological sample, compound reflexives are always marked for all persons, whereas pronominal reflexives are not. Thus, simple reflexives tend to be morphologically deficient pronouns, lacking some agreement information that would obviously play a role in identifying the possible referent. This would explain why they tend to be subject-oriented. If, as Faltz assumes, subject-antecedency serves to narrow down the possible referents of the pronoun, then it is clear that for pronouns deficient in the referentially classificatory information provided by agreement features, the strategy of fixing the antecedent to be one of particular prominence is well motivated. The subject is the most prominent argument on the functional hierarchy (see Section 10.1 and Chapter 6), but other dimensions of prominence (such as the thematic hierarchy) can also be recruited to narrow down possible antecedents.39

Further reading and discussion

The typology of reflexives in (44) has attracted many attempts to explain the phenomena in terms of the syntactic mechanisms of synchronic grammar, independently of the historical considerations outlined above. One widespread approach

39 Comrie (1998, p. 338) hypothesizes that noncoreference is marked within nonlocal domains, as the “absence of ‘topic-continuity’.”
proposes that reflexivization involves the covert movement of an anaphoric element to a higher position in the tree structure. The binding domain differences between simple and complex reflexives on this approach follow from the barriers to movement posed by the internal syntactic structure of complex reflexive NPs; see Pica (1987, 1991), Cole et al. (1990), Reinhart and Reuland (1991), Hestvik (1991), Cole and Sung (1994), and references for representative examples. For representative criticisms of the movement-based analyses, see Thráinsson (1991), C.-T. J. Huang and Tang (1991), Progovac (1993), Dalrymple (1993), and Pan (1998). It is clear that if there is a historical explanation for the typological generalizations (44), a synchronic re-explanation in completely independent terms is unneeded.

11.6 Formalization

We assume here the material in Section 10.4. The subjective/anti-subjective constraints will have the general form in (60). Some languages, such as Icelandic and Norwegian, restrict the domain of subjective and anti-subjective pronouns to the minimal finite clause, while others, such as Yoruba (Pulleyblank 1986), do not. We therefore regard this restriction as a crosslinguistic parameter of variation:

\[ \text{(60) a. Subjective:} \]
\[ \text{((DomainPath} \uparrow) \text{ Antecedent INDEX}) = (\uparrow \text{ INDEX}) \]
\[ \text{Antecedent = subj, DomainPath parametrically restricted to the minimal finite clause.} \]

\[ \text{b. Anti-subjective:} \]
\[ \text{((DomainPath} \uparrow) \text{ Antecedent INDEX}) \neq (\uparrow \text{ INDEX}) \]
\[ \text{Antecedent = subj, DomainPath parametrically restricted to the minimal finite clause.} \]

Formally, the minimal finite clause condition is expressible as an off-path constraint requiring that the domain be restricted to at most one \( f \)-structure containing the \text{TENSE} attribute:

\[ \text{(61) Finite domain condition:} \]
\[ \text{A binding constraint designator ((}} \alpha \text{ GF} \uparrow \text{ subj)} \text{ is in the minimal finite domain when, if the attribute string } \alpha \text{ is nonempty, then (} \rightarrow \text{TENSE} \text{) holds for every attribute in } \alpha \text{.} \]

The subjective/anti-subjective constraints can then be formulated as in (62), with the parametric choice given as a parenthetical option:
(62) **Formalization of subjectivity constraints:**

a. A **subjective pronoun** is lexically specified

\[ (\alpha \text{ GF} \uparrow) \text{ SUBJ INDEX} = (\uparrow \text{ INDEX}) \]

(subject to the finite domain condition (61)).

b. An **anti-subjective pronoun** is lexically specified

\[ (\alpha \text{ GF} \uparrow) \text{ SUBJ INDEX} \neq (\uparrow \text{ INDEX}) \]

(subject to the finite domain condition (61)).

The multiple binding features of the Norwegian system are interpreted as in (63):

(63) **Formalization of mixed subjective/nuclear constraints:**

a. A **subjective, nuclear pronoun** is lexically specified

\[ (\alpha \text{ GF} \uparrow) \text{ SUBJ INDEX} = (\uparrow \text{ INDEX}) \]

(subject to the minimal nucleus condition \(\neg (\rightarrow \text{SUBJ})\);

see Section 10.4).

b. An **anti-subjective, nuclear pronoun** is lexically specified

\[ (\alpha \text{ GF} \uparrow) \text{ SUBJ INDEX} \neq (\uparrow \text{ INDEX}) \]

(subject to the minimal nucleus condition \(\neg (\rightarrow \text{SUBJ})\)) and

\[ (\alpha \text{ GF} \uparrow) \text{ GF'} INDEX = (\uparrow \text{ INDEX}) \]

(subject to the minimal nucleus condition \(\neg (\rightarrow \text{SUBJ})\)).

c. A **subjective, nonnuclear pronoun** is lexically specified

\[ (\alpha \text{ GF} \uparrow) \text{ SUBJ INDEX} = (\uparrow \text{ INDEX}) \]

(subject to the finite domain condition (61)) and

\[ (\alpha \text{ GF} \uparrow) \text{ GF'} INDEX \neq (\uparrow \text{ INDEX}) \]

(subject to the minimal nucleus condition \(\neg (\rightarrow \text{SUBJ})\)).

Our logophoric binding constraints make reference to a representation of discourse as well as the to f-structure attributes. A formalization of these constraints would take us too far afield from the focus of this book, but we can point to Stirling’s (1993) elegant formalization of logophoricity within discourse representation theory (DRT), using categorial unification grammar as the syntax formalism.\(^{40}\) There are, in fact, close family resemblances among the various unification formalisms for syntax, and DRT semantics for LFG has been developed by a number of researchers, such as Asher and Wada (1988) and – in the context of the associate framework of glue semantics – Crouch and van Genabith (1999) and Bary and Haug (2011); see also the references.

\(^{40}\) Also see Oshima (2006, 2007) for a formal treatment of viewpoint.
12 Predication Relations

As we saw in Chapter 10, the coarguments of a single predicador form a domain for pronominal binding that we have designated the nucleus (of predication). In
this chapter we will see that there is evidence from binding patterns for a com-
plement function called the “predicate complement” in traditional grammar and
the XCOMP in LFG; it constitutes a second nucleus of predication within its clause.
Subjective pronominal systems (Chapter 11) also point to the existence of an f-
structure subject in these predicative complements.\(^1\)

12.1 Predicate complements versus adjuncts

Examples of predicate complements (XCOMPS) are given in (1):

(1) a. Mary didn’t sound ashamed of herself.
   b. Louise struck me as a fool.
   c. Jogging keeps Susan in a bad mood.
   d. Linda will have your brother working again.

Predicate complements must be distinguished from predicative adjuncts, which
are illustrated in (2):

(2) a. Mary looked down, ashamed of herself.
   b. Louise enjoyed sports, naturally, as a Southern Californian.
   c. Susan arrived for lunch, in a bad mood as usual.
   d. Linda found the money walking our dog.

\(^1\) See the “Further reading and discussion” section at the end of this chapter.
There are many differences between the two types of functions. For one example, removal of the predicate complement makes the sentence incomplete or changes the primary lexical meaning:

(3)  
a. ?? Mary didn’t sound.
    b. Louise struck me. [different in meaning from (1b)]
    c. * Jogging keeps Susan.
    d. Linda will have your brother. [different in meaning from (1d)]

This property is characteristic of complements but not adjuncts.

Another difference between predicate complements and adjuncts is that the word order of the complements is relatively fixed, like that of other complements in English. Placing these complements in the position immediately following the subject produces ill effects, for example:

(4)  
a. ?? Mary, ashamed of herself, didn’t sound.
    b. ?? Louise, as a fool, struck me.
    c. ?? Jogging, in a bad mood, keeps Susan.
    d. ?? Linda, working again, will have your brother.

Contrast this reordering with that of the adjuncts:

(5)  
a. Mary, ashamed of herself, looked down.
    b. Louise, as a Southern Californian, enjoyed sports, naturally.
    c. Susan, in a bad mood as usual, arrived for lunch.
    d. Linda, walking our dog, found the money.

A third characteristic of the predicate complements is that they allow extraction of their constituents more easily than the adjuncts:

(6)  
a. Who did Mary sound ashamed of ___?
    b. What kind of person did Louise strike you as ___?
    c. What will Linda have your brother working at ___?
      etc.

(7)  
a. * Who did Mary look down, ashamed of ___?
    b. * What kind of Southern Californian did Louise enjoy sports as ___?
    c. Whose dog did you find the money walking ___?
      etc.

Note that example (7c) is disambiguated in favor of the pragmatically strange complement reading (in which the money was walking the dog), because the adjunct reading (in which you were walking the dog when you found the money) is so disfavored.
Still other differences could be enumerated. The predicate complements, for example, show lexically governed predication relations. Whether the complement is predicated of the subject or object in (8) depends on the verb:

\[(8) \quad \begin{align*}
a. & \text{ Mary struck Fred as proud of herself/*himself.} \\
b. & \text{ Mary regards Fred as proud of himself/*herself.} \\
\end{align*} \]

Contrast the predicate adjuncts in (9):

\[(9) \quad \begin{align*}
a. & \text{ Mary struck Fred, proud of herself for doing so.} \\
b. & \text{ Mary struck Fred, so proud of himself for insulting her.} \\
\end{align*} \]

Still another difference between predicate complements and adjuncts is the scope of verbal negation, as registered by negative polarity items. Examples (10a,b) show that an ordinary complement (an object) may contain a negative polarity item, while an appositive adjunct to an object may not:

\[(10) \quad \begin{align*}
a. & \text{ Mary didn’t give Fred a picture of anyone.} \\
b. & * \text{ Mary didn’t see it, a picture of anyone.} \\
\end{align*} \]

A similar contrast appears in (11a,b):

\[(11) \quad \begin{align*}
a. & \text{ Mary didn’t sound at all ashamed.} \\
b. & * \text{ Mary didn’t look down, at all ashamed.} \\
\end{align*} \]

Finally, each verb takes a unique predicate complement, while adjuncts may be stacked up. In (12) we have placed a negative polarity item in the outer phrase to force the predicate complement interpretation and eliminate a possible adjunct reading:

\[(12) \quad \begin{align*}
a. & * \text{ Mary didn’t sound [ashamed of herself] [at all mute with anxiety].} \\
b. & * \text{ Louise didn’t strike me [as a fool] [as at all gullible].} \\
c. & * \text{ Jogging doesn’t keep Susan [in a bad mood] [at all on edge].} \\
\end{align*} \]

In contrast to the predicate complements shown in (12), the predicative adjuncts in (13) can easily be multiplied:

\[(13) \quad \begin{align*}
a. & \text{ Ashamed of herself, Mary looked down, mute with anxiety.} \\
b. & \text{ As a Southern Californian, Louise had enjoyed sports as a girl.} \\
c. & \text{ In a bad mood as usual, Susan arrived for lunch late, visibly on edge.} \\
\end{align*} \]

All of these observations point to the fact that predicate complements are a type of complement selected by a verb. The LFG notation for this complement type is xCOMP (read “x-comp”), also called “open complement” (Bresnan 1982a). The
name **XCOMP** was originally used because predicate complements can be of any lexical category type \( X \) \( (X = V, N, A, \text{or } P) \), although the main verb may impose restrictions on the type.\(^2\)

(14) a. Susan kept [out of the argument] \( \text{pp} \).
b. Susan kept [quiet about it] \( \text{ap} \).
c. Susan kept [eating marshmallows] \( \text{vp} \).
d. *Susan kept [a grouch] \( \text{np} \). \[“remain” sense\]

(15) Susan remained/became [a grouch] \( \text{np} \).

### 12.2 F-structures of XCOMP\(\text{s}\)

Predicate complements are phrasal categories XP of a type that inherently lack an internal c-structure subject: VP, AP, PP, and NP belong to the class of lexical projections LP within our \( X' \) theory (Chapter 6), while subjects are introduced in \( \text{SPEC} \) of FP or S. Hence, if we say nothing more, we will find, on examining the f-structure of an example like (14c), that the XCOMP is incomplete, lacking an f-structure subject:

\[
\begin{align*}
\text{(16)} & \\
& \begin{array}{c}
\text{f}_1: \\
\text{SUBJ} \rightarrow \{\text{“Susan”}\} \\
\text{PRED} \rightarrow \text{‘keep}((f_1 \text{SUBJ})(f_1 \text{XCOMP}))’ \\
\text{TENSE} \rightarrow \text{PAST} \\
\text{XCOMP} \rightarrow \{f_2 \text{SUBJ}\} \\
\text{PRED} \rightarrow \text{‘eat}((f_2 \text{SUBJ})(f_2 \text{OBJ}))’ \\
\text{OBJ} \rightarrow \{\text{“marshmallows”}\}
\end{array}
\end{align*}
\]

From this we see why a predicate complement is dependent on another argument of the head that can serve as its subject of predication. In the case of example (16), this argument is the \text{SUBJ} of \text{kept}, namely \text{Susan}. Although English is relatively impoverished in this respect, predicate complements in many languages

\(^2\) Verbs such as \text{keep}, which have a transitive alternation (see Section 12.4), appear to disallow an NP predicate complement, in contrast to nonalternating predicate complement-taking verbs.
have distinctive morphosyntactic properties that identify the relation as a matter of grammar, and not of semantics alone (see Problem Set 5 for an example). We therefore hypothesize a functional predication relation (often called “functional control” relation), represented by identifying the subj of the verb *keep* with the subj of its xcomp:

\[
\begin{align*}
&f_1: \begin{cases}
\text{SUBJ} & f_3: [ ] \\
\text{PRED} & \text{‘keep}(\langle f_1 \text{SUBJ}\rangle(f_1 \text{xcomp})\rangle)\end{cases} \\
&\text{xcomp} f_2: \begin{cases}
\text{SUBJ} & f_3: [ ] \\
\vdots & \end{cases}
\end{align*}
\]

(17) represents the subject as shared by the main verb and the predicate complement: the same f-structure $f_3$ is the value of two different attributes – the subj of $f_1$ and the subj of $f_2$.\(^3\) To emphasize that this is a relation of structure-sharing, the completely equivalent alternative representation shown in (18) is often used:

\[
\begin{align*}
&f_1: \begin{cases}
\text{SUBJ} & [ ] \\
\text{PRED} & \text{‘keep}(\langle f_1 \text{SUBJ}\rangle(f_1 \text{xcomp})\rangle)\end{cases} \\
&\text{xcomp} f_2: \begin{cases}
\text{SUBJ} & \\
\vdots & 
\end{cases}
\end{align*}
\]

The functional predication relation (or functional control relation) can be predicted from lexical properties of predicate complement-taking verbs (Bresnan 1982a; Zaenen and Engdahl 1994), but we will simply list it as an underived lexical property for present purposes. Thus the verb *keep* will have as part of its lexical entry the equation in (19):\(^4\)

\[
(19) \quad \text{keep} \quad (\uparrow \text{pred}) = \text{‘keep}(\langle(\uparrow \text{subj})(\uparrow \text{xcomp})\rangle) \\
(\uparrow \text{subj}) = (\uparrow \text{xcomp subj})
\]

Observe now that in the f-structure of example (16) there are two nuclei. The definition of nucleus is repeated here from Chapter 10:

\[
(20) \quad \textbf{Nucleus:} \\
\text{Given an f-structure } f, \text{ the nucleus of } f \text{ is the subset of } f \text{ consisting of} \\
\text{the pred element and all of the elements whose attributes are functions} \\
\text{designated by the pred.}
\]

\(^3\) Recall that f-structures allow this kind of structure-sharing, unlike constituent structure trees (Chapter 4).

\(^4\) See the “Further reading and discussion” section for more on the verb *keep*.
The two nuclei of (17) are the subsets of \( f_1 \) and \( f_2 \) containing the \textsc{pred} feature and its argument functions. The nucleus of \( f_1 \) is shown in (21a), and that of \( f_2 \) is shown in (21b):

\[
\begin{align*}
\text{(21)} \quad \text{a.} & \quad f_1: \\
& \begin{bmatrix}
\text{SUBJ} & f_3: \text{[“Susan”]} \\
\text{PRED} & \text{‘keep } \langle (f_1 \text{SUBJ})(f_1 \text{XCOMP}) \rangle’ \\
\text{XCOMP} & f_2: \\
& \begin{bmatrix}
\text{SUBJ} & f_3 \\
\text{PRED} & \text{‘eat } \langle (f_2 \text{SUBJ})(f_2 \text{OBJ}) \rangle’ \\
\text{OBJ} & \text{[“marshmallows”]} \\
\end{bmatrix}
\end{bmatrix}
\end{align*}
\]

\[
\begin{align*}
\text{b.} & \quad f_2: \\
& \begin{bmatrix}
\text{SUBJ} & f_3 \\
\text{PRED} & \text{‘eat } \langle (f_2 \text{SUBJ})(f_2 \text{OBJ}) \rangle’ \\
\text{OBJ} & \text{[“marshmallows”]} \\
\end{bmatrix}
\end{align*}
\]

These nuclei form two domains for the binding of nuclear pronouns (Chapter 10). Because there is only one subject DP in our example, and it has a shared function in both nuclei, the difference between the two nuclei cannot be easily detected by binding patterns. However, when we consider examples of transitive verbs taking predicate complements, the difference emerges.

Consider examples (22a–d):

\[
\begin{align*}
\text{(22)} \quad \text{a.} & \quad \text{Susan kept John doubting her. [possibly her = Susan]} \\
& \quad * \text{Susan kept John doubting herself.} \\
& \quad \text{c.} \quad \text{Susan kept John doubting him. [him ≠ John]} \\
& \quad \text{d.} \quad \text{Susan kept John doubting himself.}
\end{align*}
\]

This binding pattern is exactly what we expect from the basic binding properties of nuclear and nonnuclear pronouns in Chapter 10 together with our analysis of the f-structure of predicate complements. In these transitive examples, the \textsc{xcomp} is predicated of the object of \textit{keep} (again, for present purposes we will simply stipulate this lexical property without deriving it from the transitive/intransitive alternation that \textit{keep} undergoes):

\[
\begin{align*}
\text{(23)} & \quad \text{\textit{keep} (↑ \textsc{pred}) = ‘keep } \langle (↑ \textsc{subj})(↑ \textsc{obj})(↑ \textsc{xcomp}) \rangle’ \\
& \quad \text{(↑ \textsc{obj}) = (↑ \textsc{xcomp subj})}
\end{align*}
\]

This functional predication relation gives rise to the correspondences shown in (24).\(^5\)

---

\(^5\) Recall from Chapter 6 that transitive verbs with additional complements may have a binary structure, grouping the verb and object together under \( V' \) and the additional complements under higher \( V' \)'s, or a ternary structure. The latter is used here for simplicity.
Observe that (24) has two nuclei, each having a different subject:

This is what explains the binding patterns in (22): the pronominal object of **doubling** must be bound or free in its minimal nucleus. If it is a reflexive pronoun, as in (22b,d), it must be bound in the minimal nucleus in which it could be bound – namely, the minimal nucleus containing a potential binder. The embedded nucleus \( f_2 \) in (25b) constitutes the binding nucleus for these reflexives: the subject of this nucleus is the f-structure for **John**, and is a potential binder for a reflexive pronoun in the object function of \( f_2 \) (because it outranks the object). Hence, **himself** in (22d) is good, but **herself** in (22b) is bad: the latter does not match the only available binder **John** in gender, and **Susan**, which does match, lies outside of this binding nucleus. By the same token, the pronouns in (22a,c) must be free in their nucleus. For nonreflexive pronouns this is the minimal nucleus in which they could be free; again, this is \( f_2 \) in (25). This explains why **her** is good in (22a): it is free of the binders in the inner nucleus (namely, **John**), and so it is free to corefer with **Susan** in the outer nucleus. By the same token, **him** is bad in (22c), if it is taken as bound to **John**, because the f-structure for **John** lies in the binding nucleus of this pronoun, by the relation of functional predication (functional control).

What happens when a pronoun appears as the shared argument in a predicate complement? A shared argument has simultaneous functions in two different
nuclei, and by our discussion of binding and structure-sharing (Section 10.4), we
know that the binding constraints must be satisfied for each nucleus that the pro-
noun occurs in. Examples are given in (26):

\[(26)\]

a. Susan kept herself doubting herself.
   \[\text{[her} \neq \text{Susan}; \text{herself} = \text{her]}\]
b. Susan kept her doubting herself.
   \[\text{[her} \neq \text{Susan]}\]
c. Susan kept herself doubting her.
   \[\text{[her} \neq \text{Susan]}\]
d. Susan kept her_1 doubting her_2.
   \[\text{[her}_1 \neq \text{Susan}; \text{possibly her}_2 = \text{Susan}; \text{her}_1 \neq \text{her}_2]\]

Let us begin with the first example. The shared argument (the first \text{herself} in (26a))
belongs to both nuclei, because it is simultaneously the object of \text{kept} and the
subject of \text{doubting}. The binding nucleus of a reflexive is defined to be the minimal
nucleus in which it could be bound – that is, the minimal nucleus containing both
it and a potential binder for it. As subject of the embedded nucleus, the shared
argument has no potential binder in that nucleus; there is no outranking argument
that could bind it. Hence, we must take the larger nucleus as the binding nucleus,
for it does contain a potential binder (namely, the higher subject). In this larger
nucleus, the shared argument in (26a) can be bound by the subject \text{Susan}, which
outranks both it (as object) and the \text{xcomp} containing it (as subject). As subject
of the matrix nucleus, the reflexive is also bound by the subject antecedent. The
final \text{herself} in this example must be bound in its binding nucleus, which is just the
embedded nucleus. That nucleus contains a potential binder, the subject, which we
have just seen is bound to \text{Susan}. Thus the double binding of reflexives to \text{Susan}
in (26a) follows.

In the second example, (26b), the shared argument \text{her} is a free pronoun. Again
it belongs simultaneously to two nuclei and has two binding nuclei in which the
binding principles must be satisfied. In this case the two binding nuclei do not coin-
cide. As a subject of the embedded nucleus, the shared argument has no potential
binder in that domain, and so has its binding conditions satisfied. However, as
object of the matrix nucleus, it must also be free in that larger domain. Hence it
cannot be bound to the subject \text{Susan}. Meanwhile, the embedded reflexive must be
bound in the embedded nucleus as before. The subject is the only potential binder,
so \text{herself} must be bound by \text{her}, which, however, must be free of \text{Susan}, as we
have just seen.

The explanation for the binding patterns in the remaining two examples,
(26c,d), is left to the reader.

We now observe that the same binding patterns occur with predicate comple-
ments of categories other than \text{VP}. The binding patterns with an \text{AP \text{xcomp aware of}}
are given in examples (27) and (28). They are identical to those for the \text{VP}
above, and are shared by a multitude of APs (such as \text{afraid of}, \text{ignorant about},
\text{happy with}, \text{angry at}, \text{proud of}, and \text{fond of}):
(27) a. Susan kept John aware of her. [possibly \textit{her} = Susan]
b. * Susan kept John aware of herself.
c. Susan kept John aware of him. [\textit{him} \neq John]
d. Susan kept John aware of himself.

(28) a. Susan kept herself aware of herself.
b. Susan kept her aware of herself. [\textit{her} \neq Susan; \textit{herself} = \textit{her}]
c. Susan kept herself aware of her. [\textit{her} \neq Susan]
d. Susan kept her\textsubscript{1} aware of her\textsubscript{2}. [\textit{her} \neq Susan; possibly \textit{her} \textsubscript{2} = Susan; \textit{her} \textsubscript{1} \neq \textit{her} \textsubscript{2}]

A predicative PP complement \textit{in awe of} is shown in examples (29) and (30). Again, the binding patterns are identical to what we have just seen:

(29) a. Susan kept John in awe of her. [possibly \textit{her} = Susan]
b. * Susan kept John in awe of herself.
c. Susan kept John in awe of him. [\textit{him} \neq John]
d. Susan kept John in awe of himself.

(30) a. Susan kept herself in awe of herself.
b. Susan kept her in awe of herself. [\textit{her} \neq Susan; \textit{herself} = \textit{her}]
c. Susan kept herself in awe of her. [\textit{her} \neq Susan]
d. Susan kept her\textsubscript{1} in awe of her\textsubscript{2}. [\textit{her} \neq Susan; possibly \textit{her} \textsubscript{2} = Susan; \textit{her} \textsubscript{1} \neq \textit{her} \textsubscript{2}]

The same patterns hold with other PPs that predicate states of the object of \textit{keep}, such as \textit{at odds with}, \textit{in a state of awe about}, \textit{in angry opposition to}, and \textit{in love with}.

To extend our analysis uniformly to these nonverbal predicate complements, we hypothesize a lexical \textbf{predication template} which augments the lexical form for a preposition or nominal to one which has a subject of predication. We assume here that adjectives intrinsically have a subject of predication, as in (31a). The predication template gives similar lexical forms for prepositions and nouns, as illustrated in (31b,c) to the right of the $\Rightarrow$:

(31) a. ‘\textit{aware-of} ⟨↑ \textsc{subj})(↑ \textsc{obl})⟩’
b. ‘\textit{in} ⟨↑ \textsc{obj})⟩ $\Rightarrow$ ‘\textit{be-in} ⟨↑ \textsc{subj})(↑ \textsc{obj})⟩’
c. ‘grouch’ $\Rightarrow$ ‘be-a-grouch ⟨↑ \textsc{subj})⟩’
Exercise 1

Work out the f-structures for the examples in (27)–(30) and explain the observed binding patterns in detail.

Exercise 2

Explain the contrast between the following two examples:

(32)  
   a. My mother\(_i\), respected/admired her\(_j\), cook. [possibly \(i = j\)]  
   b. My mother\(_i\), remained/became her\(_j\), cook. [\(i \neq j\)]

In (32a) it is very easy to interpret ‘her’ as referring to ‘my mother’. The preferred interpretation of (32b), in contrast, is that ‘her’ does not refer to ‘my mother’. (The interpretation is possible with ‘her own’ substituted; please disregard that reading.)

12.3 F-structure of PP complements

To explain the parallel binding patterns across predicate complements of all categories, we have assumed that the lexical forms of verbal and adjectival XCOMPS have a SUBJ argument, and we have further hypothesized that prepositions (and nominals) have a predicative use in which their lexical form is augmented by a subject of predication. Focusing now on PPs, we will see that the XCOMP function is only one of three different grammatical functions that a PP complement can play.

The PPs illustrated in the previous section predicate states of an argument: at odds with, in a state of awe about, in angry opposition to, in love with, and so on. We posited a predication template to yield metaphorical extensions of locative prepositions such as the following for the word in:

\[
\text{(33) } \text{in } P (\uparrow \text{pred}) = \text{‘be-in-a-state-of} \langle (\uparrow \text{subj}) (\uparrow \text{obj}) \rangle \text{’}
\]

When the PP denotes a state or quality, it can serve as a predicate complement of a verb like keep, as illustrated in the previous section, or of various other verbs (Maling 1983):
(34)  
   a. Louise seems in a bad mood/out of character/under the weather, ...  
   b. We consider her out of it.  
   c. He looks over the hill/past his prime, ...  
   d. We regard her comments as off the wall.

For example, in (34a) takes Louise as its subject and a bad mood as its object. Like these figurative senses, the literal locative senses of many prepositions also permit predicative uses, as shown by simple primary predications:

(35) Louise is in the house/out of town/under the old apple tree.

Despite their use as primary predicates, locative PPs cannot appear with many of the verbs that otherwise allow predicate complements. Contrast (34) with (36) (the # sign marks an example which is semantically anomalous):

(36)  
   a. # Louise seems in the house/out of town/under the old apple tree.  
   b. # We consider her out of town.  
   c. # A brook looks just over the hill.  
   d. # We regard the brook as just over the hill.

The anomalous nature of such examples is consistent with a broader generalization that is not specific to PPs: the predicate complements of certain verbs must denote gradable, subjective properties (Bolinger 1972; Matushansky 2002). Adjectives are gradable (also called scalar) if they allow comparative forms and degree modifiers (see Sapir 1944, Klein 1980, or Kennedy 1999, among others). So nice is gradable (nicer, nicest, very nice) while choral is not (This song is more choral, her most choral music, very choral). Bolinger (1972, p. 77) observed that the complement of perception seem must contain a gradable predicate (see also Matushansky 2002). These are Bolinger’s judgments of his examples:

(37)  
   a. The music seems nice/*choral.  
   b. The problem seems insoluble/*mathematical.

Some nongradable predicates can be coerced to gradable senses by using a degree modifier, improving their acceptability in these complement positions (examples from Bolinger 1972):

---

6 Matushansky (2002) argues that the AP-taking seem is a perception verb with a gradability condition on its AP complement, while the infinitive-taking seem is an epistemic modal and lacks a gradability condition. Hence these examples are acceptable, in contrast with (37a) and (39b), respectively: The music seems to be choral/The number seems to be third. See Asudeh and Toivonen (2012) for a recent LFG analysis of the different uses of seem and further discussion of the perceptual/epistemic distinction (Asudeh and Toivonen 2012, pp. 362–363).
(38) a. The music seems almost choral.
b. The problem seems pretty much mathematical.

Matushansky (2002, p. 231) observes that some adjectives cannot be coerced, citing this contrast between gradable large and nongradable third:

(39) a. This number seems large.
b. *This number seems third (in a sequence).

As Matushansky (2002, p. 231) writes, “Intuitively, the property of being third is binary. Either something is third or it is not.”

Returning to the PPs, in their figurative senses they denote gradable properties: Louise can be in a bad mood, out of character, or under the weather to a greater or lesser degree. But the locative senses are nongradable and uncoercible: either Louise is out of town, or she is not. In conclusion, many prepositions in both their literal locative and figurative senses can be predicative, but some attempts at predication fail because certain verbs impose a semantic selectional restriction of gradability on their predicate complements.

There are other literal locative PP complements that are not predicative. In the previous section we looked at the transitive verb keep in its abstract sense of “keeping someone or something in a state or involved in a process,” but this verb also has the related sense of “keeping someone or something in a physical location.” The two senses can be grammatically distinguished by locative inversion, a process which results in preposing of the PP and postposing of the subject (Bresnan 1994b):

(40) a. An old vase was kept on the shelf. [locational]
b. A young child was kept on the alert. [nonlocational]

(41) a. On the shelf was kept an old vase. [locational]
b. # On the alert was kept a young child. [nonlocational]

This evidence supports the conclusion that while keep in the former abstract sense selects an xcomp complement as discussed in the previous section, the locative PP complements of keep in the latter sense of maintaining a physical location are not xcomps.7

Moreover, there is a class of transitive locational verbs (put, position, place, pull, …) that take locative PPs but not predicative complements:

(42) a. Susan happily placed John beside the hostess.
b. Mary pulled the shawl around her shoulders.

---

7 Indeed, Bresnan and Kanerva (1989) and Bresnan (1994b) argue that locatives alternate with f-structure subjects under locative inversion, but subjects are not functionally controllable.
(43)  
  a. #Susan happily placed John in a frenzy.
  b. #Mary pulled the shawl very attractive.

These verbs entail that their objects have the locational property specified by the PP: if Susan placed John beside the hostess, then John was beside the hostess; and if Mary pulled the shawl around her shoulders, then the shawl was around her shoulders. But these entailments can be seen to follow simply from the lexical semantics of the verbs, rather than from a grammatical relation which specifies a subject of predication in the f-structure. In contrast to the xcomp verbs, for example, most of these verbs allow the PP complement to be omitted, retaining the entailment that the object is in some (unspecified) location:

(44)  
  a. Susan positioned John.
  b. Mary pulled the shawl.

Further, the actual entailment in many cases is not expressed by the xcomp analysis, because it involves the intrinsic lexical semantics of the main verb. For example, *Mary pulled the shawl into a strange shape* does not entail *the shawl was into a strange shape*, which is actually deviant, but rather that the shawl got or went into a strange shape. This additional component of meaning must be implied by the verb *pull*, because replacing that verb in the example does not preserve the entailment: #Mary positioned the shawl into a strange shape.

This evidence suggests that the locative PPs are not predicate complements but oblique arguments of their verbs. The oblique arguments lack a subject of predication, as illustrated in (45):\(^8\)

---

\(^8\) See footnote 5.
Now observe that the preposition defines its own nucleus $f_2$ in (45), but it is an incomplete nucleus in the sense of (21) in Chapter 10, in contrast to those of the predicative complements (xcomps) of the previous section. Our binding theory thus predicts a different set of binding patterns for these locative verb constructions; in particular, both pronoun and reflexive objects of the preposition should be able to be bound by the same antecedent:

(46) a. Mary$_i$ placed John beside herself$_i$/her$_i$ at the table.
    b. Mary$_i$ pulled her shawl around herself$_i$/her$_i$.
    c. Mary$_i$ angrily peeled her clothes off herself$_i$/her$_i$.

The pronoun is free within the minimal nucleus that contains it (the PP nucleus) and hence may be bound by Mary. But the reflexive must be bound within the minimal complete nucleus that contains it, which in these cases is that of the entire sentence. In contrast, where the PP is an xcomp, the PP itself defines a complete nucleus outside of which the reflexive cannot be bound:

(47) Linda$_i$ kept John doubting *herself$_i$/her$_i$.

It also follows that keep should have different binding patterns correlating with its selection of an obl$_{loc}$ or an xcomp. This prediction is borne out by (48). Here the locational sense of keep displays a binding pattern different from that in (47) but similar to that in (46):

(48) a. Linda$_i$ likes to keep a shawl around herself$_i$/her$_i$.
    b. The old professor$_i$ likes to keep all the younger professors after himself$_i$/him$_i$ in the academic procession.

The PP in (48b) refers to a physical position located behind the old professor. When the same preposition after is used metaphorically in a predicate complement construction, the pattern differs sharply:

(49) Linda$_i$ likes to keep all the men after *herself$_i$/her$_i$.

Here after does not refer to positional location, but means something like ‘in pursuit of’. Similar xcomp uses of the PP with keep are given in (50):

(50) a. Linda$_i$ kept John in love with *herself$_i$/her$_i$.
    b. Susan$_i$ kept me in awe of *herself$_i$/her$_i$.

For these reasons, we analyze locative PPs as obl functions, having a pred but lacking a subj.

Other prepositional phrases differ yet again in their binding patterns with transitive verbs. One example is shown in (51):

(51) Mary$_i$ gave a present to herself$_i$/*her$_i$. 
This pattern is just what would be expected if the preposition were serving as a marker of an argument of the verbal PRED, similar in function to a case marker:

(52)

In support of this analysis, we can observe that the preposition to is specifically selected by give. There is no range of prepositions from the same semantic field that can express the giving relation in these examples:

(53)  a. * Mary gave a present toward/up to herself.
      b. * Mary gave a present there.

In sum, we have found three different patterns of pronominal and reflexive binding with PPs, corresponding to three distinct grammatical relations: the predicative complement (xcomp), the semantic oblique complement (obl_\( q \)), and the grammatical oblique complement (obl_\( \text{case} \)). The binding patterns reflect how fully elaborated the complement’s functional structure is.

A note must be added about the pattern of free variation in binding. Free variation is allowed in principle by the formal grammar, but it intersects with the inalienable binding principle discussed in Section 11.5. In some circumstances, the English reflexive pronoun seems to have the connotation not just that its reference is bound to that of the antecedent, but also that the referent is involved in an inherently reflexive action on its (body) parts, like the locally bound seg in Norwegian (Lødrup 1999a). The contrasts between the following examples can be understood in this way:

(54)  a. Mary angrily pulled Bill’s arms off her/?herself.
      b. Mary angrily pulled her peeling skin off ?her/herself.

---

9 One fact not explained by this analysis, however, is the possibility of locative inversion with dative to phrases, as in To Mary was given the gift of eloquence. Possibly the PP has semantic content but shares it with the verb in such a way as to extend the nucleus. We will not be concerned with a formalization here; see Andrews and Manning (1999) and references.
c. Mary angrily pulled her clothes off her/herself.
d. Mary angrily pulled the spider off her/herself.

In (54a), Bill’s arms are clearly not part of Mary, so the nonreflexive pronoun is slightly preferred. Using the reflexive pronoun in this example almost seems to suggest that Bill’s arms have been detached from him and have somehow adhered to Mary. In (54b), in contrast, Mary’s peeling skin is part of her, and the reflexive seems to be used preferentially. The nonreflexive pronoun here might suggest that Mary’s skin has already become separated from her. In (54c) Mary’s clothes arguably might or might not be considered part of her. But in (54d) the spider clearly cannot be considered part of Mary, and it is outside the realm of possible parts of the agent invoked in the preceding examples (arms, skin, possibly clothes); here both variants can be taken, as expected under our theory. Thus subtle semantic factors may define preferences within the grammatical domain of potential free variation, but the existence of the domain itself must still be defined in some formal way.

12.4 C-structure of predicate complements

An assumption of the theory of this chapter is that both transitive and intransitive verbs may have predicative complements (xcomps). Let us briefly enumerate several kinds of evidence for this assumption.

First, a well-known and intensively studied class of English verbs participate in what is called the transitive alternation (Levin 1993), illustrated in (55)–(58):

(55) a. The boat sank.
    b. They sank the boat.

(56) a. The baby moved.
    b. They moved the baby.

(57) a. The worm turned.
    b. They turned the worm.

(58) a. Corn grew.
    b. They grew corn.

Verbs in this class have the property that the intransitive assigns the same semantic role to its subject that the transitive assigns to its object. Several of the verbs that take predicative complements belong to this class, including turn, grow, keep, get [American English], and prove:
Predication Relations

(59)  
   a. The milk turned sour.
   b. Exposure to high temperature turned the milk sour.

(60)  
   a. The bushes grew thicker.
   b. Grow the bushes thicker (for more privacy).

(61)  
   a. Mary kept in shape.
   b. Jogging kept Mary in shape.

(62)  
   a. She got angry at him.
   b. That got her angry at him.

(63)  
   a. It proved worthless.
   b. What proved it worthless was …

Second, transitive verbs allow the shifting of “heavy” objects to the right margin of the VP, following other complements:

(64)  
   We gave ___ to Mary [one picture of her mother/?one/*it].

(65)  
   We placed ___ on the table [one of Susan’s tartes Tatin].

In contrast, English subjects cannot shift to the right edge of their XP (as first observed by Postal 1974):

(66)  
   a. We talked about no women who represent our point of view being on the committee.
   b. ?* We talked about being on the committee no women who represent our point of view.

Observe that embedded shifting of an object is possible: 10

(67)  
   a. We talked about my having on the committee no women who represent our point of view.
   b. We talked about there being on the committee no women who represent our point of view.

Thus this phenomenon clearly distinguishes subject and object.

In this respect, too, the objects of transitive verbs taking xcomps behave like the c-structure objects of transitive verbs, not the c-structure subjects (or specifiers) or the complements:

---

10 The postverbal DP in existentials is also in an object position in English (Bresnan 1982c).
(68)  a. She considers foolish/out of the ordinary anyone who disagrees with her/??anyone/*it.
    b. I find rather charming your naive innocence/??you.
    c. He made a little too obvious his sudden displeasure/??that/*it.

To be sure, some transitive verbs that take xcomps resist this shifting, in a kind of “garden path” effect wherein the comprehender of the sentence is initially led to construe it as an intransitive construction rather than a transitive with shifted object (as first noted by Postal 1974 for another class of ambiguous verbs):

(69)  ??Jogging keeps fit anyone who does it regularly.

But this fact seems to be a general property of verbs showing the transitive alternative. Thus, (69) compares with (70), which does not involve an xcomp at all:

(70)  a. * They sank into the ocean the boat that they had targeted.
    b. ?? The baby bounced over the crib the ball that we had given her.

Other word order evidence confirms the object status of the subject of predication of these verbs. For example, only a single NP or PP constituent can be clefted (in some varieties of English, including the one spoken by the first author). Hence the complements of ditransitive verbs (71a) or transitive-locative verbs (71b) cannot be clefted felicitously, in contrast to the complex complements of simple transitive verbs (71c):

(71)  a. * It is Mary a present that I gave.
    b. * It is food on the table that I put for you.
    c. It is no women being on the committee that we talked about.

The transitive xcomp verbs behave like the other transitive verbs:

(72)  a. * It is Fred on edge that Linda kept.
    b. * It is Milly a coward that we considered.

Similarly (in some dialects, at least, including that of the first author), right node raising can factor out from two conjoined clauses only a single constituent:^11

(73)  a. * Mary gave, but Louise didn’t give, Peter the grape.
    b. Mary liked, but Louise didn’t like, Peter the Great.

^11 There are speakers who impose a weaker constraint on the “right node,” and for them the contrast in constituency cannot be tested by this means.
A similar contrast is provided by transitive xcomp verbs in (74) compared with the simple transitive verbs in (75):

(74)  
   a. * Mary kept, but Louise didn’t keep, Peter proud of her.  
   b. * Mary proved, but you didn’t prove, me wrong.

(75)  
   a. I brought up, though he didn’t want to talk about, no women being on the committee.  
   b. I detest, and Linda hates, ducks being eaten.

Many other facts could be summoned to corroborate our basic assumption that both transitive and intransitive verbs may take predicative complements (xcomps). In all of the c-structures [V DP XP] we have seen in this chapter, whether XP is a predicative complement (xcomp), a semantic oblique (obl\theta), or a grammatical oblique (obl\textit{case}), we find that V and DP cohere structurally as verb and object, while DP and XP do not cohere structurally as subject and predicate. The variation in predication and binding, then, belongs to f-structure, not c-structure.

12.5 Raising

Not all of the predicators which take xcomps impose semantic selection on the functional controller argument. For example, the verb strike allows both contentful subjects (Mary in (76a)) and expletives (there in (76b)):

(76)  
   a. Mary struck me as being very capable.  
   b. There struck me as being too few women on the committee.

But impress contrasts in disallowing an expletive subject:

(77)  
   a. Mary impressed me as being very capable.  
   b. ?? There impressed me as being too few women on the committee.

This difference is represented in the lexical forms for the two verbs, as shown in (78):\textsuperscript{12}

(78)  
   a. strike \langle (↑\textit{OBJ})(↑\textit{xcomp})(↑\textit{subj}) \rangle  
   b. impress \langle (↑\textit{subj})(↑\textit{OBJ})(↑\textit{xcomp}) \rangle  

\textsuperscript{12} The analysis of existential there with be is considered in Problem Set 6.
The verb *strike* takes an athematic subject, shown outside of the angled brackets which enclose the semantically selected arguments of the lexical form. This subject is identified with the predicate complement subject, just as the subject of *impress* is. In Chapter 4 we noted that all designators (↑ GF) represented within the angled brackets ⟨…⟩ correspond to semantic roles; nonsemantic arguments, such as expletive subjects, appear outside of the angled brackets. This lexical difference is the only one that distinguishes the f-structures of examples (76b) and (77b).

The distribution of athematic subjects is regulated by the principles of completeness and coherence. Recall the completeness and coherence conditions from Chapter 4. **Completeness** requires that every function designated by a pred be present in the f-structure of that pred. Completeness also requires a further matching between preds and their f-structure functions: if a designator (↑ GF) is associated with a semantic role by the pred, the f-structure element satisfying the designator must itself contain a semantic feature [pred ‘…’]. The expletive subject *there* lacks a pred and therefore cannot serve as the subject of *impress*, though it can serve as the subject of *strike* without violating completeness. Conversely, **coherence** requires that every argument function in an f-structure be designated by a pred. Furthermore, any function that has a semantic feature must match up with a designator associated with a semantic role by its pred. Therefore the contentful subject of *strike* in (76a) must be designated as a thematic argument by another predicator, such as the xcomp pred (or an xcomp’s xcomp’s pred …), to satisfy coherence.

*Strike* is called a “raising” verb, because its athematic argument functions as a selected argument of its complement (or its complement’s complement…). If one imagines that selected arguments must be local to their selecting predicates in phrase structure, then the unselected argument must have been moved away from the local predicate that selects it, and raised up into the clause headed by *strike* by a movement transformation. In LFG, however, locality in predicate argument relations (represented by f-structure) need not match locality in phrase structure relations (represented by c-structure), because of the imperfect correspondence of the c-structure to f-structure mappings (Part III).

Adjective preds also allow athematic subjects, as illustrated by *liable, likely,* and *apt* in (79a–c):

(79)  
  a. There is liable to be another earthquake soon.  
  b. There are likely to be more women on the committee.  
  c. There is apt to be a snowstorm.  

These would have lexical forms of the kind shown in (80):

(80)  
  liable(⟨↑ xcomp⟩)(↑ subj)
Now it follows from this simple theory that adjectives having athematic subjects can head phrasal APs which function directly as predicate complements to main verbs. In (81) the main verbs are subject-raising verbs and the APs are italicized:

(81)  
   a. There struck me as likely to be too few women on the committee.  
   b. There seems unlikely to be snow in March.

In (82a–d) the main verbs have thematic subjects which are functional controllers of their adjectival complements. In all of these examples, the complements are headed by subject-raising adjectives.

(82)  
   a. Mary impresses John as likely to win.  
   b. They felt liable to be assaulted.  
   c. He looks apt to lose his temper.  
   d. City-dwellers have become less likely to be mugged in recent years.

The fact that the main verbs have thematic subjects is shown by their resistance to expletive subjects:

(83)  
   a. ??There impressed me as being too few women on the committee.  
   b. ??There felt liable to be an earthquake there.  
   c. ??There looks apt to be snow in March.  
   d. ??There has become more likely to be reindeer on the roof, since they put the feeder up there.

Note that while some of the verbs taking AP xcomps can be paraphrased with a VP – *Mary impresses John as (being) likely to win* – others have no verbal equivalents:

(84)  
   a. The wall will stay (∗to be) yellow.  
   b. She kept the wall (∗being) yellow.  
   c. John felt (∗himself to be) angry.  
   d. That got John (∗to be) worried.

Feeling angry, for example, is a direct emotional experience, while feeling oneself to be angry is a judgment. Getting someone worried is not the same thing as getting some one to ‘be’ (perhaps to act) worried. We conclude that it is the adjectives themselves, and not a covert copula, that designate a subject.

All of this evidence reinforces our hypothesis of earlier sections that the APs themselves have subjects of predication (provided by the functional controllers determined by their matrix verbs). The presence of an f-structure subject in the AP xcomp phrases is parallel to the presence of a subject in the f-structure of passive participial complements:
(85) The wall will stay painted black.
(86) John felt betrayed and made to look like a fool by Susan.

Finally, note that just as strike differs from impress in taking an athematic subject, so other verbs differ in whether they take athematic objects:

(87) a. She proved there to be infinitely many prime numbers.
    b. She proved there unlikely to be infinitely many prime numbers.
    c. ?? She kept there being food on the table.
    d. ?? She regards there as likely to be no one there.

The object-raising verbs (prove in (87a,b)) allow an expletive object which is passed to the complement subject by functional control, while the nonraising verbs (keep, regard in (87c,d)) select their objects as thematic arguments. This difference is represented in (88a,b), which is parallel to (78a,b):

(88) a. prove (↑ subj)(↑ xcomp)(↑ obj)
    b. keep (↑ subj)(↑ obj)(↑ xcomp)

Both of (88a,b) specify functional control of the xcomp via the specification (↑ obj) = (↑ xcomp subj).

Parallel to the subject-raising verbs (78a) and (80), the object-raising verbs may take direct AP complements headed by raising adjectives:

(89) a. A humble attitude has kept John apt to underestimate himself.
    b. John regards Mary as likely to win.

The same verbs can take passive participial complements:

(90) a. Mary regards John as already elected.
    b. Mary regards John as having been given in to too much as a child.
    c. She kept the walls painted yellow.

In sum, evidence from binding, raising, and passivization supports our theory of predicate complements as having an f-structure subject of predication identified with an argument of the higher clause.

**Further reading and discussion**

The analysis of keep in Section 12.2 treats it as a subject equi verb (also known as a subject control verb), using the mechanism of functional control (Bresnan 1982a). There is ongoing debate in the LFG literature about whether English equi involves functional control or anaphoric control (Chapter 13); see Dalrymple (2001), Asudeh (2005a), and Haug (2013) for relevant discussion. Note also that some speakers allow raising-like uses of keep, as in *There kept being problems*.
with the analysis (example from Pollard and Sag 1994, 137), which is modeled by analyzing *keep* as permitting an athematic subject, perhaps optionally.

Predicate complements (xcomps) also exist in Icelandic, where the availability of subjective reflexives such as *sig* and oblique case-marked subjects provide still further support for this theory of predication (Maling 1982; Andrews 1982, 1990b). Extensive work has been done on Icelandic in LFG (see Maling and Zaenen 1990, Strahan 2011a,b, and references), which thus provides excellent material for further reading.
In Chapter 12 we examined predicative complements (xcomps), using participial VP complements as the paradigm case. We saw that the characteristic binding patterns of predicative VP complements extend across categories and can be explained by identifying in f-structure a complement subject with the subject or object of the matrix verb. The relation between this implicit subject and the matrix argument is called functional predication or \textit{functional control}. In this chapter we examine a contrasting verbal construction that exhibits a different type of control, called \textit{anaphoric control}. In English these verbal constructions are known as gerundive VPs. Anaphoric control also occurs with some infinitival constructions in English (Bresnan 1982a), but the gerundives make a very clear contrast.

### 13.1 Gerundive versus participial VPs in English

English gerundive VPs appear superficially identical to participial VPs. Contrast (1a) and (1b):

(1) a. Susan discussed \textit{visiting Fred}. [gerundive VP]
    b. Susan kept \textit{visiting Fred}. [participial VP]

Despite the formal similarity, numerous differences between the constructions exist. The gerundive VP passivizes, for example, while the participial VP does not:

(2) a. Visiting Fred was discussed by Susan.
    b. *Visiting Fred was kept by Susan.
The gerundive VP undergoes clefting in (3), “tough-movement” in (4), and topicalization in (5), but the participial VP does not:

(3) a. It was visiting Fred that Susan discussed.
   b. * It was visiting Fred that Susan kept.
(4) a. Visiting Fred is unpleasant for Susan to discuss.
   b. * Visiting Fred is unpleasant for Susan to keep.
(5) a. Visiting Fred, Susan doesn’t want to discuss.
   b. * Visiting Fred, Susan doesn’t want to keep.

The pronoun it can be substituted for the gerundive VP, but not for the participial VP:

(6) a. Visiting Fred, Susan doesn’t want to discuss it.
   b. * Visiting Fred, Susan doesn’t want to keep it.

The gerundive VP permits a genitive subject, but the participial VP does not:

(7) a. Susan discussed our visiting Fred.
   b. * Susan kept our visiting Fred.

The gerundive VP can be fronted in question formation, but the participial VP cannot:

(8) a. Whose visiting Fred did Susan discuss?
   b. * Whose visiting Fred did Susan keep?

The gerundive VP “pied pipes” (that is, the entire phrase can be fronted when it contains a relative pronoun) in a nonrestrictive relative clause, but the participial VP does not:

(9) a. Fred, visiting whom Susan discussed with her lawyer, is in the custody of his father.
   b. * Fred, visiting whom Susan kept with her lawyer, is in the custody of his father.

The gerundive VP undergoes pseudo-clefting without doing, but the participial VP does not:

(10) a. What Susan discussed was visiting Fred.
    b. * What Susan kept was visiting Fred.
    cf. What Susan discussed/kept doing was visiting Fred.

The gerundive VP is immune to the ‘-ing -ing’ constraint, but the participial phrase is not:

(11) a. Susan is discussing visiting Fred.
    b. * Susan is keeping visiting Fred.

These contrasts uniformly point to a single difference between participial and gerundive VPs: the latter behave like nominal phrases. As we saw in Chapter 2,
only nominal phrases (NPs and DPs) can bear the subj and obj functions, while Chapter 12 analyzes participial phrase complements as xcomp VPs. Since passivization involves the alternation of subj and obj functions in English, the nominal nature of gerundives would immediately explain why they contrast with participials in passivization as in example (2). Similarly, in standard American English, clefting applies to subjects and objects, but not to predicates or predicative complements:

\[(12)\]
\begin{align*}
  a. \text{I} \text{t is proud that he is/seems.} \\
  b. \text{I} \text{t is a fool that he is/seems.} \\
  c. \text{I} \text{t is a proud man that you see before you.} \\
  d. \text{I} \text{t is a real fool that you see before you.}
\end{align*}

Hence, the phrasal VP xcomps will not undergo clefting, while the nominal gerundive VPs will, by virtue of their being able to bear subject and object functions. This explains (3). Likewise, “tough movement” involves a complement object position gap; predicative NPs (xcomps) do not permit it:

\[(13)\]
\begin{align*}
  a. \ast \text{A fool is unpleasant for Susan to be/seem.} \\
  b. \text{A fool is unpleasant for Susan to meet.}
\end{align*}

The pronoun it can be substituted for an NP subject or object, but not for a VP xcomp. This accounts for (6). Further, the optional presence of a genitive specifier is typical of NPs in English:

\[(14)\] Susan discussed our picture of Fred.

In this respect, too, the gerundive has nominal properties that the participial would not be expected to show, explaining (7). This property also entails the difference in question formation shown by (8).

Although we will not examine them in detail, the remaining properties reinforce the conclusion that gerundive and participial VPs have differing nominal and verbal functions (as “arguments” and “predicates”).

13.2 Structure of gerundive VPs

Our explanation of the differences just observed between gerundive and participial VPs in English is that (i) only nominal categories can bear subject and object functions (Chapter 2), and (ii) gerundive VPs are dominated by a nominal category, NP or DP, while participial VPs are not. Point (ii) raises the question of exactly what the structure of gerundive VPs is. We have concluded that participials and
Anaphoric Control

gerundive VPs differ as in (15a,b), respectively.\(^1\) What exactly is in the triangle in the gerundive example? How does the VP visiting Fred become a nominal phrase DP or NP?

\[(15)\]

\[
\begin{align*}
\text{a.} & \quad \text{VP} \\
& \quad \text{kept} \\
& \quad \text{visiting} \\
& \quad \text{Fred} \\
\text{b.} & \quad \text{VP} \\
& \quad \text{discussed} \\
& \quad \text{visiting Fred}
\end{align*}
\]

The first hypothesis one might consider is that the nominal character of the gerundive VP arises directly from its morphological form, which is that of a nominalized verb. This nominalized verb then heads a nominal phrase, so that the structure of the gerundive VP is as shown in (16):

\[(16)\]

\[
\begin{align*}
\text{NP} \\
& \quad \text{visiting} \\
& \quad \text{Fred}
\end{align*}
\]

This analysis explains the nominal character of gerundive VPs, but it fails to account for their verbal character.

English does in fact have gerundive nominal constructions with the properties expected from (16):

\[(17)\]

\[
\begin{align*}
\text{DP} \\
& \quad \text{Roseanne's} \\
& \quad \text{singing} \\
& \quad \text{of the song}
\end{align*}
\]

\(^1\) We are assuming the principle of economy of expression from Chapter 6 and the "flexible" definition of endocentricity from Section 6.5, which serve to prune away nonbranching X' nodes and X' daughters of nonbranching nodes. We also assume the definition of endocentricity from Section 7.2, which is restricted to lexical projections.
These take adjectival modifiers, prefixal negation (non-), and nominal complementation (PPs, not DPs/NPs), as shown in (18a), all in contrast to the gerundive VPs, as shown in (18b):

(18)  
\begin{enumerate}
  \item Roseanne’s clownish non-singing of the national anthem
  \item Roseanne’s clownishly not singing the national anthem
\end{enumerate}

The structure of (18a) is shown in (19):

\begin{figure}[h]
\centering
\begin{tikzpicture}
  \node (dp) at (0,0) {DP};
  \node (d) at (0,1) {DP};
  \node (n) at (1,2) {NP};
  \node (ap) at (0.5,3) {AP};
  \node (np) at (1.5,3) {NP};
  \node (pp) at (2.5,3) {PP};
  \node (n1) at (1.5,4) {non-singing};
  \node (n2) at (2.5,4) {of the National Anthem};
  \node (n3) at (0.5,4) {clownish};
  \draw (dp) -- (d);
  \draw (d) -- (n);
  \draw (ap) -- (n);
  \draw (np) -- (n2);
  \draw (n3) -- (ap);
\end{tikzpicture}
\caption{Structure of (18a)}
\end{figure}

The structure of (18b) is reflected in (20):

\begin{figure}[h]
\centering
\begin{tikzpicture}
  \node (dp) at (0,0) {DP};
  \node (vp) at (0,1) {VP};
  \node (advp) at (-1,2) {AdvP};
  \node (vp2) at (1,2) {VP};
  \node (v) at (1.5,3) {V};
  \node (dp2) at (3,3) {DP};
  \node (n) at (1.5,4) {singing};
  \node (n1) at (2.5,4) {the National Anthem};
  \node (n2) at (0.5,4) {not clownishly};
  \draw (dp) -- (vp);
  \draw (vp) -- (advp);
  \draw (advp) -- (vp2);
  \draw (vp2) -- (v);
  \draw (v) -- (dp2);
\end{tikzpicture}
\caption{Structure of (18b)}
\end{figure}

Thus (16) seems appropriate for gerundive nominals of the kind illustrated in (18a), but fails to capture the VP properties of the gerundive VP construction (18b). Even if we allowed the gerund N to take VP-type complements, we would incorrectly predict the presence of prenominal AP modifiers and nominal negative prefixation co-occurring with the VP properties of (18b):

(21)  
\begin{tabular}{c}
  * Roseanne’s clownish non-singing the national anthem
\end{tabular}
Although the structure of (16) is inadequate for gerundive VPs for the reasons given, a slight modification of it solves our problems. We need only replace the NP in (19) by a VP. Our combinatorial constraint on functional heads (Section 6.2.1, (20)) allows for VP to be embedded as a complement of DP:

(22)

\[
\begin{array}{c}
\text{DP} \\
\text{NP} \\
\text{Roseanne's} \\
\text{VP} \\
\text{AdvP} \\
\text{clownishly} \\
\text{not} \\
\text{VP} \\
\text{V} \\
\text{singing} \\
\text{DP} \\
\text{the National Anthem}
\end{array}
\]

This analysis of the structure of the gerundive VP places the genitive NP in the position of the specifier of DP, rather than that of subject of S or IP. In other words, it exploits the direct structural analogy between (23) and (24):

(23)

\[
\begin{array}{c}
\text{DP} \\
\text{DP} \\
\text{Mary's} \\
\text{AP} \\
\text{overly frequent} \\
\text{NP} \\
\text{visits}
\end{array}
\]

(24)

\[
\begin{array}{c}
\text{DP} \\
\text{DP} \\
\text{Mary's} \\
\text{VP} \\
\text{AdvP} \\
\text{frequently} \\
\text{VP} \\
\text{visiting Fred}
\end{array}
\]

The genitive marking of the gerundive VP subject is an obvious clue to its status as possessor. In fact, there is also interesting evidence from quantifier scope that the genitive NP has the scope properties of possessive NPs of nouns, and not
of specially case-marked subjects of embedded Ss. Observe the contrast in (25) (adapted from Zucchi 1993, p. 50):

(25)   a. John resents everyone's taking a day off.
       b. John resents that everyone takes a day off.
       c. John dislikes (it) for everyone to take a day off.

The quantifier phrase in (25a) may have wide scope, exactly as in (26):

(26)   John resents everyone’s absence.

Both (25a) and (26) are ambiguous: John may resent only the universal absence of other employees, leaving him stuck with all the work (the narrow-scope reading); or for each absent employee, John may resent that person’s individual absence (the wide-scope reading). But (25b,c) are unambiguous, having only the narrow-scope reading, or at least a very strong preference for it.

Furthermore, while certain expletive pronouns can be subjects, they cannot be possessors (though there is worse than it in this respect):

(27)   a. There appears to be a reindeer on the roof.
       b. *There’s appearing to be a reindeer on the roof is an illusion.

(28)   a. It appears that there’s a reindeer on the roof.
       b. ?Its appearing that there’s a reindeer on the roof is an illusion.

This is further evidence that the genitive subject of the gerundive verb is like a possessor.

Now let us consider the f-structure of the possessor. The lexical forms of nouns, illustrated by horse in (29a), may have their argument structures augmented to take the possessor (poss) function as an argument by a lexical predication template which augments the lexical form for a nominal to one which has a possessor. (Compare the predication template for predicative NPs and PPs in Section 12.2.) The result is illustrated in (29b):

(29)   a. horse  N (↑ pred) = ‘horse ⟨⟩’
       b. ‘horse ⟨⟩’ ⇒ ‘horse-of ⟨↑ poss⟩’

The f-structure of an expression such as Mary’s horse in English will thus look like (30):

(30)   f: [pred ‘horse-of ⟨(f poss)⟩’]
      poss g: [pred ‘Mary’]
The same predication template applies to nominal gerunds of the kinds shown in (17):

\[(31)\]
\[
\begin{align*}
\text{a.} & \quad \text{singing} & & \text{N} & & (\uparrow \text{PRED}) & = & & \text{‘singing} & \langle (\uparrow \text{OBL}_{of}) \rangle' \\
\text{b.} & \quad \text{‘singing} & \langle (\uparrow \text{OBL}_{of}) \rangle' & \Rightarrow & \text{‘singing-of} & \langle (\uparrow \text{POSS}) (\uparrow \text{OBL}_{of}) \rangle' \\
\end{align*}
\]

As we have noted in previous chapters, the function POSS is restricted to the f-structures of nominal categories.\(^2\) How can this restriction between structure and function be captured? Formally, it is a simple matter to constrain the inverse image of the mapping \(\phi\) from c-structure to f-structure to contain a nominal category label such as NP or DP (which we denote by \(n\)) when the f-structure immediately contains the poss function:

\[(32)\]
\[
\begin{align*}
n & \in \lambda(\phi^{-1}(\text{POSS} \uparrow)) \\
\end{align*}
\]

The function \(\lambda\) is the labeling function that associates category labels with c-structure nodes (Kaplan 1987). By (32), the poss function must occur in a nominal f-structure.\(^3\) It is also possible to type Pred attributes in this way, so that the gerundive verb singing shares the categorization of the verb sing but must still occur in a nominal (DP or NP) f-structure as in (22):

\[(33)\]
\[
\begin{align*}
\text{V (gerundive)} & \Rightarrow n & \in \lambda(\phi^{-1}(\text{PRED} \uparrow)) \\
\end{align*}
\]

Now though contained in a higher DP, verbal gerunds of the kind illustrated in (22) and (24) are verbs and therefore not subject to the general lexical POSS template for nominals:

\[(34)\]
\[
\begin{align*}
\text{singing} & \text{ V (gerundive),} \\
(\uparrow \text{PRED}) & = \text{‘singing} \langle (\uparrow \text{SUBJ}) (\uparrow \text{OBJ}) \rangle' \\
\end{align*}
\]

As it stands, then, the structures in (22) and (24) will be incomplete and incoherent: incomplete because the verbal lexical form requires a subject, and incoherent because the DP provides a POSS function which is not designated by any predicator.

Among several possible solutions to this problem, one is particularly straightforward. We can view the DP possessor as being identified with the verbal subject by a lexical rule which identifies the gerundive verb subj function with poss:

\[(35)\]
\[
\begin{align*}
\text{Possessor subject of gerundive verbs:} \\
\text{V (gerundive)} & \Rightarrow (\uparrow \text{POSS}) = (\uparrow \text{SUBJ}) \\
\end{align*}
\]


\(^3\) Constraint (32) should properly be viewed as part of a more general theory relating f-structure attribute types to c-structure categories. Similar constraints relating f-structure attributes to c-structure category have been proposed by Nordlinger (1998a) and Sells (1999).
The application of this rule to (34) will produce (36):

(36)  

singing  V  

\( (\uparrow \text{PRED}) = \text{‘singing (}(\uparrow \text{SUBJ})(\uparrow \text{OBJ}))’ \)  

\( (\uparrow \text{POSS}) = (\uparrow \text{SUBJ}) \)

By virtue of (35), the f-structures of gerundive VP structures like (22) and (24) will be complete and coherent. The latter’s f-structure is illustrated in (37):

(37)  

\[
\begin{array}{ccc}
\text{POSS} & \{\text{“Mary”}\} \\
\text{SUBJ} & \text{PRED} & \text{‘visiting ((f SUBJ)(f OBJ))’} \\
\text{OBJ} & \{\text{“Fred”}\} \\
\text{ADJ} & \{\{\text{“frequently”}\}\}
\end{array}
\]

In effect, the poss is analyzed like a functional controller of the gerundive verb’s subject. This analysis ensures the completeness and coherence of the gerundive VP structure (22).

What happens when the optional possessive NP is omitted from the DP? It is a property of all nonfinite verbs in English to allow a null pronominal subject (Bresnan 1982a). This property is a special case of a general crosslinguistic property by which null pronouns are provided as a lexical default to core arguments of verbal argument structures (Mohanan 1981; Bresnan 1982a; Simpson 1983a, 1991; Hale 1983; Austin and Bresnan 1996):

(38)  

Null subjects:  

\((V \text{ (nonfinite)} \Rightarrow (\uparrow \text{SUBJ PRED}) = \text{‘pro’})\)

As indicated in (38), the provision of a null subject pronoun to nonfinite verbs is optional. When it is taken by a gerundive verb, both the subj function and the poss function with which it is identified will be lexically (not syntactically) specified:

(39)  

\[
\begin{array}{ccc}
\text{POSS} & \{\text{‘pro’}\} \\
\text{SUBJ} & \text{PRED} & \text{‘visiting ((f SUBJ)(f OBJ))’} \\
\text{OBJ} & \{\text{“Fred”}\} \\
\text{ADJ} & \{\{\text{“frequently”}\}\}
\end{array}
\]

\footnote{Notice that we have assumed that the value of ADJ is a set (see Section 4.9), but this does not affect the point at hand.}
Consequently, the specifier of DP position cannot be filled in the c-structure without violating functional uniqueness. Because of the optionality of all syntactic nodes (by the principle of economy of expression, Chapter 6), the result will be the structure given in (40):

\[
(40) \quad \begin{align*}
&\text{DP} \\
&\quad \text{VP} \\
&\quad \quad \text{AdvP} \\
&\quad \quad \text{frequently} \\
&\quad \quad \text{VP} \\
&\quad \quad \text{visiting Fred}
\end{align*}
\]

Finally, gerundive verbs may also appear with accusative subjects rather than genitives:

(41) a. I disapprove of them being exploited.
    b. They don’t talk about him hanging around all the time.

These would arise from embedding S under DP:

\[
(42) \quad \begin{align*}
&\text{DP} \\
&\quad \text{S} \\
&\quad \quad \text{DP} \\
&\quad \quad \text{him} \\
&\quad \quad \text{VP} \\
&\quad \quad \text{hanging around}
\end{align*}
\]

The accusative case subject is a lexical alternative to the provision of the possessive subject through (35):

(43) **Subject of gerundive verbs:**
    \[
    V \text{ (gerundive)} \Rightarrow (↑ \text{poss}) = (↑ \text{subj}) \\
    V (↑ \text{subj case}) = \text{ACC}
    \]

(Other languages make other choices for nonfinite subject case; see Andrews 1982, 1990a, Neidle 1988, and Simpson 1983a, 1991.) The requirement of an accusative case subject would preclude the specifier of DP option from being taken (it would be incoherent and inconsistent in its case value, possessors being genitive). The presence of the topmost DP in (42) is still guaranteed by (33) on gerundive verbs.
This analysis also explains the contrasts in (44) and (45):

(44) a. "There’s appearing to be a reindeer on the roof is an illusion.
    b. There appearing to be a reindeer on the roof is an illusion.

(45) a. ?I’m worried about its appearing that there’s a reindeer on the roof.
    b. I’m worried about it appearing that there’s a reindeer on the roof.

These expletive pronouns, as we saw above in (28), cannot be possessors, but they can be subjects in the structure in (42).

Other pronominal subjects of gerundive VPs – both null and overt – do allow subject raising (Section 12.5), as expected under the present analysis:

(46) a. Susan discussed seeming to be targeted by the IRS.
    b. Susan discussed her seeming to be targeted by the IRS.

This concludes our discussion of the structure of gerundive VPs.

13.3 Anaphoric control versus functional control

Let us return to our initial pair of contrasting examples, repeated here:

(47) a. Susan discussed visiting Fred.  [gerundive VP]
    b. Susan kept visiting Fred.  [participial VP]

We now see that these contrast in both c-structure and f-structure. As in Chapter 12, the participial VP example (47b) is represented by the c-structure/f-structure pair of (48):

(48) 

\[ \text{NP} \quad \text{VP} \quad \text{Susan} \quad \text{kept} \quad \text{V} \quad \text{visiting} \quad \text{Fred} \]

\[ \text{NP} \quad \text{V} \quad \text{NP} \quad \text{V} \quad \text{VP}_2 \]

\[ \text{PRED} \quad \text{TENSE} \quad \text{SUBJ} \quad \text{XCOMP} \quad \text{SUBJ} \quad \text{PRED} \quad \text{OBJ} \quad \text{OBJ} \]

\[ \text{‘keep} \quad \text{‘visit} \]

\[ \text{‘(f_1 \text{SUBJ})(f_1 \text{XCOMP})’} \quad \text{‘(f_2 \text{SUBJ})(f_2 \text{OBJ})’} \]

\[ \text{‘("Susan")} \quad \text{‘("Fred")} \]

\[ \text{‘Past’} \quad \text{‘F”} \]

\[ \text{‘(f_1 \text{SUBJ})(f_1 \text{XCOMP})’} \quad \text{‘(f_2 \text{SUBJ})(f_2 \text{OBJ})’} \]

\[ \text{‘Past’} \quad \text{‘F”} \]
The gerundive VP example (47a) is represented as in (49):

(49)

Functional control (48) identifies the f-structures of the controller and the controlled, while anaphoric control is like pronominal binding: only the referential index of the controller and controlled are identified. Thus, f-structure attributes such as case are expected to be shared in functional control, but not in anaphoric control. The Icelandic problem of Problem Set 5 contains an excellent illustration of this important point, due to Andrews (1982 1990a).

Other consequences ensue from the close relation between anaphoric control and the binding of personal pronouns (Bresnan 1982a). For example, anaphoric control can have split antecedents, as in (50):

(50) Mary spent hours plotting with John about strategies for getting (themselves) out of the country.

This is impossible with functional control, because it would violate functional uniqueness. Anaphoric control may have a grammatically remote controller, buried within the relative clause deeply below the gerund as in (51):

(51) Visiting Fred in jail became the kind of activity that it was obvious Martha could enjoy without damaging her sense of self-sacrifice.

Again, this is impossible with functional control, where an xcomp is predicated of a subject or object of its governing head. Anaphoric control may lack a syntactic controller altogether, taking a specific discourse antecedent as in (52):

(52) Mary and John spent hours plotting their escape. Getting (themselves) out of the country could solve everything.

Again, this is impossible with functional control.
Anaphoric control resembles familiar pronominal binding in that it activates the anti-binding principle (Section 10.3, (39)):

(53) a. Visiting Sally’s parents in jail disturbed her.
    (her ≠ Sally if her = the visitor)
b. Visiting Sally’s parents in jail disturbed her friends.
    (possibly her = Sally)

However, the null pronominal does differ from personal pronouns. For one thing, it is subject to constraints on its controller that differ from the ordinary coreference relations of personal pronouns. One is the intervention constraint. In (54a,b) the pronoun *his* may corefer with *Dad*, regardless of their relative position:

(54) a. Dad didn’t want Mom to worry about his losing his hair.
    (Mom’s losing his hair)
b. It’s his losing his hair that Dad didn’t want Mom to worry about.
    (Mom’s or Dad’s losing his hair)

In contrast, the null pronominal in (55a,b) shows different control possibilities in the same two positions, for many speakers:

(55) a. Dad didn’t want Mom to worry about losing his hair.
    (Mom’s losing his hair)
b. It’s losing his hair that Dad didn’t want Mom to worry about.
    (Mom’s or Dad’s losing his hair)

Despite the pragmatic unlikeliness of Mom’s losing Dad’s hair, this is a preferred reading of (55a) for many, while (55b) has both that reading and the one in which Dad is losing his hair. In (55a) *Mom* intervenes between the gerundive phrase and *Dad*, preventing anaphoric control by the latter.

What accounts for the odd interpretations in (55a,b)? Roughly speaking, the null pronominal is controlled by the closest eligible antecedent: in (55a) this is *Mom*, and in (55b) this is *Mom* or *Dad*. Having two antecedents count as “closest” is not at all paradoxical within the f-structure, because losing his hair has two functions in (55b): it is simultaneously the focus of the main clause (and entire sentence) and the object of the embedded complement’s preposition. This point is illustrated in the (simplified) f-structure of (56):

(56) \[
\begin{array}{c}
\text{FOC} \\
\text{SUBJ} \\
\text{PRED} \\
\text{PREP} \\
\text{SUBJ} \\
\text{PRED} \\
\text{OBL} \\
\text{OBL} \\
\text{OBJ} \\
\end{array}
\]
From the point of view of the null pronominal subject of the gerund (the [PRED ‘pro’] in (56)), there are two equally accessible subject controllers, one in each of the predicative f-structures that immediately contains it.

Now let us embed the gerundive complement within a predicative complement (xcomp), as in (57):

(57) Dad didn’t want Mom to become worried about losing his hair.
    (Mom’s losing his hair)

The f-structure contains an extra layer of embedding, as illustrated in (58):

(58) ![Diagram](image)

If we were to make the xcomp containing the gerundive phrase be the FOC of the main clause, rather than the gerundive phrase by itself, the closest eligible antecedent would still only be Mom:

(59) ![Diagram](image)

The reason is that the functional control relation fixes the subject of the predicate complement, regardless of its position. The xcomp’s subject of predication is a syntactic property of the complement structure itself, and not a matter of interpretation like the anaphoric controller.

As we have already observed in Section 13.1, xcomps do not undergo clefting, but we can still exemplify (59) by using the question construction to focus the predicate complement. (60) unambiguously fixes the subject of losing his hair to be Mom:

(60) How worried about losing his hair did Dad expect Mom to be?

Thus the differing effects of the intervention constraint constitute a subtle but interesting further contrast between functional and anaphoric control.
13.4 Conclusion

We have seen that the superficially similar participles and gerundive VP complements have quite different c-structures and f-structures, one exhibiting functional control and the other anaphoric control. It turns out that infinitival complements are structurally ambiguous in a similar way (Bresnan 1982a). Some infinitival complements are CPs that can take null pronominal subjects when a for complementizer is absent. These complements are anaphorically controlled, and show additional interesting properties such as subject–subject obviation (Bresnan 1982a; Simpson and Bresnan 1983; Zec 1987). Other infinitival complements are VP xcomps subject to functional control. This includes the class of raising verb complements (Section 12.5).

Problems

The reader is now prepared to undertake Problem Set 5.

Further reading and discussion

For more detailed discussions of the differences between functional and anaphoric control, the following are recommended readings: Bresnan (1982a), Zec (1987), Andrews (1990a), and Kroeger (1993). Semantic issues arising from the distinction between functional control and anaphoric control are taken up in Dalrymple (2001) and Asudeh (2005a).


Gerundive VPs show mixed nominal and verbal properties, as we have seen in Sections 13.1 and 13.2. For more on the syntax of mixed categories across a variety of languages in LFG, see Bresnan (1997), Bresnan and Mugane (1999), and references.

The discovery of the intervention constraint is due to Grinder (1970, 1971). See Jacobson and Neubauer (1976), Soames and Perlmutter (1979), and references for early analysis in terms of the cyclic application of transformations. The analysis at the end of Section 13.3 of the interactions of control and extractions in terms of structure-sharing versus anaphoric control was first presented by the first author in class lectures at MIT and public lectures at Stanford in 1980 and subsequent years. Similar phenomena have been analyzed as “reconstruction effects” in logical form within later transformational frameworks by Huang (1993) and Heycock (1995). Asudeh (1998, 2000) discusses similar phenomena within head-driven phrase structure grammar.
We have now seen how functional structures allow a form-independent characterization of binding, predication, and control without the “configurational bias” which favors syntactic over morphological forms of expression. The question we come to at last is: where do functional structures themselves come from? The answer lies in the “lexical mapping theory” (LMT), which projects skeletal f-structures from argument structures (a-structures) by general principles.

We can illustrate this basic idea in terms of the contrast between English and Warlpiri given in Chapter 1. (1) represents informally the correspondences between a-structure, f-structure, and c-structure in a simple English sentence.

(1) English

In (1) $\alpha$ designates the mapping from a-structure to f-structure functions, while $\phi$ designates the mapping from c-structure to f-structure. The latter follows from

the principles discussed in Chapter 6; the former follows from the theory of a-structure to f-structure mapping – the lexical mapping theory, which is described in this chapter.

(2) shows the equivalent mappings in a simple Warlpiri sentence corresponding to the English sentence in (1). Any order of the constituents is possible, with the exception of the fixed position of the Auxiliary (or I), as discussed in Chapters 1, 6, and 7. Although the $\phi$ mapping from c-structure NPs to f-structure is lexocentric in Warlpiri and endocentric in English, the $\alpha$ mapping from a-structure to f-structure functions is the same for the two languages.

(2) Warlpiri:

Thus, in both configurational English and nonconfigurational Warlpiri, argument structures project similar skeletal functional structures, which are mapped to the very different overt forms of expression in the two languages by the principles of Chapter 6.

The same point can be made with the contrast between English and a head-marking language such as Chichewa, discussed in Chapter 8. In English, as illustrated by (3), the semantic roles of the a-structure of the verb see map onto the f-structure functions SUBJ and OBJ, respectively.

(3) English:
The same mapping from a-structure to f-structure functions occurs in Chichewa, despite the very different morphological realization of subject and object as verb stem prefixes in c-structure:

(4) Chichewa:

```
PRED
SUBJ ["I"]
OBJ ["him/her"]
```

Not all languages have the same mappings from a-structure roles to grammatical functions, of course. Nevertheless, there are important limits to the variation across languages; not every function can be associated with every type of semantic role. Constraints on argument realization (the mapping from a-structure roles to functions) are imposed by the theory of argument structure.

14.1 What is argument structure?

There are varying conceptions of what argument structure is, even among researchers working within LFG. The reason for this is that argument structure has two faces, semantic and syntactic. On the semantic side, argument structure represents the core participants in events/states/processes designated by a single predicator. From this point of view it appears as a type of representation of event structure. On the syntactic side, argument structure represents the minimal information needed to characterize the syntactic dependents of an argument-taking head. From this point of view it appears as a type of syntactic subcategorization or valence register. Thus argument structure is an interface between the semantics and syntax of predicators (which we may take to be verbs in the general case):¹

(5) lexical semantics
   ↓
   a-structure
   ↓
   syntactic structure

Argument structure encodes lexical information about the number of arguments, their syntactic type, and their hierarchical organization necessary for the mapping to syntactic structure. It is therefore fundamentally a lexical syntactic construct, not a semantic one (Bresnan and Zaenen 1990; Zaenen and Engdahl 1994; Mohanan 1994, 1997).

¹ – ignoring the issue of complex predicates, or multi-headed lexical constructs (Alsina et al. 1997); see the “Further reading and discussion” section of this chapter.
The conception of argument structure as a lexical syntactic construct is common to many lexicalist theories of syntax, though there are differences in representation. Some researchers within LFG have adopted a Jackendovian perspective on argument structure (e.g. Butt 1995, 1997, Broadwell 1998, and references), using an elaborated “lexical conceptual structure” indexed to syntactic realization at f-structure. Although Jackendoff (1990) suggests that a separate level of argument structure is unnecessary, given a level of lexical semantics, his lexical semantic representations contain syntactic information about the indexing of semantic roles to syntactic structure which makes them a variant of argument structure in the sense adopted here (Butt 1995).

Another influential conception of argument structure is that of Levin and Rappaport Hovav (1998) and Rappaport Hovav and Levin (1998). The conception of a-structure adopted here differs from that of Levin and Rappaport Hovav in the specific model of argument structure adopted and its role within the larger framework, but is strikingly similar in general conception. The fundamental difference is that Levin and Rappaport Hovav interpret the “syntactic structure” in (5) as an underlying syntactic tree prior to movement. Within the framework of LFG, this structure is redundant.\(^2\)

To appreciate this point, consider the well-known model of a-structure proposed by Levin and Rappaport (1986), Levin and Rappaport Hovav (1995, 1998) and Rappaport Hovav and Levin (1998). (6) shows their argument structure for the verb *put*.

\[
\langle x, y, P_{loc} z \rangle
\]

The three arguments \(x\), \(y\), and \(z\) in this representation are classified according to their syntactic type and their hierarchical structure in syntax. The lowercase variables \(x\), \(y\), and \(z\) represent nominal arguments (NPs/DPs). The variable \(P_{loc}\) represents a locative preposition. The variable \(x\), outside the angled brackets, is the external argument, whereas \(y\) and \(z\) are internal arguments; \(y\), the underscored argument, is the direct internal argument (which must be a sister of the verb to be governed and hence receive a theta role), while \(z\) is simply an internal argument embedded in a prepositional phrase. As (7) shows, the correspondence between this representation and the underlying \(X'\) tree projected by the verb is one-to-one (omitting the verb, as (6) does):

\[
X \]
\[
NP_x \quad VP
\]
\[
NP_y \quad PP
\]
\[
P \quad NP_z
\]

\(^2\) See also Chapter 3 for an empirical argument that underlying syntactic trees are undesirable.
Levin and Rappaport Hovav themselves characterize the syntactic projection relation between the argument structure and the initial syntactic structure as “trivial,” although they do not draw the obvious conclusion that one of the two structures is redundant. But consider the interface model they assume, the familiar scheme in (8):

(8) lexical semantics
    ↓                           Lexicon
     a-structure
     ↓                           Syntactic projection
    initial syntactic structure
    ↓                           Syntactic transformations
final syntactic structure

The triviality of the relation between argument structure and a level of initial syntactic structure invites an alternative, which has been taken in much recent work. This is to eliminate a distinct level of lexical argument structure altogether in favor of the syntactic construction of meanings from lexical semantic primitives (e.g. Hale and Keyser 1997, 2002; Borer 2005a,b, 2013; Ramchand 2008). This alternative is schematized in (9):

(9) lexical primitives
    ↓                           Lexicon
    initial syntactic structure
    ↓                           Syntactic transformations
final syntactic structure

Here, argument structure is in effect identified with an initial syntactic structure in a transformational derivation. It is a syntactic representation, as in Levin and Rappaport Hovav, but no longer lexical in the same sense, being formed from syntactic categories and relations. Indeed, echoing a line of argument from early work in generative semantics, Hale and Keyser contend that the generalizations about possible meanings of verbs reflect syntactic constraints on movement.\(^3\) Thus this approach denies the *lexicality* of argument structure by identifying it with the initial syntactic structure.

From the beginning, LFG has taken just the opposite position: the decision to reject (8) on grounds of redundancy is correct, but what is redundant is not the argument structure; it is the initial syntactic structure that should be eliminated. In

---

\(^3\) See Kiparsky (1997a), Levin and Rappaport Hovav (1998), and Müller and Wechsler (2014) for contrary arguments.
other words, the role of underlying syntactic trees in the linkage of lexical semantics to syntax should be eliminated. Thus LFG adopts (10) over (8) and (9):

\[ \text{lexical semantics} \downarrow \ \text{Lexico-semantic projection} \]
\[ \text{a-structure} \downarrow \ \text{Lexico-syntactic projection} \]
\[ \text{syntactic structure} \]

To see that (10) is the scheme that underlies the design of LFG (as of other lexicalist syntactic frameworks), simply take the (relevant aspect of) syntactic structure in (10) to be the f-structure, which is an abstraction over typologically varying c-structures representing overt forms of expression. The argument structure is directly mapped onto this level. We see, then, that a-structures in LFG must have sufficient syntactic information to support the direct mapping to surface functions. They are lexical syntactic constructs.

### 14.2 The theory of a-structures

An a-structure consists of a predicator with its argument roles, an ordering that represents the relative prominence of the roles, and a syntactic classification of each role indicated by a feature. Examples are given in (11)–(13):

\[ \text{put} \langle \text{agent theme locative} \rangle \]
\[ [-o] \quad [-r] \quad [-o] \]

\[ \text{pound} \langle \text{agent patient} \rangle \]
\[ [-o] \quad [-r] \]

\[ \text{freeze} \langle \text{theme} \rangle \]
\[ [-r] \]

The relative prominence of the roles is indicated by their left to right order and reflects a thematic hierarchy.\(^4\)

\[ \text{Thematic hierarchy:} \]
\[ \text{agent > beneficiary > experiencer/goal > instrument > patient/theme > locative} \]

In this hierarchy, the most prominent role of \text{put} and \text{pound} (an agent in the lexical semantics) is the leftmost argument of (11) and (12); in their lexical semantics the patient role of \text{pound} and theme role of \text{put} correspond to the second most

\(^4\) The ordering is the one proposed in Kiparsky (1987), Bresnan and Kanerva (1989), and elsewhere, and may be derived from semantic primitives along the lines of Dowty (1991) and Engdahl (1990) or Jackendoff (1990) and Pinker (1989).
prominent argument, ordered to the right of the agent in (11) and (12); and the
location role of put is the least prominent on the hierarchy. The most prominent
role of freeze (a theme in its lexical semantics) is its sole argument in (13). The
most prominent semantic role of a predicator is designated ̂θ:

(15) **Logical subject, ̂θ:**

  ̂θ designates the most prominent semantic role of a predicator.

Although the agents in (11) and (12) resemble the theme in (13) in being the
most prominent roles in the respective argument structures, there are important
syntactic differences between them. These are captured by the syntactic features
of the a-structure.

Recall that Section 6.1.2 distinguishes argument from nonargument functions
and grammaticalized discourse functions from nondiscourse functions, as in (16)
and (17), respectively.

\[
\begin{array}{c}
\text{a-fns} \\
\text{non-a-fns} \\
\text{d-fns} \\
\text{non-d-fns}
\end{array}
\]

(16) \[
\begin{array}{c}
\text{TOP} \quad \text{FOC} \quad \text{OBJ} \quad \text{OBJ} \quad \text{OBL} \\
\text{non-a-fns} \quad \text{xcomp} \quad \text{comp} \quad \text{adjunct}
\end{array}
\]

(17) \[
\begin{array}{c}
\text{TOP} \quad \text{FOC} \quad \text{SUBJ} \quad \text{OBJ} \quad \text{OBJ} \quad \text{OBL} \\
\text{adjunct} \quad \text{non-d-fns}
\end{array}
\]

The **subject**, according to this classification, has the unique property of being both
an argument function and a grammaticalized discourse function, while the class of **complement functions** (OBJ, OBJ, OBL, XCOMP, COMP) can be defined as the
nondiscourse argument functions. But further fine-grained distinctions between
argument functions are left in Chapter 6 to lexical selection for additional features.
This is the topic we turn to now.

The a-structure features \([±o]\) and \([±r]\) constrain the way in which the roles are
mapped onto argument functions in f-structures. The basic argument functions
are grouped into natural classes as shown in (18):\(^5\)

(18) **Feature decomposition of argument functions:**

<table>
<thead>
<tr>
<th>([-r])</th>
<th>([+r])</th>
</tr>
</thead>
<tbody>
<tr>
<td>([-o])</td>
<td>(\text{SUBJ} \quad \text{OBL})</td>
</tr>
<tr>
<td>([+o])</td>
<td>(\text{OBJ} \quad \text{OBL})</td>
</tr>
</tbody>
</table>

\([±r]\): (un)restricted
\([±o]\): (non)objective

---

\(^5\) Basic argument functions are those borne by nominal arguments. Zaenen and Engdahl (1994) extend
this theory to xcomps and comps, which include adjectival, verbal, and sentential complements.
The feature \([-r]\) refers to an **unrestricted** syntactic function, the kind of function which is not restricted as to its semantic role in the sense that it need not have any semantic role. The raised and expletive arguments of Chapter 12 are examples of functions that have no semantic role. Only subjects and objects are \([-r]\); obliques and restricted objects are \([+r]\). The feature \([-o]\) refers to a **nonobjective** syntactic function, the kind of function which complements intransitive predicates such as N or A. Only subjects and obliques are \([-o]\); objects and restricted objects are \([+o]\). Not all languages make use of all these possibilities. Languages which lack restricted objects have no ditransitive verbs. However, LMT assumes that all languages have subjects.\(^6\) In the representations given here, the minus features define the unmarked feature values; hence the subject is least marked, and the restricted object is most marked. Descending diagonally from the left corner to the right corner, (18) can be read as a partial ordering of basic argument functions:

\[
(19) \quad \text{Partial ordering of argument functions:}
\]

\[
\text{SUBJ} > \text{OBJ}, \text{OBL}_\theta > \text{OBJ}_\theta
\]

(Negatively specified features are unmarked.)

It follows from this classification that a \([-o]\) role cannot be mapped onto an object, and a \([-r]\) role can be mapped onto a subject or object:

\[
(20) \quad \text{a-structure:} \quad \theta \quad \theta
\]

\[
\begin{array}{c}
[-o] \\
{o} \\
\end{array}
\quad \begin{array}{c}
[-r] \\
\theta \\
\end{array}
\]

\[
\text{f-structure:} \quad o \quad s/o
\]

The basic principles for determining the choice of syntactic features in the a-structure (ignoring cases of lexical idiosyncrasy) are based on the underlying lexical semantics of the roles:

\[
(21) \quad \text{Semantic classification of a-structure roles for function:}
\]

patientlike roles: \[ \theta \]

\[ [-r] \]

secondary patientlike roles:\(^7\) \[ \theta \]

\[ [+o] \]

other semantic roles: \[ \theta \]

\[ [-o] \]

This way of classifying a-structure roles allows us to distinguish different types of “logical subject” (\(\hat{\theta}\)): one type has the object features (\([-r]\) or \([+o]\)), while another

---

\(^6\) This assumption is not uncontroversial. See Foley and Van Valin (1984), Andrews (1985), and Falk (2006) for discussion.

\(^7\) Verbs may have multiple patientlike roles, as with ditransitives. Which roles count as secondary appears to be a parameter of variation. See Alsina and Mchombo (1993), Bresnan and Moshi (1990), Huang (1993), Alsina (1990, 1996b), Joshi (1993), and Austin (1997) for further discussion.
type has the nonobject feature classification \([-o]\). Examples are discussed below and in Problem Set 6.

A-structures may also have empty argument roles that have no semantic content; these can only be \([-r]\), by definition of the unrestricted feature (Bresnan and Zaenen 1990). An example would be the a-structures for the subject-raising verb *seem* and the object-raising verb *believe* (Zaenen and Engdahl 1994):

(22) There seems to me to be a problem with the proposal.
(23) John believes there to be a problem with the proposal.
(24) **Athematic argument roles:**

a. *seem*  \(\langle\text{experiencer proposition}\rangle\)

\([-r]\) \([-o]\) \([-o]\)

b. *believe*  \(\langle\text{experiencer proposition}\rangle\)

\([-o]\) \([-o]\) \([-r]\)

In these example argument structures, as in Chapter 12, athematic arguments are represented outside of the angled brackets. As in Zaenen and Engdahl (1994), the empty argument role may be ordered before (as in (24a)) or after (as in (24b)) the other argument roles, which will give it greater or lesser priority in the mapping to functions (Section 14.3). In both these examples, \(x\) is an experiencer argument and \(y\) a propositional argument.

We use the variable \(\theta\) for both thematic (semantic) and athematic (nonsemantic) argument roles. However, \(\hat{\theta}\) always designates the semantically most prominent role on the thematic hierarchy (14). In the a-structure of *seem*, \(x = \hat{\theta}\) is not the initial role of the argument structure, because an empty argument role precedes it. In the a-structure of *believe*, \(x = \hat{\theta}\) is both the logical subject and the initial role of the argument structure.

Conditions can be imposed on the a-structure. In some languages more than one semantic role can be associated with \([-r]\), whereas in others this association is limited to just one (Bresnan and Moshi 1990). English is a language with this constraint on a-structures, stated in (25) (Alsina and Mchombo 1993):

(25) **Asymmetrical object parameter:**

\[
\begin{array}{cc}
\theta & \theta \\
[-r] & [-r]
\end{array}
\]

When, in an asymmetrical object construction, there are two patientlike roles (for example, a recipient object and a theme), \([+o]\) will be assigned to the secondary one. In English this is always the lower role on the hierarchy.

---

8 Zaenen and Engdahl (1994) analyze xcomp and comp as specialized types of o\(\hat{b}_{lg}\). Dalrymple and Lødrup (2000) argue that some roles analyzed as comp are better analyzed as obj.
The lexical stock of a-structures in a language can be extended by morpholexi-
cal means. For example, the a-structure of a passive differs from the active in that
the most prominent role is not mapped onto the most prominent available gram-
matical function (subj) (though it may be realized less prominently, such as in a
by-phrase in English). This is called “suppression” and is associated with passive
morphology. The notation is given in (26):

\[
(26) \text{Passive: } \hat{\theta} \\
\downarrow
\emptyset
\]

Less prominent roles can also be suppressed in a-structure. “Unspecified object
deletion,” allowing verbs such as eat to appear without an object, can be viewed
as suppressing a patient or theme role:

\[
(27) \text{Unspecified object deletion: } \theta \text{ (\(\theta\) a patient or theme)} \\
\downarrow
\emptyset
\]

Suppressions can affect only unmarked roles in a-structures (Alsina 1990) – that
is, only negatively specified roles:

\[
(28) \text{Recoverability of suppression:} \\
\text{Only unmarked arguments can be suppressed.}
\]

Unmarked arguments are defined by the markedness interpretation of the features
in (18): the negatively specified features are unmarked.

In sum, the a-structures of words contain the minimal lexical information
needed for the projection of semantic roles onto surface syntactic functions. A
fundamental generalization embodied in them is that patientlike roles may alter-
mate between subject and object while other roles such as agents and locatives
have nonobject functions. This captures a pervasive typological pattern across
languages. (See Bresnan and Kanerva 1989, pp. 25–26.)

### 14.3 Mapping a-structures to syntactic functions

The basic syntactic principles for mapping a-structures to surface grammatical
functions are simple. The underspecified roles are freely mapped onto all compat-
able grammatical functions subject to a few general constraints: if it is the initial
argument of the predicator, a most prominent role (\(\hat{\theta}\) classified \([-o]\)) has to be
mapped onto the subject function; if such a role is unavailable, a nonagentive
unrestricted role (\(\hat{\theta}\) classified \([-r]\)) is mapped onto the subject function. All other
roles are mapped onto the lowest compatible function on the partial ordering (19), which will be the most marked function:

(29) **Mapping principles:**  
  a. Subject roles:  
     i. \( \hat{\theta} \) is mapped onto **SUBJ** when initial in the a-structure;  
        \([-o]\)  
     otherwise:  
     ii. \( \theta \) is mapped onto **SUBJ**.  
        \([-r]\)  
  b. Other roles are mapped onto the lowest compatible function on the markedness hierarchy (19).

In (24a), \( x = \hat{\theta} \) is not the initial role of *seem*, and so by (29) it will be mapped not onto **SUBJ** but onto **OBL\(_{\theta}**. In (24b), in contrast, \( x = \hat{\theta} \) is the initial role of *believe*, and so by (29) it will be mapped onto **SUBJ**.

There are two other constraints on the mapping, namely function–argument bi-uniqueness (Bresnan 1980) and the subject condition (Baker 1983).\(^9\)

(30) **Function–argument bi-uniqueness:**  
Each a-structure role must be associated with a unique function, and vice versa.

(31) **The subject condition:**  
Every predicator must have a subject.

Multiple restricted objects and obliques are possible because these functions are further individuated by their semantic roles (see Bresnan and Kanerva 1989, p. 25 for discussion).

### 14.4 Examples and consequences

#### 14.4.1 Unaccusatives

The active form of the transitive verb *pound* has an agent role and a patient role. These are respectively assigned a \([-o]\) and a \([-r]\) feature by the a-structure

---

\(^9\) This condition may need to be parameterized so as to hold only for some types of languages (see Bresnan and Kanerva 1989; Mohanan 1994). Also, it applies only to argument structures of predicators taking core arguments (as defined in Section 6.1.1). See Asudeh (2012) for further discussion of the subject condition in light of expletives in English copy raising (e.g. *There seemed like there was a problem*).
From Argument Structure to Functional Structure

principles given above. The \([-o]\) argument is also the most prominent argument, given the thematic hierarchy. The a-structure is as given in (32):

(32) \(\text{pound} \langle \text{agent patient} \rangle\)  
\([-o] [-r]\)

According to the a-structure to f-structure mapping principles in (29), the most prominent role will be mapped onto the \(\text{subj}\) function (29a i); the other argument role will be mapped to the unrestricted object (\(\text{obj}\)) function, the lowest function of the partial ordering compatible with the \([-r]\) a-structure feature:

(33) **TRANSITIVE:**

| a-structure: \(\text{pound} \langle \text{agent patient} \rangle\) | f-structure: s o (29a i) and (29b) |
| \([-o] [-r]\) | |

In the passive a-structure, \(\hat{\theta}\) is suppressed and the remaining role is mapped onto the subject function by (29a ii):

(34) **PASSIVE:**

| a-structure: \(\text{pounded} \langle \text{agent patient} \rangle\) | f-structure: s (29a ii) |
| \([-o] [-r]\) | \(\emptyset\) (26) |

The unaccusative is subject to the same mapping as the passive: here there is no logical subject classified \([-o]\), so again (29a ii) applies to constrain the subject mapping.

(35) **UNACCUSATIVE:**

| a-structure: \(\text{freeze} \langle \text{theme} \rangle\) | f-structure: s (29a ii) |
| \([-r]\) | |

In the unergative, the sole argument is also mapped onto the subject function, but this time by virtue of principle (29a i):

(36) **UNERGATIVE:**

| a-structure: \(\text{bark} \langle \text{agent} \rangle\) | f-structure: s (29a i) |
| \([-o]\) | |
In sum, the sole required argument of English intransitive verbs (whether passive, unergative, or unaccusative) is mapped to the subj function. Nevertheless, the different classifications of the sole argument in a-structure explain a subtle split between two types of intransitive verbs regarding the behavior of resultative secondary predicates (discovered by Simpson 1983b).

### 14.4.2 Resultatives

The sole argument of passives and unaccusatives shares with the second argument of transitives the property of allowing a resultative predication:

(37) a. We pounded the metal flat. (transitive)
    b. The metal was pounded flat. (passive)

(38) The river froze solid. (unaccusative)

(39) * The dog barked hoarse. (unergative)

Note that a resultative predicate cannot be applied to subjects in general. For example, resultative predication cannot be applied to the subject of a transitive verb or that of an unergative verb: (37a) cannot mean that we got flat by pounding the metal, and (39) cannot mean that the dog was hoarse as a result of barking. The resultative predicate applies only to an argument that is classified as \([-r]\) in the a-structure. Why does resultative predication have access to this information? Because, as argued in Simpson (1983b), it alters the a-structure by adding the resultative argument to the predicate.

### 14.4.3 “Fake” reflexives and “nonsubcategorized objects”

Unergatives also differ from unaccusatives in allowing “fake reflexive” arguments, which then permit resultatives:

(40) a. The dog barked itself hoarse. (unergative)
    b. She shouted herself beet red. (unergative)
    c. * She flushed herself red. (unaccusative)

Similarly, the two types differ in allowing “nonsubcategorized objects:”

(41) a. The dog barked us awake. (unergative)
    b. We ran the soles right off our shoes. (unergative)
    c. * The dog fell us awake. (unaccusative)

Both fake reflexives and nonsubcategorized objects are thematic arguments of their verb, having no semantic role with respect to the verb alone: the dog does not bark itself, nor can it bark us. As we saw above, in English there can only be one
[−r] argument in the a-structure of a verb, and because nonsemantic roles by definition can only be [−r], unaccusative verbs cannot have nonthematic objects. This explains the contrast between the ability of unergatives and unaccusatives to take fake reflexives and nonsubcategorized objects. For a different view of resultatives see the “Further reading and discussion” section below.

14.4.4 Word order of internal/external arguments

The lexical mapping theory has further consequences when combined with the theory of c-structure to f-structure mapping presented in Chapter 6. By the X’ theory of Chapter 6, the VP is the phrase structure category that is both predicative (i.e. cannot dominate a subject NP) and potentially transitive (i.e. can dominate object NPs). It follows that in a language that has a VP, the $\theta[−o]$ argument being realized as a subj must appear outside the VP, while the [−r] argument(s) being realized as either subj or obj can appear either inside or outside the VP. Can the sole argument of unaccusative verbs such as freeze appear inside the VP in English or other configurational languages? Relevant evidence bearing on this question is given in Problem Set 6.

The present theory of “internal”/“external” arguments has the advantage of generalizing gracefully to languages in which VP constituents are not independently motivated.

14.4.5 Ditransitives

The active form of cook has an agent role and a patient role. These are respectively assigned a [−o] and a [−r] feature by the a-structure principles given above. The [−o] argument is also the most prominent argument, given the thematic hierarchy, so it is the “external argument.” The a-structure is as given in (42):

\[
\text{cook } \langle \text{agent patient } \rangle \\
[−o] \quad [−r]
\]

According to the a-structure to f-structure mapping principles in (29), the “external” argument role will be mapped onto the subject as in (29a i); the other argument role will be mapped to the unrestricted object function, the most marked function compatible with the [−r] a-structure feature:

\[
\text{TRANSITIVE:} \\
\text{a-structure: cook } \langle \text{agent patient } \rangle \\
\begin{array}{c}
[−o] \\
[−r]
\end{array} \\
\text{f-structure: s o } \quad (29\text{a i) and (29b)}
\]
In the passive a-structure, \( \hat{\theta} \) is suppressed and an internal role is mapped onto the subject function by (29a ii):

\[(44) \text{PASSIVE:}
\begin{align*}
\text{a-structure:} & \quad \text{cooked} \langle \text{agent patient} \rangle \\
& \quad \begin{array}{c}
-\text{o} \\
\emptyset
\end{array} \begin{array}{c}
-\text{r}
\end{array} \\
\text{f-structure:} & \quad \text{s}
\end{align*}
\]

In the active intransitive a-structure, it is the patient role that is suppressed:

\[(45) \text{INTRANSITIVE:}
\begin{align*}
\text{a-structure:} & \quad \text{cook} \langle \text{agent patient} \rangle \\
& \quad \begin{array}{c}
-\text{o} \\
\emptyset
\end{array} \begin{array}{c}
-\text{r}
\end{array} \\
\text{f-structure:} & \quad \text{s}
\end{align*}
\]

This analysis accounts for facts like those in (46):

\[(46) \begin{align*}
a. \quad & \text{Both parents cooked supper (for the children).} \\
b. \quad & \text{Supper was cooked (by both parents) (for the children).} \\
c. \quad & \text{Both parents cooked (for the children).}
\end{align*}
\]

The ditransitive of cook has an added beneficiary role, which is a patientlike “internal argument” (Toivonen 2013). It is thus assigned the \([-r]\) feature and, because English allows only one such internal role by the asymmetrical object parameter (25) discussed above, the lower patient role must then receive the secondary \([+o]\) classification. The a-structure is as given in (47):

\[(47) \text{cook-for} \langle \text{agent beneficiary patient} \rangle \\
\begin{array}{c}
-\text{o} \\
\emptyset \\
-\text{r} \\
\end{array} \begin{array}{c}
+\text{o}
\end{array}
\]

Applying the mapping principles to this argument structure, we find that the agent will be mapped onto the subject as external argument; the beneficiary will be mapped onto the object as the most marked function compatible with the \([-r]\) feature; and the patient will be mapped onto the restricted object as the most marked function compatible with the \([+o]\) feature:

\[(48) \text{DITRANSITIVE:}
\begin{align*}
\text{a-structure:} & \quad \text{cook-for} \langle \text{agent beneficiary patient} \rangle \\
& \quad \begin{array}{c}
-\text{o} \\
\emptyset
\end{array} \begin{array}{c}
-\text{r}
\end{array} \begin{array}{c}
+\text{o}
\end{array}
\end{align*}
\]

\[\text{f-structure: s o o}_\theta \quad (29a \text{ i) and (29b)} \]
In the corresponding passive a-structure, \( \theta \) is suppressed and an internal role is mapped onto the subject function:

\[(49) \text{ PASSIVE OF DITRANSITIVE:} \]
\[
\text{a-structure: } \text{cooked-for} \langle \text{agent} \text{ beneficiary} \text{ patient} \rangle \]
\[
\begin{array}{ccc}
[-o] & [-r] & [+o] \\
\emptyset & & \\
\end{array}
\]
\[
\text{f-structure: } s \quad o_{\emptyset} \quad (29a \ ii)
\]

This analysis accounts for facts like those in (50):

\[(50) \]
\[
a. \text{ Both parents cooked the children supper.} \\
b. \text{ The children were cooked supper by both parents.} \\
c. ^* \text{ Supper was cooked the children by both parents.}
\]

Now if we try to apply intransitivization to either the active ditransitive argument structure or the passive version, it will fail.Suppressions may apply only to unmarked roles, i.e. those that are negatively specified:

\[(51) \text{ DITRANSITIVE:} \]
\[
\text{a-structure: } \text{cook-for} \langle \text{agent} \text{ beneficiary} \text{ patient} \rangle \]
\[
\begin{array}{ccc}
[-o] & [-r] & [+o] \\
\emptyset & & \\
\end{array}
\]
\[
^* \quad (27)
\]

This accounts for examples like the following.

\[(52) \]
\[
a. \text{ We’ll cook for Thanksgiving.} \\
(= \text{ We’ll cook something for Thanksgiving.}) \\
b. ^* \text{ We’ll cook the children for Thanksgiving.} \\
(= \text{ We’ll cook the children something for Thanksgiving.})
\]

\[(53) \]
\[
^* \text{ The children will be cooked for Thanksgiving.} \\
(= \text{ The children will be cooked something for Thanksgiving.})
\]

Putting together the results from our examination of ditransitives in English with those of resultatives, we can easily explain the following contrasts:

\[(54) \]
\[
a. \text{ John cooked the egg hard for Mary.} \\
b. ^* \text{ John cooked Mary the egg hard.}
\]
The theme argument of transitive \textit{cook} can be suppressed by unspecified object deletion (27) because it corresponds to an unrestricted role \([-r]\), which (being unmarked) is eligible for suppression. But the same semantic role, in the ditransitive \textit{cook for}, cannot be unrestricted, by the asymmetrical object parameter (25), and so cannot be suppressed.

\subsection*{14.4.6 Interactions of passive and raising}

As we saw above, the raising verbs \textit{seem} and \textit{believe} have the argument structures shown in (55) and (56), respectively. Each verb has an empty (athematic) role, and both verbs have an experiencer argument (\(x\)) and a propositional argument (\(y\)). By definition, the athematic roles are \([-r]\), and the semantic roles receive the “other semantic roles” classification \([-o]\) from (21).

\begin{align*}
(55) \quad & \text{\textit{seem}} \quad \langle \text{experiencer proposition} \rangle \\
& \quad \ questionnaire
14.4.7 Morphology that adds or suppresses a-structure roles

We have seen that passive morphology on a verb suppresses the most prominent a-structure role by designating that role as unavailable for mapping to a syntactic argument (see (26)). Less prominent roles can also be suppressed or demoted from expression as direct objects to obliques. Although English lacks verbal morphology to signal such “unspecified object deletion,” many languages possess such morphology, called the antipassive. An example is the verbal suffix -ŋa in the Australian language Dyirbal:

(60) a. yabu ŋuma-ŋugu bura-n.
   mother.abs father.erg see-nofut
   “Father saw mother.”
   
   b. ŋuma bural-ŋa-nyu yabu-gu.
   father.abs saw-antip-nofut mother-dat
   “Father saw mother.”

The patient argument is expressed as a direct grammatical function in (60a), but as an oblique in the antipassive sentence (60b). Note that while sentence (60a) is transitive, as shown by the ergative case on the experiencer argument, the antipassive sentence is intransitive, with the experiencer appearing in absolutive case instead.

While passive and antipassive morphology marks the suppression, or else demotion to oblique status, of roles that would otherwise be expressed as subjects and objects, causative and applicative morphology has the opposite effect of adding roles or else promoting them from oblique status. For example, Chichewa has a causative verbal morpheme -ets/-its (-ets is used when the stem has no vowel or only mid vowels; -its is used elsewhere). The verb in sentence (61) is the causative version of the intransitive verb nám ‘lie’:

(61) Chatsalíra a-ku-nám-íts-á mvána.
    1 name 1 s-pr-lie-caus-fv 1 child
    “Chatsalíra is making the child lie (tell lies).”

The verb nám (‘lie’) has this argument structure:

(62) nám ‘lie’ ⟨agent⟩
    [−o]

The causative morpheme adds a causer argument, the logical subject of the causative verb:
From the principles of semantic classification (21), this causer role is classified as \([-o]\):

\[
\begin{array}{c}
\text{nám-its ‘lie-CAUS’} \\
\langle \text{causer} \quad \text{agent} \rangle \\
\hline
\text{[-o]} \quad \text{[-o]} \\
\text{OBJ} \quad \text{OBJ}
\end{array}
\]

The result is a transitive verb with a causer subject and causee object, as in example (61).

When a transitive Chichewa verb such as phik (‘cook’) is causativized, there are two alternative outcomes. The causee argument (the semantically subordinate agent, e.g. ‘the owl’ in the following examples) may be expressed as a direct object, as in (65b), or an oblique, as in (65c):

\[
\begin{align*}
a. \quad \text{Kadzídzi a-na-phík-a (maúngu).} \\
& \quad \text{1a owl 1 s-ps-cook-fv 6 pumpkins.} \\
& \quad \text{“The owl cooked (the pumpkins).”}
\end{align*}
\]

\[
\begin{align*}
b. \quad \text{Núngu i-na-phík-íts-a kadzídzi maúngu.} \\
& \quad \text{9 porcupine 9 s-ps-cook-CAUS-fv la owl 6 pumpkins.} \\
& \quad \text{“The porcupine made the owl cook the pumpkins.”}
\end{align*}
\]

\[
\begin{align*}
c. \quad \text{Núngu i-na-phík-íts-a maúngu kwá kádzídzi.} \\
& \quad \text{9 porcupine 9 s-ps-cook-CAUS-fv 6 pumpkins to 1a owl.} \\
& \quad \text{“The porcupine had the pumpkins cooked by the owl.”}
\end{align*}
\]

The lexical entry for phik is shown in (66):

\[
\begin{array}{c}
\text{phik ‘cook’} \\
\langle \text{agent} \quad \text{patient} \rangle \\
\hline
\text{[-o]} \quad \text{[-r]}
\end{array}
\]

When the verb is causativized, the new causer argument is added in the initial place in the a-structure. Since it is not “patientlike” by (21), it receives an

\[\text{Alsina (1992) argues that the causative in fact adds two arguments: the causer and a patient argument, which is identified with an argument of the root verb. Examples (61) and (65) are from Alsina (1992, p. 518 and 524).}\]
intrinsic classification of \([-o]\). The causee (‘the owl’) is both an agent (of the cooking action) and a patient (of the causing action). Let us posit two alternative intrinsic classifications. Corresponding to its agentive status, the causee is classified as \([-o]\) (for ‘other roles’). The patient receives \([-r]\), the classification for ‘patientlike roles’:

(67)  \(phik\)-its ‘cook.caus’  \(\langle\begin{array}{ccc}
\text{causer} & \text{agent} & \text{patient} \\
[{-o}] & [{-o}] & [{-r}] \\
\text{SUBJ} & \text{OBL} & \text{OBJ}
\end{array}\rangle\)

Alternatively, the causee may be classified as \([-r]\), due to its patientlike role as recipient of the causing action. As a consequence, the patient becomes a “secondary patient,” leading to its \([+o]\) classification (again, see (21)). (Also, a \([-r]\) intrinsic classification of the patient argument would violate the asymmetrical object parameter (25).)

(68)  \(phik\)-its ‘cook.caus’  \(\langle\begin{array}{ccc}
\text{causer} & \text{agent} & \text{patient} \\
[{-o}] & [{-r}] & [+o] \\
\text{SUBJ} & \text{OBJ} & \text{OBJ}_{\theta}
\end{array}\rangle\)

These two alternative lexical mappings underlie the verbs in (65c) and (65b), respectively.

On the latter alternative, the causee argument is classified as \([-r]\), reflecting its patientlike role as the recipient of the causing action. That analysis has also been applied to morphologically underived causatives, as in English Mary jumped the horse, which means ‘Mary made the horse jump’. The horse is the agent of the jumping, but also a recipient of the causation. Mohanan (1988) proposed that causativization can involve composition of a three-place causative predicate with the base verb. The three-place causative predicate involves a causer who acts on a causee to bring about an event in which the causee participates in another role. On Mohanan’s theory, the agent of the base verb a-structure can be realized as an object just when the composition of a higher three-place causative predicate alters the meaning of this argument role by binding the agent of the verb stem to the patient of causation of the causative morphology. This idea was further developed in work by Alsina and Joshi (1991) and Alsina (1992, 1996b, 1997), and was then generalized by Austin (1997) to a wider range of transitivizing processes in Australian aboriginal languages.\(^{11}\)

\(^{11}\)Argument structure causativization is an addition to the incorporated xCOMP analysis of causatives introduced in Problem Set 5 (Ishikawa 1985; Saiki 1985, 1986; Matsumoto 1996a,b,c). Work on the typology of causatives can be found in Matsumoto (1998) and references.
While causative morphology marks the addition of an a-structure-initial argument, morphology marking the addition of a noninitial argument is called applicative morphology. The Chichewa applicative morpheme \(-er/-ir\) is illustrated in (69b) (-er is used when the stem has no vowel or only mid vowels; -ir is used elsewhere; example from Alsina and Mchombo 1993, p. 18):

(69) a. Chitsiru chi-na-gul-\(\text{-}\)ul-\(\text{-}\)am phatso.
  7.fool 7-pst-buy-fv 9.gift
  “The fool bought a gift.”

b. Chitsiru chi-na-gul-\(\text{-}\)ir-\(\text{-}\)a tsek\(\text{-}\)ana mphatso.
  7.fool 7-pst-buy-APPL-fv 2.girls 9.gift
  “The fool bought the girls a gift.”

We will assume the following applicative rule:

(70) **Applicative rule for Chichewa:**
Add the applicative morpheme \(-ir\) to the verb. Add an argument in the second position in the argument structure (i.e. just to the right of the first argument).

Hence the argument structure for \(gul\)-\(ir\) (‘buy-for’) in (72) is derived from that of \(gul\) (‘buy’) in (71) as follows:

(71) \(gul\) ‘buy’ \(\langle\) agent theme \(\rangle\)
  \([-o]\) \([-r]\)

(72) \(gul\)-\(ir\) ‘buy-APPL’ \(\langle\) agent beneficiary theme \(\rangle\)
  \([-o]\) \([-r]\) \([+o]\)

Crosslinguistically applied roles tend to be primary objects (Marantz 1984). So let us posit that the intrinsic classification for applied roles is \([-r]\).

**Problems**

The reader is now equipped to solve Problem Set 6.

**Further reading and discussion**

Predicate argument structure played a fundamental role in the early motivation for LFG. It was argued, for example, that many properties of what were once
considered syntactic transformations (passive, dative, *there*-insertion, and the like) – their cyclicity, their structure preservation, their locality, and their lexical governance – could be derived instead from lexical operations on predicate argument structures which realigned their mappings to syntactic phrase structure constituents (Bresnan 1978). Lexical operations on the grammatical function arrays associated with predicate argument structures are central in the early LFG works in Bresnan (1982b) and L. Levin et al. (1983). Comprehensive reviews of arguments for lexical approaches to argument structure can be found in Müller and Wechsler (2014) and Wechsler (2015, ch. 6).

Early on it was suggested that there might be general principles for selecting grammatical functions from argument structures (Bresnan 1980), and the first convincing instantiation of such principles is found in the work of Zaenen et al. (1985). But it was L. Levin (1985) who pioneered the lexical mapping theory by showing that alternations in lexical forms that had previously been expressed by lexical rules transforming the grammatical function array present in lexical subcategorizations (or “lexical forms”) could be better captured by mapping principles that select varying sets of grammatical functions directly on the basis of the classification of the semantic roles. This idea is further developed in work by Bresnan and Kanerva (1989), and Bresnan (1980) provides arguments against lexical rules in LFG.

Argument structure and the lexical mapping theory have become one of the most intensively investigated areas of research in LFG, and there are many alternative hypotheses under active investigation in various empirical domains. Moreover, the theories of argument structure and a-structure to f-structure mapping have only recently begun to be formalized (see Butt et al. 1997; Andrews and Manning 1999; Asudeh and Giorgolo 2012; Asudeh et al. 2014). This is a part of the theory where further reading is essential to get a full picture of rapidly evolving research on the subject. The reader should now be able to venture into this rich area. For a variety of perspectives, see the papers in Butt and King (2000), and also Kibort (2007) and Her (2013). In addition, the following readings are recommended as starting points on the topics indicated.

**Symmetrical/asymmetrical object properties, passive, and inversion**

The description of ditransitives given for English above differs from what is found in some other languages. Research on the nature of this variation can be found in Mchombo and Firmino (1999), Alsina and Mchombo (1990, 1991, 1993), Bresnan and Moshi (1990), Simpson (1991), Tan (1991), Joshi (1993), Harford (1993), Alsina (1994a,b, 1996a,b), Lodrup (1995), Her (1997, 1998), Torn (2006), Kibort (2008), Camilleri and Sadler (2012), and references. Unlike English, some “symmetrical object” languages allow either object argument to be expressed as subject of the passive ditransitive. These constructions are closely related to the behavior
of unaccusatives and locative inversion constructions in Bantu (see Demuth 1990; Demuth and Mmusi 1997; Morapedi 2006) and elsewhere (see Tan 1991; Ackerman 1990, 1992; Bresnan 1994b; Pan 1996; Her and Huang 1998; Morimoto 1999; Lødrup 2000, in addition to the above references).

**Nominalizations and derivational morphology**

The pioneering work in LFG on nominalizations is that of Rappaport (1983), which predates the lexical mapping theory. The idea that meaning changes can alter the semantic classification of roles (21) in LMT is developed by Ackerman (1990) and Markantonatou (1995). Laczkó (1995, 1997) analyzes nominalizations in Hungarian and English from a comparative perspective. See also Mchombo and Ngalande (1980), Mchombo (1992, 1993a,b), Dubinsky and Simango (1996), Mugane (1996), Alsina (1996b, 1999), and Wechsler (2008a,b).

**Agentive objects**

Some languages appear to allow mapping of agent roles to objects, in apparent violation of the mapping rules presented in this chapter. In a number of Austronesian languages, transitive clauses in the most basic voice appear to map the agent to the object and the patient to the subject. Such languages include Tagalog (Kroeger 1993), Toba Batak (Manning and Sag 1998), and Balinese (Wechsler and Arka 1998). In addition, agents are mapped to objects in some inverse languages (Arnold 1994) and in special constructions such as subject inversion constructions in Italian dialects (Saccon 1993) and Norwegian presentational constructions (Lødrup 1999b, 2000). Various lines of attack on these problems have been taken, including underspecification (Arnold 1994; Lødrup 2000). Some work adopts the optimality-theoretic idea of violable constraints to explain marked realizations of argument types (Lødrup 1999b; Morimoto 1999; Sells 2001a). Some alternative argument mapping theories within LFG allow for agentive objects (Manning 1996; Arka 2003; Udayana 2013).

**Complex predicates**

While LFG provides a natural theory of discontinuous constituents for arguments and other dependents (Chapters 1, 6, and 7), the problem of discontinuous verbs (and other heads) is more difficult, as first noted by Simpson (1983b) and Ackerman (1987). Because each Pred is uniquely instantiated (Chapter 4), two parts of the same Pred cannot be unified in the formalism presented in this book.

**Resultatives**

Lexicalist analyses of resultative constructions have been developed in both LFG (Simpson 1983b; Bresnan and Zaenen 1990) and HPSG (Wechsler 1997b; Müller 2002). The LMT analysis sketched in Section 14.4.2 is based on Bresnan and Zaenen (1990). Simpson (1983b) captured the parallel between “nonsubcategorized objects” and subject-to-object raising by modeling English resultatives as functional control of the secondary predicate. Recent work on resultatives in LFG by Christie (MacGregor 2009; Christie 2010, 2011, 2013) has analyzed English resultatives in terms of templates (Dalrymple et al. 2004; Asudeh et al. 2008, 2013). Many have suggested that the verb and the resultative adjective form a complex predicate, such as *pound-flat* in example (37) (Dowty 1979, pp. 219–224). Wechsler (2005) addresses the aspectual semantics of this hypothesized verb–adjective composition. See the paragraph above for LFG references on complex predicates.

**Proto-roles**


**Argument roles**

It is not always obvious which roles should be included on a verb’s list of argument roles. Certain phrases seem to display some characteristics of arguments and some characteristics of modifiers. Works that address the issue of such “in-between” phrases include Wechsler (1997a) (albeit in the framework of HPSG), Donohue and Donohue (2004), Rákosi (2006, 2012), Zaenen and Crouch (2009), Needham
and Toivonen (2011), Asudeh and Giorgolo (2012), Giorgolo and Asudeh (2012),
discuss the argumenthood status of the experiencer to-PPs (such as to me in seem
to me, which is used as an example in this chapter).

**Argument structure binding**

Argument structure binding appears in the work of Grimshaw (1982b), Sells et al.
(1987), Mchombo (1992, 1993a,b), Bresnan and Moshi (1990), Alsina (1992,
1994b, 1996b, 1999), Alsina and Mchombo (1993), and elsewhere. In this work,
reflexive/reciprocal morphology and clitics serve to suppress an a-structure role
by binding it to another. This phenomenon could be viewed as a type of grammatic-
alization that lexicalizes anaphoric binding relations.

A-structure prominence has long been a factor in anaphoric reflexive binding,
as noted in Chapters 10 and 11 and references. Manning (1996) proposes that all
binding and control should be based on a-structure prominence, and modifies the
theory of a-structure to support this proposal, bringing it closer to developments
in HPSG. Interesting applications of this approach are found in some Austronesian
languages (see especially Arka and Wechsler 1996, Arka and Manning 1998, and
Arka and Simpson 1998). But the generality of the binding hypothesis remains to
be determined (Dukes 1998). In Chapters 10 and 11 we have already seen that
binding is subject to multiple dimensions such as logophoricity and subjectivity,
which may apply simultaneously. It thus seems premature at the moment to reduce
all binding to a single linguistic representation.
Introduction

Most of the following problems are based on published and unpublished sources listed in the references at the end of the set of solutions. While you are strongly encouraged to work through the problems without recourse to the published sources, for the practice in syntactic analysis that this will provide, the problems are quite open-ended and often represent only a small piece of a larger linguistic issue raised by the phenomena in question. You may therefore find it interesting after completing the problems to refer to the original sources in order to pursue in greater depth the issues they raise. Solutions are provided to only some of the problems.

A word is in order about how the sources have been used. In most cases, the data are taken directly from them. But there are also certain cases in which, for pedagogical reasons, the data has been somewhat modified, or constructed examples have been added, or the analysis itself has been somewhat simplified. Moreover, in some cases the analysis argued for in the sources is different from what an analysis within lexical-functional theory might look like. Therefore you should not assume that any problem fully represents either the complexities of the phenomena it addresses or the views of the author on whose work it draws.
Problem Set 1

P1.1 Warlpiri

Warlpiri, a Pama-Nyungan language spoken in northern Australia, is what is sometimes called a free word order language. In this exercise we will consider the following sentences from Warlpiri, and show that while they differ in c-structure, they have identical f-structures.

(1) Kurdu-jarra-rlu wita-jarra-rlu ka-pala maliki wajilipi-nyi.
   child-DUAL-ERG small-DUAL-ERG PRES-DUAL dog.ABS chase-NONPAST
   “The two small children are chasing the dog.”

(2) Kurdu-jarra-rlu ka-pala maliki wajilipi-nyi wita-jarra-rlu.
   child-DUAL-ERG PRES-DUAL dog.ABS chase-NONPAST small-DUAL-ERG
   “The two small children are chasing the dog.”

(3) Maliki ka-pala kurdu-jarra-rlu wajilipi-nyi wita-jarra-rlu.
   dog.ABS PRES-DUAL child-DUAL-ERG chase-NONPAST small-DUAL-ERG
   “The two small children are chasing the dog.”

(R1) and (R2) below give rules that will generate the constituent structures of such simple Warlpiri sentences. We have used an abbreviation (the “X”) in the rule schema in (R1a) in order to highlight the significant generalization that nominal and verbal constituents are treated alike with respect to word order. Each instance of X should be freely instantiated with either of the categories NP or V, as specified by the condition underneath the rule schema. The * in the notation X* means that there may be any number of instances of X, including none. We can then use the instructions in (R2) to assign functional schemata to the constituents in the right
sides of the rules we create by this instantiation. With these rules and the lexical choices in (L1)–(L5), it is possible to provide derivations for the sentences in (38)–(40).

\[(R1)\]  
\[a. \quad S \rightarrow X \text{ (Aux)} \quad X^* \quad \text{where } X = \text{NP or V}\]  
\[b. \quad \text{NP} \rightarrow \quad \text{N}^*\]

\[(R2)\]  
\[a. \quad \text{Assign } (↑ \text{subj}) = \downarrow \text{ or } (↑ \text{obj}) = \downarrow \text{ freely to NP.}\]  
\[b. \quad \text{Assign } ↑ = \downarrow \text{ to N, V, and Aux.}\]

Listed below are the relevant lexical choices (L1)–(L5). These fully inflected words are created from the lexical stock of stems by morpholexical processes which we will not discuss here. We make the simplifying (and artificial) assumption that they are simply given to the grammar as lexical items:

\[(L1)\]  
\[\text{kurdu-jarra-rlu} \quad \text{N} \quad (↑ \text{pred}) = \text{‘child’}\]  
\[\quad (↑ \text{num}) = \text{DUAL}\]  
\[\quad (↑ \text{case}) = \text{ERG}\]

\[(L2)\]  
\[\text{maliki} \quad \text{N} \quad (↑ \text{pred}) = \text{‘dog’}\]  
\[\quad (↑ \text{num}) = \text{SG}\]  
\[\quad (↑ \text{case}) = \text{ABS}\]

\[(L3)\]  
\[\text{wita-jarra-rlu} \quad \text{N} \quad (↑ \text{adj pred}) = \text{‘small’}\]  
\[\quad (↑ \text{num}) = \text{DUAL}\]  
\[\quad (↑ \text{case}) = \text{ERG}\]

\[(L4)\]  
\[\text{wajilipi-nyi} \quad \text{V} \quad (↑ \text{pred}) = \text{‘chase} ((↑ \text{subj}) (↑ \text{obj}))\’\]  
\[\quad (↑ \text{tense}) = \text{NONPAST}\]  
\[\quad (↑ \text{subj case}) = \text{ERG}\]  
\[\quad (↑ \text{obj case}) = \text{ABS}\]

\[(L5)\]  
\[\text{ka-pala} \quad \text{Aux} \quad (↑ \text{aspect}) = \text{PRESENT.IMPERFECT}\]  
\[\quad (↑ \text{subj num}) = \text{DUAL}\]

**Task I**  
Give c- and f-structures for (1)–(3).

It is interesting to note that in Warlpiri, there is no class of adjectives distinct from nouns, and any nominal may serve either as an adjunct or as the argument modified by the adjunct. Thus the word specifications for (L1) and (L3) above could each include the alternative annotation (↑\text{adj pred}) = ‘child’ and (↑\text{pred}) = ‘small’, respectively. However, speakers of Warlpiri have a strong preference for adjuncts to follow what they modify, and this interpretation is the only one you need to be concerned with for the purpose of this preliminary exercise.
**P1.2  Monsters and how to avoid them**

The notation for annotated c-structure rules is properly considered a formal language for writing grammars. In P1.1 we made use of some of its power and flexibility. The problem from the point of view of the linguistic theorist is that, as it stands, the language is too powerful and flexible: it is possible to write monster [monster: “an animal of strange or terrifying shape”] grammars that yield consistent, coherent, and complete f-structures but which correspond to no type of natural language known to us. Here is an example:

```
S
   ↑ = ↓
   NP
   (↑ OBJ) = ↓
   Aux
     ↑ = ↓
     V
     (↑ NUM) = PL
     ↓
     N
     ↑ = ↓
     snake
     (↑ PRED) = 'snake'
     ↑ = ↓
     V
     (↑ NUM) = PL
     ↓
     N
     ↑ = ↓
     people
     (↑ PRED) = 'person'
     ↑ = ↓
     V
     (↑ NUM) = PL
     ↓
     N
```

**Task II**  Display the f-structure that corresponds to this example. Notice that it is entirely well-formed and sensible looking, despite the c-structure.

**Task III**  Some way is needed of constraining possible annotations to word and phrase structure, to provide a theory of the natural ways that functional schemata can be associated with external structures. Can you propose any generalizations about these associations? Can you propose any ways you might expect such properties to vary across language types?
P2.1 Spanish

P2.1.1 The basic sentence pattern

First consider the following sentences:

(1)  
   a.  *Juan vió algo.
       saw something
       “Juan saw something.”
   b.  *Juan vió a algo.
       saw Prep something
       “Juan saw something.”

(2)  
   a.  Juan vió a alguien.
       saw Prep someone
       “Juan saw someone.”
   b.  *Juan vió alguien.
       saw someone
       “Juan saw someone.”

The gloss below a stands for ‘Preposition’. It is assumed here that a algo and a alguien in the above examples are prepositional phrases (PPs). (This position is not uncontroversial: alternatively this could be considered some form of case marker within the noun phrase.)

Task I  Propose a set of phrase structure rules that will generate the grammatical sentences in (1) and (2), while ruling out the ungrammatical ones. Include all the necessary functional annotations. Although word order in Spanish is fairly free,
you may assume for the purpose of this exercise that Spanish c-structure is roughly comparable to what we find in English, and that the Spanish S and PP rules are the following:

\[(R1)\quad S \rightarrow \text{NP} \quad \text{VP} \quad (\uparrow \text{subj}) = \downarrow \quad \uparrow = \downarrow\]

\[(R2)\quad PP \rightarrow \text{P} \quad \text{NP} \quad \uparrow = \downarrow \quad \uparrow = \downarrow\]

It is left to you to provide the VP and NP rules. The expansion of VP should include an optional PP, and you should consider carefully the treatment of this constituent within the VP. In particular, bear in mind the word specifications for the verb \(vió\) (in (L5) below). Remember – there is no single “correct” set of rules for this problem, so just propose some rules, and make sure that they provide c-structures and well-formed f-structures for (1a) and (2a) but not for (1b) and (2b).

The relevant lexical entries are given below.

\[(L1)\quad a \quad \text{P} \quad (\uparrow \text{case}) = \text{ACC} \quad (\uparrow \text{anim}) = +\]

\[(L2)\quad \text{algo} \quad \text{N} \quad (\uparrow \text{pred}) = \text{‘something’} \quad (\uparrow \text{anim}) = -\]

\[(L3)\quad \text{alguien} \quad \text{N} \quad (\uparrow \text{pred}) = \text{‘someone’} \quad (\uparrow \text{anim}) = +\]

\[(L4)\quad \text{Juan} \quad \text{N} \quad (\uparrow \text{pred}) = \text{‘Juan’} \quad (\uparrow \text{num}) = \text{SG} \quad (\uparrow \text{gend}) = \text{MASC} \quad (\uparrow \text{anim}) = +\]

\[(L5)\quad vió \quad \text{V} \quad (\uparrow \text{pred}) = \text{‘see ((\uparrow \text{subj})(\uparrow \text{obj}))’} \quad (\uparrow \text{tense}) = \text{Past}\]

**Task II**  Write out the c-structures and f-structures for (1a) and (2a).

**P2.1.2 Clitics**

Consider now the following sentences:

(3) a. \(Juan \; vió \; a \; Pedro.\)  
\hspace{1cm} saw Prep  
\hspace{1cm} “Juan saw Pedro.”
b. *Juan lo vió.*
   cl.acc.sg saw
   “Juan saw him.”

(4) a. *Juan vió a sus amigos.*
   saw Prep his friends
   “Juan saw his friends.”

b. *Juan los vió.*
   cl.acc.pl saw
   “Juan saw them.”

Lo and los are clitic pronouns, phonologically attached to the verb. Their lexical specifications are given in (L6) and (L7) below. These are fairly standard for pronouns, though of course you are free to modify them if you wish. They include a simple referential feature common to all pronouns (the pred feature ‘pro’), together with agreement features such as person, number, and gender and grammatical features such as case:

(L6)  \[ \text{lo} \quad \text{CL} \quad \uparrow \text{pred} = \text{’pro’} \]
      \[ \quad \uparrow \text{case} = \text{ACC} \]
      \[ \quad \uparrow \text{num} = \text{SG} \]
      \[ \quad \uparrow \text{pers} = 3 \quad \uparrow \text{gend} = \text{MASC} \]

(L7)  \[ \text{los} \quad \text{CL} \quad \uparrow \text{pred} = \text{’pro’} \]
      \[ \quad \uparrow \text{case} = \text{ACC} \]
      \[ \quad \uparrow \text{num} = \text{PL} \]
      \[ \quad \uparrow \text{pers} = 3 \quad \uparrow \text{gend} = \text{MASC} \]

You must now refine your rules so that they can also generate c-structures for sentences containing clitics as in (3b) and (4b). You may assume that clitics belong to the category CL, and use the following rule to generate the constituent containing the clitic and verb:

(R3)  \[ \overline{V} \rightarrow \left( \frac{\text{CL}}{\uparrow \text{obj} = \downarrow} \right) \quad \uparrow V \]

(This rule is not intended to account for all the verbal clitics in Spanish. For example, in addition to accusative clitics, Spanish has dative clitics.)

**Task III**  Modify your VP rule so that it includes \( \overline{V} \) in its expansion. List the new rule.

**Task IV**  Give c- and f-structures for (3a) and (3b). You will need the following additional lexical specification:
P2.1.3 Clitic doubling

Finally, consider the following sentences. These exhibit a phenomenon called clitic doubling, which is widespread in some dialects of Spanish, such as the River Plate and Peruvian dialects:

(5) a. Juan lo vió a Pedro.
   cl.acc.sg saw Prep
   “Juan saw Pedro.”

b. Juan los vió a sus amigos.
   cl.acc.pl saw Prep his friends
   “Juan saw his friends.”

In these examples we find both a clitic and a full PP object. In such dialects, lo and los may still serve as objects, as in (3b) and (4b), and so may a full PP as in (3a) and (4a). Thus it would seem that in the sentences in (5) we have two forms which express the object of the sentence. Note that there must be gender and number agreement between the clitic and the PP object:

(6) a. Juan lo /*los /*la vió a Pedro.
   cl.masc.sg cl.masc.pl cl.fem.sg

b. Juan los /*lo /*las vió a sus amigos.
   cl.masc.pl cl.masc.sg cl.fem.pl

The final goal of this exercise is to highlight the linguistically significant issue raised by syntactic doubling phenomena such as the one illustrated here and to delve into a specific treatment of it in LFG.

Task V Your set of rules and morpholexical specifications accounting for (1)–(3) probably predicts that (5a) and (5b) are ill-formed. Explain why.

Task VI Modify your c-structure rules and/or morpholexical specifications to account for the well-formedness of (5a) and (5b). Be sure that your rules continue to allow for the well-formedness of the sentences in (3) and (4).

In conclusion, it is interesting to note that doubling is possible only with a PP object introduced by a, and never with a plain NP (note: al is a contraction of a el):
(7)  a.  *Juan lo vio al hombre.
   cl.acc.sg saw Prep.Det man
   “Juan saw the man.”

   b.  *Juan lo vio el libro.
   cl.acc.sg saw Det book
   “Juan saw the book.”

It would be perfectly possible, however, for the clitic lo in a sentence like (3b) to
be used to refer to either a man or a book. Although it is in no way necessary for
the completion of this problem, you may find it interesting to consider how your
analysis might be modified to account for this generalization about when doubling
is possible.

P2.2  Moroccan Arabic

Moroccan, like Arabic in general, is a so-called “subject pro-drop” language.
This means that a sentence need not contain a subject NP. A subject agreement
marker appears on each verb whether or not a subject NP is present, as illustrated
in (1):

(1)  a.  Mša-t nažat.
      went-3.sg.fem Najat
      “Najat went.”

   b.  Mša-t.
      went-3.sg.fem
      “She went.”

A further characteristic of Moroccan is that an object argument of a transitive
verb may be represented by either an NP or a pronominal affix, but not both. This
is shown in (2) below:

(2)  a.  Šra-t lbent lxʷebz.
      bought-3.sg.fem the.girl the.bread
      “The girl bought the bread.”

   b.  Šra-t-u lbent.
      bought-3.sg.fem-3.sg.masc the.girl
      “The girl bought it.”

   c.  *Šra-t-u lbent lxʷebz.
      bought-3.sg.fem-3.sg.masc the.girl the.bread
Some verbs in Moroccan lexically select oblique arguments. For example, in addition to subj and obj, ‘give’ takes an obl$_{go(adj)}$ (example (3)), and ‘lose’ takes a subj and an obl$_{experiencer}$ (example (4)). Both of these oblique arguments are marked by l, taken here to be a preposition, so that the entire phrase expressing the argument (e.g. l edderri in (3a)) is analyzed as a PP. Furthermore, when a prepositional object is pronominal, it takes the form of a suffix attached to the preposition. As shown in (3b) and (4b), the resulting PP is usually a clitic appearing in the position immediately following the verb, to the left of the subject:

(3) a. $Et\alpha$ mu$hend lektab l edderri.
gave.3.sg.masc Mohand the.book to the.boy
“Mohand gave the book to the boy.”

b. $Et\alpha$ lih mu$hend lektab.
gave.3.sg.masc to.3.sg.masc Mohand the.book
“Mohand gave him the book.”

(4) a. $M\check{sa}w$ leflus l mu$hend.
went.3.pl the.money to Mohand
“Mohand lost the money.”

b. $M\check{sa}w$ lih leflus.
went.3.pl to.3.sg.masc the.money
“He lost the money.”

Listed below are c-structure rules for this fragment of Moroccan (note that Moroccan is, basically, a VSO language):$^1$

(R1) $S \rightarrow V \left( \uparrow \downarrow \right) \left( PP \left( \uparrow \downarrow \text{case} \right) = \downarrow \right) \left( NP \left( \uparrow \downarrow \text{subj} \right) = \downarrow \right) \left( NP \left( \uparrow \downarrow \text{obj} \right) = \downarrow \right)$

(R2) $PP \rightarrow P \left( \uparrow \downarrow \right) \left( NP \left( \uparrow \downarrow \text{obj} \right) = \downarrow \right)$

(R3) $NP \rightarrow N \left( \uparrow \downarrow \right)$

$L1$–$L11$ are word specifications that will be needed for the completion of this exercise. Note that the specifications for the inflected verbs contribute complex information. You may find it useful to think of a word such as $m\check{sa}t$ ((L1) below) as combining the information encoded in the stem $m\check{sa}$- and in the affix $-t$: $m\check{sa}$-contributes the specification for pred, while $-t$ contributes those for aspect, subj num, subj gend, and subj pers:

$L1$ Please note that the right-hand side of rule (R1) continues on a second line.
(L1) \textit{mšat} \ V \quad (↑ \text{PRED}) = \text{‘go}((↑ \text{SUBJ}))’
\( (↑ \text{ASPECT}) = \text{PERF} \)
\( (↑ \text{SUBJ NUM}) = \text{SG} \)
\( (↑ \text{SUBJ GEND}) = \text{FEM} \)
\( (↑ \text{SUBJ PERS}) = 3 \)

(L2) \textit{nažat} \ N \quad (↑ \text{PRED}) = \text{‘Najat’}
\( (↑ \text{NUM}) = \text{SG} \)
\( (↑ \text{PERS}) = 3 \)
\( (↑ \text{GEND}) = \text{FEM} \)

(L3) \textit{lbent} \ N \quad (↑ \text{PRED}) = \text{‘girl’}
\( (↑ \text{NUM}) = \text{SG} \)
\( (↑ \text{PERS}) = 3 \)
\( (↑ \text{GEND}) = \text{FEM} \)

(L4) \textit{lxwebz} \ N \quad (↑ \text{PRED}) = \text{‘bread’}
\( (↑ \text{NUM}) = \text{SG} \)
\( (↑ \text{PERS}) = 3 \)
\( (↑ \text{GEND}) = \text{MASC} \)

(L5) \textit{muhend} \ N \quad (↑ \text{PRED}) = \text{‘Mohand’}
\( (↑ \text{NUM}) = \text{SG} \)
\( (↑ \text{PERS}) = 3 \)
\( (↑ \text{GEND}) = \text{MASC} \)

(L6) \textit{lektab} \ N \quad (↑ \text{PRED}) = \text{‘book’}
\( (↑ \text{NUM}) = \text{SG} \)
\( (↑ \text{PERS}) = 3 \)

(L7) \textit{edderri} \ N \quad (↑ \text{PRED}) = \text{‘boy’}
\( (↑ \text{NUM}) = \text{SG} \)
\( (↑ \text{PERS}) = 3 \)
\( (↑ \text{GEND}) = \text{MASC} \)

(L8) \textit{leflus} \ N \quad (↑ \text{PRED}) = \text{‘money’}
\( (↑ \text{NUM}) = \text{PL} \)
\( (↑ \text{PERS}) = 3 \)

(L9) \textit{l} \quad P \quad (↑ \text{CASE}) = \text{OBL}_{go} ∨ (↑ \text{CASE}) = \text{OBL}_{exp}

(L10) \textit{mšaw} \ V \quad (↑ \text{PRED}) = \text{‘lose}((↑ \text{SUBJ})(↑ \text{OBL}_{exp} \text{OBJ}))’
\( (↑ \text{ASPECT}) = \text{PERF} \)
\( (↑ \text{SUBJ NUM}) = \text{PL} \)
\( (↑ \text{SUBJ PERS}) = 3 \)
(L11) \( \text{eta} \) \( V \) \((\uparrow \text{PRED}) = \text{‘give’}(\uparrow \text{SUBJ})(\uparrow \text{OBJ})(\uparrow \text{OBL}_{go} \text{OBJ})\)’

\((\uparrow \text{ASPECT}) = \text{PERF} \)
\((\uparrow \text{SUBJ NUM}) = \text{SG} \)
\((\uparrow \text{SUBJ GEND}) = \text{MASC} \)
\((\uparrow \text{SUBJ PERS}) = 3 \)

**Task VII** Propose or modify as needed the specifications for the verbs \( m\text{ˇsat} \) and \( s\text{ˇratu} \), which will account for the patterns in (1) and (2) respectively. Also propose a specification for \( lih \), which occurs in (3b) and (4b).

**Task VIII** Give detailed c- and f-structures for (1b), (2a), (2b), (3a), and (4b).

**Task IX** Here \( l\text{ edderri} \) in (3a) and \( l\text{ muhend} \) in (4a) are analyzed as PPs. Phonologically, however, they behave as single words and \( l \) can easily be analyzed as an affix. Try to develop an alternative analysis of these forms.

### P2.3 Irish

#### P2.3.1 Person/number inflection

Irish has two types of verbal form: *analytic* and *synthetic*. An analytic form encodes tense and mood. A synthetic form encodes, in addition to tense and mood, the person and number of its subject. A single verbal paradigm often combines synthetic and analytic forms. For example, the verb \( cuir \) (‘put’) has the following conditional forms in the Ulster dialect:

\[
(1)\quad \begin{array}{ll}
\text{chuirfim} & \text{‘I would put’} \\
\text{chuirfeá} & \text{‘you.sg would put’} \\
\text{chuirfeadh sé} & \text{‘he would put’} \\
\text{chuirfeadh sí} & \text{‘she would put’} \\
\text{chuirfimis} & \text{‘we would put’} \\
\text{chuirfeadh sibh} & \text{‘you.pl would put’} \\
\text{chuirfeadh siad} & \text{‘they would put’}
\end{array}
\]

The analytic form \( chuirfeadh \) carries no specification of the person or number of its subject. In the examples above, this form regularly appears with a pronoun: \( sé, sí, sibh, \) or \( siad \). It also occurs with lexical NPs, as illustrated in (2) below:

\[
(2)\quad \text{Chuirfeadh Eoghan isteach ar an phost sin.} \\
\text{put_COND Owen in on the job that} \\
\text{“Owen would apply for that job.”}
\]

The synthetic forms in the paradigm are *chuirfinn*, *chuirféa*, and *chuirfimis*. These forms appear without a pronoun, as in (3) below:

(3) *Chuirfinn* isteach ar an phost sin.
    putCOND.1.sg in on the job that
    “I would apply for that job.”

Moreover, as illustrated in (4) below, it is impossible for a synthetic form to co-occur with a pronoun, even if the pronoun encodes the same person and number features:

(4) * *Chuirfinn* mé isteach ar an phost sin.
    putCOND.1.sg I in on the job that

An interesting fact about these verb forms is that an analytic form cannot be used when a synthetic form is available. For example, the analytic form *chuirfeadh* cannot be used with a first-person singular pronoun:

(5) *Chuirfeadh* mé isteach ar an phost sin.
    put.past I refl in on the job that

However, you will not be expected to account for this latter phenomenon in this problem.

**P2.3.2 Interactions with syntactic facts**

Certain syntactic phenomena point to a close parallelism between a synthetic verbal form and an analytic form combined with a subject. One of these phenomena concerns the behavior of certain NP modifiers which typically occur with pronouns but may also appear in the normal subject position when a synthetic form is used. The emphatic/reflexive particle *fein* accompanies pronouns as in (6); however, it can occur not only after an analytic verbal form as in (7a) but also after a synthetic one as in (7b):

(6) mé I/me mé féin myself
tú you tú féin yourself
sé he sé féin himself
sinn we sinn féin ourselves
iad them iad féin themselves

(7) a. *Chuir* mé féin isteach ar an phost sin.
    put.past I refl in on the job that
    “I myself applied for that job.”
b. *Chuirfinn féin isteach ar an phost sin.*

put.cond.1.sg refl in on the job that
“I myself would apply for that job.”

Let us assume that this fragment of Irish, which is a VSO language, can be generated by the following c-structure rules:

(R1) \[
S \rightarrow V \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \downarrow \right) \left( \rightarrow \downarrow \right)
\]

(R2) \[
PP \rightarrow P \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \downarrow \right)
\]

(R3) \[
NP \rightarrow \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \uparrow \downarrow \right) \left( \rightarrow \uparrow \downarrow \right)
\]

Since Irish allows either an analytic form with a subject NP (as in (2)) or a synthetic form without a subject NP (as in (3)), the optionality of the head N in (R3) allows for the occurrence of the reflexive *féin* in cases like (7b) where the head is not present in the c-structure.

Let us assume the following morpholexical specifications, which will be relevant for the completion of this exercise:

(L1) \[chuirfeadh V \left( \rightarrow \uparrow \text{PRED} \right) = \text{‘apply-for (\rightarrow \uparrow \text{SUBJ}, \rightarrow \uparrow \text{OBL}_{ar} \text{OBJ})’} \]

(L2) \[isteach Part \left( \rightarrow \uparrow \text{LOC} \right) = + \]

(L3) \[ar P \left( \rightarrow \uparrow \text{CASE} \right) = \text{OBL}_{ar} \]

(L4) \[phost N \left( \rightarrow \uparrow \text{PRED} \right) = \text{‘job’} \]

(L5) \[féin Part \left( \rightarrow \uparrow \text{REFL} \right) = + \]

(L6) \[sin Part \left( \rightarrow \uparrow \text{DEIXIS} \right) = \text{DISTANT} \]

(L7) \[an Art \left( \rightarrow \uparrow \text{DEF} \right) = + \]

(L8) \[chuir V \left( \rightarrow \uparrow \text{PRED} \right) = \text{‘apply-for (\rightarrow \uparrow \text{SUBJ}, \rightarrow \uparrow \text{OBL}_{ar} \text{OBJ})’} \]

\[\left( \rightarrow \uparrow \text{TENSE} \right) = \text{PAST} \]

\[\left( \rightarrow \uparrow \text{LOC} \right) = c + \]
(L9)  mé  N  (↑ PRED) = ‘pro’
     (↑ PERS) = 1
     (↑ NUM) = SG

(L10)  Eoghan  N  (↑ PRED) = ‘Owen’
       (↑ PERS) = 3
       (↑ NUM) = SG

**Task X**  How would you account for the fact that synthetic verbal forms cannot co-occur with a subject NP?

**Task XI**  Provide morpholexical specifications for the verbal forms chuirfinn, chuirfén, and chuirfimís in the paradigm in (1).

**Task XII**  Provide full c- and f-structures for (7a) and (7b) above.

---

**P2.4  Noun incorporation in Greenlandic**

**P2.4.1  Morphological ergativity**

In Greenlandic a single case form, the absolutive (abs), marks both the subject of an intransitive verb and the object of a transitive verb. A different case form, the ergative (erg), is reserved for the subject of a transitive verb. (This patterning of subjects of intransitive verbs with objects in contradistinction to subjects of transitive verbs is called ergativity.) An intransitive verb agrees with its subject (see (1) below), while a transitive verb, using a distinct agreement affix, agrees with both its subject and its object (see (2)–(4) below).

(1)  Arnaq  tikippoq.
    woman.abs come.indic.3.sg
    “The woman came.”

(2)  Arna-p  meeraq  takuvaa.
    woman-erg  child.abs  see.indic.3.sg.3.sg
    “The woman saw the child.”

Note that an NP subject or object need not be present for this case-marking pattern to appear:

(3)  Arnaq  takuvara.
    woman.abs  see.indic.1.sg.3.sg
    “I saw the woman.”
(4) Arna-p takuvaanga.  
enoma-erg see.indic.3.sg.1.sg  
“The woman saw me.”

As in many languages with ergative case-marking, certain basically transitive verbs can be used as intransitive verbs just by affixing the agreement marking appropriate to an intransitive verb. While the transitive form of the verb will select an ergative-marked subject and an absolutive-marked object, the intransitive form of the verb will select an absolutive-marked subject and an oblique. In Greenlandic this oblique argument has instrumental case, and the verb does not show any agreement with it.

(5) Neqi nerivara.  
meat.abs eat.indic.1.sg.3.sg  
“I ate the meat.”

(6) Neqi-mik nerivunga.  
meat-inst eat.indic.1.sg  
“I ate meat.”

P2.4.2 Noun incorporation

Greenlandic has a class of suffixes that combine with nouns to form verbs in which the incorporated noun is understood to be a grammatical argument of a verb encoded by the suffix. Given below are two such suffixes, -qarpoq, whose meaning corresponds to ‘have’, and -sivoq, whose meaning is, roughly, ‘buy’. Qimmeq and sapangaq, given in (7a) and (8a) respectively, are independent lexical items, which form derived verbs when combined with the verbal suffixes (see (7b) and (8b)).

(7) a. qimmeq  ‘dog’  
b. Qimmeq-arpoq.  “He has a dog.”

(8) a. sapangaq  ‘bead’  
b. Sapangar-sivoq.  “He bought beads.”

In general in Greenlandic, NP modifiers are in the same case as the NP they modify. In (9) the noun angutip is marked in the ergative and so is its modifier angisuuup. In (10) the noun angummik is in the instrumental case and so is its modifier angisuumik.

(9) Anguti-p angisuu-p takuvaanga.  
man-erg big-erg see.indic.3.sg.1.sg  
“The big man saw me.”
The incorporated grammatical arguments in (11) and (12) can likewise be modified, with the modifiers appearing as separate words in the instrumental case.

(11) *Angisuu-mik qimmeq-arpoq.*
big-inst dog-have.indic.3.sg
“He has a big dog.”

(12) *Kusanartu-mik sapangar-sivoq.*
beautiful-inst bead-get.indic.3.sg
“He bought a beautiful bead.”

It appears that the number of the incorporated noun is in most cases neutralized, although plurality may be conveyed by the choice of a plural modifier as in (13), in contrast to (12).

(13) *Kusanartu-nik sapangar-sivoq.*
beautiful-inst.pl bead-get.indic.3.sg
“He bought beautiful beads.”

But in the case of a noun like *qamutit* (‘sled’), which is grammatically always plural, the plural form of the modifier must be used:

(14) *Ataatsi-nik qamuteq-arpoq.*
one-inst.pl sled-have.indic.3.sg
“He has one sled.”

P2.4.3 The problem

We can propose the following set of c-structure rules and functional equations for Greenlandic:

(R1) \[ S \rightarrow \left( \begin{array}{c} \text{NP} \\ \uparrow \text{SUBJ} = \downarrow \end{array} \right) \left( \begin{array}{c} \text{NP} \\ \uparrow \text{OBJ} = \downarrow \end{array} \right) \left( \begin{array}{c} \text{NP} \\ \uparrow \text{OBL} = \downarrow \end{array} \right) \text{V} \uparrow = \downarrow \]

(R2) \[ \text{NP} \rightarrow \left( \begin{array}{c} \text{N} \\ \uparrow = \down \end{array} \right) \left( \begin{array}{c} \text{N} \\ \uparrow \text{ADJ} = \down \end{array} \right) \left( \begin{array}{c} \text{N} \\ \uparrow \text{CASE} = (\down \text{CASE}) \end{array} \right) \left( \begin{array}{c} \text{N} \\ \uparrow \text{NUM} = (\down \text{NUM}) \end{array} \right) \]

Below are given morpholexical specifications for the three types of verbs found in the above examples:
(L1) tikippoq  V  (↑ PRED) = ‘come (↑ SUBJ)’
(↑ SUBJ NUM) = SG
(↑ SUBJ PERS) = 3
(↑ SUBJ CASE) = ABS

(L2) takuvara  V  (↑ PRED) = ‘see (↑ SUBJ (↑ OBJ))’
(↑ SUBJ NUM) = SG
(↑ SUBJ CASE) = ERG
(↑ SUBJ PERS) = 1
(↑ OBJ CASE) = ABS
(↑ OBJ NUM) = SG
(↑ OBJ PERS) = 3

(L3) nerivara  V  (↑ PRED) = ‘eat (↑ SUBJ (↑ OBJ))’
(↑ SUBJ NUM) = SG
(↑ SUBJ CASE) = ERG
(↑ SUBJ PERS) = 1
(↑ OBJ CASE) = ABS
(↑ OBJ NUM) = SG
(↑ OBJ PERS) = 3

(L4) nerivunga  V  (↑ PRED) = ‘eat (↑ SUBJ (↑ OBL))’
(↑ SUBJ CASE) = ABS
(↑ SUBJ NUM) = SG
(↑ SUBJ PERS) = 1
(↑ OBL CASE) = INST

(L1) illustrates an intransitive lexical form with one argument, (L4) is an intransitive form with two arguments, while (L2) and (L3) are transitive lexical forms whose objects are cross-referenced on the verb. (A lexical form is a predicate argument structure associated with argument grammatical functions.) The rules and morpholexical specifications given above are not written in stone. You will probably wish to revise them.

Task XIII  Provide morpholexical specifications for the verbal suffixes -qarpoq and -sivoq. You should be able to decide which of the three types of lexical forms they pattern with on the basis of the data given above.

Task XIV  Provide morpholexical specifications for the derived verbs qimmegarpoq and sapangarsivoq. You do not have to derive these words (yet).

P2.4.4 Sublexical structure

Until now we have largely ignored the internal structure of words. But it is clear from the striking example of Greenlandic, as well as from the phenomena we
have seen in the preceding problems, that the f-structure associated with a word can contribute extremely complex information to the f-structure of a sentence as a whole. We have seen how the f-structure of a sentence is related to its phrase structure in a systematic way mediated by functional annotations; in this final task we will begin to consider how the f-structure of a word is likewise systematically related to its morphemic structure.

One solution might be to represent the internal structure of a word with a “word structure tree” analogous to a phrase structure tree, derived by using annotated word structure rules similar to the annotated phrase structure rules with which you are already acquainted. For example, we might propose the following sublexical c-structure rules for nouns in Greenlandic:

\[
\begin{align*}
\text{(RS1)} \quad & N \rightarrow N_{\text{stem}} N_{\text{aff}} \\
& \uparrow = \downarrow \quad \uparrow = \downarrow \\
\text{(RS2)} \quad & N \rightarrow N_{\text{stem}} \\
& \uparrow = \downarrow \\
& (\uparrow \text{CASE}) = \text{ABS}
\end{align*}
\]

This approach adopts a “configurational” word structure for Greenlandic, though not necessarily for all languages.

Note that the second of the above rules is intended to express a kind of morphological “elsewhere condition.” The generalization we want to express is that all nouns in Greenlandic have case, and that a noun which is not marked for case by a case affix bears the unmarked case, which is absolutive. We represent this here by the availability of one noun-formation rule which adds a case affix and one which does not, with the choice of not adding an affix entailing the information that case of the noun will be absolutive.

The following sublexical entries would also be required:

\[
\begin{align*}
\text{(L5)} \quad & qimmeq \quad N_{\text{stem}} \quad (\uparrow \text{PRED}) = \text{`dog'} \\
\text{(L6)} \quad & -p \quad N_{\text{aff}} \quad (\uparrow \text{CASE}) = \text{ERG} \\
\text{(L7)} \quad & -mik \quad N_{\text{aff}} \quad (\uparrow \text{CASE}) = \text{INST} \\
& \quad \quad \quad \quad (\uparrow \text{NUM}) = \text{SG} \\
\text{(L8)} \quad & -nik \quad N_{\text{aff}} \quad (\uparrow \text{CASE}) = \text{INST} \\
& \quad \quad \quad \quad (\uparrow \text{NUM}) = \text{PL}
\end{align*}
\]

You will notice that these rules will not get the words in exactly the right forms. This is because we are not treating the phonological processes which give rise to morphophonemic alternations.
Task XV  Assume the following sublexical rule for noun incorporation:

(RS3) $V \rightarrow N_{stem} \; V_{suff}$

What should the functional annotations be?

Task XVI  Give word-, c-, and f-structures for (11) and (14). You will need the morpholexical specifications listed below in addition to those above and ones that you must write for this purpose.

(L9) $sapangaq \; N_{stem} \quad (\uparrow \text{PRED}) = \text{‘bead’}$

(L10) $angisuu \; N_{stem} \quad (\uparrow \text{PRED}) = \text{‘big’}$

(L11) $qamuteq \; N_{stem} \quad (\uparrow \text{PRED}) = \text{‘sled’}$

\[ (\uparrow \text{NUM}) = \text{PL} \]
Problem Set 3

P3.1  C-structures and grammatical functions

Consider the examples in (1).

(1)  a. Atia looked at Antony.
     b. Vorena forgave Vorenus on his deathbed.
     c. Vorenus put a curse on his children before he rushed off.
     d. Cleopatra invited Caesar to her home last night.
     e. The senators assassinated Gaius Julius Caesar.

Task I  Draw the c-structure trees for the sentences in (1).

Task II  For each example in (1), identify the constituents that are arguments of the main (= matrix) verb and the constituents that are adjuncts/modifiers of the main verb.

Task III  Label all grammatical functions in (1a–e).

Task IV  Draw the f-structures for (1a–e).

P3.2  Subjecthood

Inari Saami and Finnish are distinct but related Finno-Ugric languages, and they both have rich case and agreement marking. Both languages have fairly flexible word order, but examples (1) and (2) below illustrate the discourse-neutral word order (SVO):

(1) Minä näen poron. [Finnish]
I.nom see.1sg reindeer.acc
“I see a reindeer.”

(2) Mun uámám poccu. [Inari Saami]
I.nom see.1sg reindeer.acc
“I see a reindeer.”

Now carefully consider (3)–(6). Adessive (ade) and locative (loc) can be considered inherent cases here, in the sense that they are associated with a particular thematic role (the possessor role).

(3) Minulla on poro. [Finnish]
I.ade is.3sg reindeer.nom.
“I have a reindeer.” (Lit.: “On me is a reindeer.”)

(4) Minulla on porot. [Finnish]
I.ade is.3sg reindeer.pl.nom
“I have (several) reindeer.” (Lit: “On me is some reindeer.”)

(5) Muste lii puásui. [Inari Saami]
I.loc is.3sg reindeer.nom
“I have a reindeer.” (Lit.: “On me is a reindeer.”)

(6) Muste láá poccuh. [Inari Saami]
I.loc are.3pl reindeer.pl.nom
“I have (several) reindeer.” (Lit.: “On me are some reindeer.”)

Task V It is not obvious which NP is the subject in the Finnish possessive (‘to have’) construction (see (3) and (4)). Considering case, agreement, and word order, what indications do you find that minulla is the subject and what indications do you find that poro/porot is the subject?

Task VI It is not obvious which NP is the subject in the Inari Saami possessive (‘to have’) construction (see (5) and (6)). Considering case, agreement, and word order, what indications do you find that muste is the subject and what indications do you find that puásui/poccuh is the subject?

Task VII What type of data other than case, agreement, and word order can you investigate in order to determine which phrase is the subject? (You may want to return to this question after you have covered the material in Chapters 7–10 and 12.)

P3.3 Ivatan syntax

Ivatan is an Austronesian language spoken in the Batanes Islands.
Problem Set 3

(1) a. maypaqpaw gо-qalat ko
become.light TOPIC-basket my
“My basket is becoming light.”

b. tomoaw gо-tao do-vahay
go.out TOPIC-man REFERENT-house
“The man is going out of the house.”

c. mangamoqmo gо-tao so-motdeh no-boday
frighten TOPIC-man OBJECT-child ASSOCIATIVE-snake
do-vahay
REFERENT-house
“The man is frightening a child with a snake in the house.”

For the purposes of this exercise, let us assume that Ivatan has fully endocentric c-structures. Also assume that Ivatan follows the mapping principles in Chapter 6.

Task VIII Propose a c-structure for (1c). [Hint: You will find it useful to explore the word order flexibility offered by the extended projection of VP.]

P3.4 Sinhala c-structure

Sinhala (or Sinhalese) is an Indo-European language spoken in Sri Lanka.

(1) lamayi gahagatta
children strike-take.PAST
“Children fought.”

(2) Nimal Siriw˚a tamange ged˚ar¨adi d˚ekka
N. S. self’s house-at see.PAST
“Nimal˚ saw Siri at his˚ house.”

(3) Wim˚ale Sirit˚a taman g˚en˚a k˚i˚u˚w˚a
W. S. DATIVE self about say.PAST
“Wimale˚ told Siri about himself˚.”

(4) Daya Piyalt˚a tamange kaarek˚a bod˚ann˚at˚a (ki˚ya˚la) k˚i˚u˚w˚a
D. P. DATIVE self’s car wash.INFinitive that tell.PAST
“Daya˚ told Piyal to wash her˚ car.”

(5) Gune hituwa, Wim˚ale lam˚ayat˚a k˚i˚u˚w˚a k˚i˚ya˚la Siri tamanvw˚a
G. think.PAST W. child.DATIVE say.PAST that S. self
criticize-do.PAST that
“Gune˚ thought that Wimale told the child that Siri criticized him˚.”
Task IX  Draw the phrase structure tree for sentence (1).

Task X  Try to come up with a VP rule for Sinhala. What problems do you encounter?

Task XI  Try to come up with solutions for the problems you listed in the previous task.

P3.5  Barasano c-structure

Barasano is a Tucanoan language spoken in Colombia.

(1)  buea bu  
    study you  
    “You study.”

(2)  adire abiabu yu  
    these brought I  
    “I brought these.”

(3)  bekoare bakabi tarobuku  
    flies eat tarobuku-toad  
    “The tarobuku toad eats flies.”

(4)  keti bure koaruukuha yu  
    letter you will.send I  
    “I will send you a letter.”

(5)  buto yure tubiaba ida  
    much me scold they  
    “They scold me a lot.”

(6)  adi-rahe hubeahu tire saya bu  
    this-barrel inside those put you  
    “You put those inside this barrel.”

(7)  gubo-sudi yure isiya bu  
    foot-clothes me give you  
    “You give me boots.”

Task XII  List all and only the phrase structure rules needed to generate the sentences in (1)–(7).

Task XIII  Give the c-structure for (3).
Task XIV  Give the c-structure for (5) using X’ theory. You may (but do not have to) use functional projections.

(8) \( \text{ire bua eharebokabaida} \)
    him build help they
    “They help him build (things).”

(9) \( \text{sore budi rotibi Tomás} \)
    her:TOPIC leave ordered Thomas
    “Thomas told her to leave.”

Task XV  Give the lexical entry for each verb in (9).

Task XVI  Give the c-structure for (9).

Task XVII  Give the f-structure for (9).

(10) \( \text{sore idare sia rotibi Tomás} \)
    her:TOPIC them kill ordered Thomas
    “Thomas ordered them to kill her.”
    “It was her that Thomas ordered them to kill.”

Task XVIII  Give the c-structure for (10).

Task XIX  Give the f-structure for (10).
Problem Set 4

P4.1  German word order

This problem further explores variation in syntactic categories of verbal elements across languages. A verb can be of the categories V, I, or C. In fact, nothing in our theory prevents a verbal element from being lexically specified with more than one syntactic category.

P4.1.1 Subordinate clauses

Consider the following German subordinate clauses, paying particular attention to the word order:

(1) a. ... daß Karl das Buch kaufte.
    that the book bought
    “... that Karl bought the book.”
  b. *... daß Karl kaufte das Buch.

(2) a. ... daß Karl das Buch gekauft hat.
    that the book bought has
    “... that Karl has bought the book.”
  b. *... daß Karl gekauft das Buch hat.
  c. *... daß Karl gekauft hat das Buch.

Task I  Propose a set of c-structure rules that will generate the grammatical sentences above and rule out the ungrammatical ones. Be sure to include all functional annotations. Is the VP head-initial or head-final?
You may assume that the c-structure rules follow the basic principles of endocentric structure–function association discussed in Chapter 6. The relevant (simplified) morpholexical specifications for the words are as follows:

(L1) \( \text{daß} \) C \((\uparrow \text{MOOD}) = \text{DECL}\) \((\uparrow \text{TENSE})\)

(L2) \( \text{Karl} \) N \((\uparrow \text{PRED}) = \text{‘Karl’}\)

(L3) \( \text{das} \) D \((\uparrow \text{DEF}) = +\)

(L4) \( \text{Buch} \) N \((\uparrow \text{PRED}) = \text{‘book’}\)

(L5) \( \text{kaufte} \) I \((\uparrow \text{PRED}) = \text{‘buy}\langle(\uparrow \text{SUBJ}), (\uparrow \text{OBJ})\rangle’\) \((\uparrow \text{TENSE}) = \text{PAST}\)

(L6) \( \text{gekauft} \) V \((\uparrow \text{PRED}) = \text{‘buy}\langle(\uparrow \text{SUBJ}), (\uparrow \text{OBJ})\rangle’\)

(L7) \( \text{hat} \) I \((\uparrow \text{TENSE}) = \text{PRES}\) \((\uparrow \text{ASPECT}) = \text{PERF}\)

**Task II**  Provide c-structures and f-structures for (1a) and (2a).

**P4.1.2 Main clauses**

A well-known feature of German syntax, common to most of the Germanic languages, is that the order of the finite verb and its complements differs depending on whether the clause is a main clause or a subordinate one. While the finite verb is always final in subordinate clauses, such as in (1) and (2) above, in main (declarative) clauses it must appear in second position, preceded by a topicalized element such as the subject, the object, or an adjunct. This requirement is often referred to in the literature as the verb second constraint:

(3)  a. \( \text{Karl kaufte das Buch} \)
    \( \text{bought the book} \)
    \( \text{“Karl bought the book.”} \)

    b. \( \text{Das Buch kaufte Karl.} \)
    \( \text{the book bought} \)
    \( \text{“The book, Karl bought.”} \)

    c. \( \text{Gestern kaufte Karl das Buch} \)
    \( \text{yesterday bought the book} \)
    \( \text{“Yesterday, Karl bought the book.”} \)

    d. *\( \text{Karl das Buch kaufte.} \)

    e. *\( \text{Kaufte das Buch Karl.} \)

The question, then, is how to analyze German phrase structure so that these alternative ordering constraints can be captured. One possibility is to simply have two
different sets of c-structure rules for main and subordinate clauses. There are (at least) two pieces of evidence against such an analysis.

First, it is only the position of the finite verb that is different in main clauses; nonfinite verbs remain in the same position as in subordinate clauses:

(4) a. ... daß Karl das Buch gekauft hat.
    that the book bought has
    “... that Karl bought the book.”

b. Karl hat das Buch gekauft.
    has the book bought
    “Karl bought the book.”

c. *Karl hat gekauft das Buch.

d. *Karl gekauft das Buch hat.

A second piece of evidence comes from verb–particle combinations. These are verbs which are composed of two elements: a verb stem and a (separable) particle. The verb zurückgeben (‘return, give back’), for example, consists of the verb stem geben (‘give’) and the particle zurück (‘back’). While these verbs behave as single lexical units in subordinate clauses, in main clauses it is only the verb stem that appears in second position; the particle still appears in final position:

(5) a. ... daß Karl das Buch zurückgab.
    that the book back-gave
    “... that Karl returned the book.”

b. *...daß Karl das Buch gab zurück.

(6) a. Karl gab das Buch zurück.
    gave the Buch back
    “Karl returned the book.”

b. *Karl zurückgab das Buch.

Thus, elements such as nonfinite verbs and separable particles, which appear in the VP, are found in the same positions in both subordinate and main clauses, despite the fact that the finite verb appears in a different position. This suggests that we do not want to have completely separate sets of rules, one for main clauses and one for subordinate clauses, since we would then fail to capture certain generalizations that hold across the two.

Another possibility would be to have two IP rules but the same VP rule. Since it is only finite verbs which appear in I, meaning that they are the only elements which would be affected by the different rules, this solution would not run into the same problems as the previous one. However, while this analysis is certainly possible, it is clearly less desirable than one that can account for all of the data
without needing to postulate different phrase structure rules for main and subordinate clauses. Such an analysis is available, and is supported by the following facts about German complementizers.

Unlike English complementizers, the complementizer in German subordinate clauses is generally obligatory:

(7) I believe (that) Karl is sick.
(8) a. *Ich glaube daß Karl krank ist.
     I believe that sick is
     “I believe that Karl is sick.”
     b. *Ich glaube Karl krank ist.

However, a few verbs – of which glauben (‘believe’) is one – allow the complementizer to be omitted from their complement clause. Interestingly, in just these cases, the subordinate verb must appear in second position:

(9) Ich glaube Karl ist krank.
     I believe is sick
     “I believe Karl is sick.”
(10) a. Sie sagte daß wir keinen Wein mitbringen sollten.
     she said that we no wine along.take should
     “She said that we should take no wine along.”
     b. Sie sagte wir sollten keinen Wein mitbringen.
     she said we should no wine along.take
     “She said we should take no wine along.”
     c. *Sie sagt wir keinen Wein mitbringen sollten.
     d. *Sie sagte daß wir sollten keinen Wein mitbringen.

Thus, the complementizer and the verb in second position appear to be in complementary distribution with one another.

**Task III** Propose an analysis of German main clauses which captures all of the information about word order given above. Provide any new information (e.g. morpholexical specifications and/or c-structure rules) that your account requires in order to generate the sentences given in (3a) and (4b). Be careful to ensure that your analysis will still correctly account for the data in (1) and (2). Is the headedness of the VP (i.e. initial or final) the same as it was in Task I? Explain.

Although all c-structure nodes are assumed to be optional in LFG, unless required by a general principle, you can assume for the purposes of this
problem that C is obligatory in German. In addition, you can assume the following rules for CP:

\[(R1)\quad \text{CP} \rightarrow \left(\begin{array}{c} \text{DP} \\ \uparrow \text{TOP} = \downarrow \end{array}\right) \quad \text{C'} \quad \uparrow = \downarrow\]

\[(R2)\quad \text{C'} \rightarrow \left(\begin{array}{c} \text{C} \\ \uparrow = \downarrow \end{array}\right) \quad \text{IP} \quad \uparrow = \downarrow\]

**Task IV** Provide c-structures and f-structures for (3a) and (4b).

**Task V** Explain how your analysis can rule out ungrammatical examples such as the following:

(11) * ... daß kaufte Karl das Buch.

that bought the book

“... that Karl bought the book.”

(12) * Karl gekauft das Buch.

bought the book

“Karl bought the book.”

There are two further important generalizations about German that are implicit in the above discussion: (i) a complementizer must always be initial in its clause; and (ii) a (declarative) main clause verb must always be second in its clause. Thus, while the two may be in complementary distribution with each other, they appear in different syntactic contexts:

(13) a. ... daß Karl das Buch kaufte.

that the book bought

“... that Karl bought the book.”

b. * ... Karl daß das Buch kaufte.

(14) a. Karl kaufte das Buch.

bought the book

“Karl bought the book.”

b. * Kaufte Karl das Buch.

**Task VI** Does your account capture these generalizations? If so, explain how. If not, explain the modifications necessary for it to do so. Provide any modified morpholexical specifications and/or c-structure rules that your analysis requires in order to account for examples (13) and (14). *Hint:* There are many possible solutions to this task, and no single right answer.
Wambaya is a non-Pama-Nyungan language spoken in Northern Australia. Like Warlpiri (see Problem Set 1), it is a nonconfigurational language with free word order and no VP constituent. Nouns and pronouns are marked according to an ergative/absolutive case-marking system: the subjects of transitive verbs carry ergative case marking, while objects of transitive verbs and subjects of intransitive verbs are marked with absolutive case.

In this problem, we will be concerned with the Wambaya auxiliary, which appears in second position and contains information about the subject, the object, and the tense/aspect/mood of the clause. The auxiliary is obligatory in all finite clauses, irrespective of the presence or absence of the corresponding NPs. Some examples of simple Wambaya clauses follow:

(1) a. *Bardbi ny-a nyamirniji.*
    run you.SUBJ-PST you.ABS
    “You (sg.) ran.”

b. *Bardbi ny-a.*
    run you.SUBJ-PST
    “You (sg.) ran.”

(2) a. *Gulugbi girr-a girriyani.*
    sleep you.PL.SUBJ-PST you.PL.ABS
    “You (pl.) slept.”

b. *Gulugbi girr-a.*
    sleep you.PL.SUBJ-PST
    “You (pl.) slept.”

(3) a. *Ngajbi gini-ng-a ngawurniji alangini.*
    see he.SUBJ-ME.OBJ-PST me.ABS boy.ERG
    “The boy saw me.”

b. *Ngajbi gini-ng-a alangini.*
    see he.SUBJ-ME.OBJ-PST boy.ERG
    “The boy saw me.”

c. *Ngajbi gini-ng-a.*
    see he.SUBJ-ME.OBJ-PST
    “He saw me.”

As discussed in Chapter 7, let us assume the following c-structure rules for Wambaya. The abbreviation X is used to cover both NP and V, which are treated alike with respect to word order within the S. Instances of X and NP should be instantiated according to the rules given in (R6). The asterisk means that there
may be any number of Xs, including none. As discussed in Chapter 7, you may assume that the auxiliary is generated in I and that, when there is nothing in the specifier of IP, the verb is generated adjoined to the I node:

\[(R1) \quad \text{IP} \rightarrow \left( \begin{array}{c} \text{NP} \\ (\uparrow \text{FOC}) = \downarrow \end{array} \right) \quad \text{I}' \quad \uparrow = \downarrow \]

\[(R2) \quad \text{I}' \rightarrow \text{I} \quad \uparrow = \downarrow \quad \uparrow = \downarrow \]

\[(R3) \quad \text{I} \rightarrow \left( \begin{array}{c} \text{V} \\ \uparrow = \downarrow \end{array} \right) \quad \text{I} \quad \uparrow = \downarrow \]

\[(R4) \quad \text{S} \rightarrow \text{X*} \quad \text{where X = NP or V} \]

\[(R5) \quad \text{NP} \rightarrow \text{N} \]

\[(R6) \quad \text{a. Assign (}\uparrow \text{subj}) = \downarrow \text{ or (}\uparrow \text{obj}) = \downarrow \text{ freely to NP.} \]

\[ \quad \text{b. Assign } \uparrow = \downarrow \text{ to } \text{N and V.} \]

You will need the following morpholexical specifications for the words:

\[(L1) \quad \text{alangini N (}\uparrow \text{pred}) = \text{‘boy’} \]
\[ \quad \text{(}\uparrow \text{case}) = \text{ERG} \]

\[(L2) \quad \text{ngawurniji N (}\uparrow \text{pred}) = \text{‘pro’} \]
\[ \quad \text{(}\uparrow \text{pers}) = 1 \]
\[ \quad \text{(}\uparrow \text{num}) = \text{SG} \]
\[ \quad \text{(}\uparrow \text{case}) = \text{ABS} \]

\[(L3) \quad \text{ngajbi V (}\uparrow \text{pred}) = \text{‘see (}(\uparrow \text{subj}),(\uparrow \text{obj}))’} \]
\[ \quad \text{(}\uparrow \text{subj case}) = \text{ERG} \]
\[ \quad \text{(}\uparrow \text{obj case}) = \text{ABS} \]

**Task VII**  Give morpholexical specifications for the auxiliary *gininga* which appears in (3).

**Task VIII**  Provide c-structures and f-structures for (3a,b,c).

While the forms of the subject-bound pronouns change according to the number of the subject (compare (1) and (2), for example), this is not so for the object-bound pronouns, which remain the same regardless of the number of the object:

\[(4) \quad \text{a. } \text{Ngajbi gininga ngawurniji.} \]
\[ \quad \text{see me.ABS} \]
\[ \quad \text{“He saw me.”} \]
Problem Set 4

b. *Ngajbi gininga ngurla.*
   see us.DUAL.ABS
   “He saw us two.”

c. *Ngajbi gininga ngirra.*
   see us.PL.ABS
   “He saw us all.”

Task IX Modify, if necessary, the morpholexical specifications for *gininga* that you gave in Task VII in order to account for the examples in (4). Explain any changes you make.

Task X Provide c- and f-structures for (4c).

Note that the object-bound pronoun must always co-occur with a corresponding NP when the object is nonsingular (as in (4b,c)). When there is no object NP present, the object-bound pronoun obligatorily has singular number:

(5) *Ngajbi gininga.*
   see
   “He saw me /*us two /*us all.”

Task XI Does your analysis of the auxiliary account for this fact about object number? If so, explain how. If not, explain what changes need to be made to your analysis in order for it to do so.

Task XII One possible way of analyzing languages such as Wambaya is to consider the subject and object markers in the auxiliary to be the real arguments of the verb, while the corresponding NPs are simply coreferential adjuncts. In this approach, the subject and object auxiliary markers would always be incorporated pronominals, and the NPs, being adjuncts, would be optional. The data presented above constitute a piece of evidence bearing on such an analysis for Wambaya. Does it argue for or against it? Explain your answer.

P4.3 Head-marking in K’ichee’

Observe the following one-word sentences of the Mayan language K’ichee’:

(1) *k-at-b’iin-ik*
   IMPF-2SG.ABS-walk-INTR
   “You (sg.) walk.”

---

1 IMPF = imperfective aspect; ABS = absolutive; ERG = ergative; INTR = the intransitive finite (“plain”) marker; TRANS = transitive finite (“plain”).
K’ichee’ has two sets of pronominal inflections, absolutive and ergative. Absolutive markers are used for the subjects of intransitive verbs (and subjects of non-verbal predicates) and for the objects of transitive verbs.

(3) Absolutive pronominal inflections:

- 1sg. in-
- 2sg. at-
- 3sg. ∅
- 1pl. oj-
- 2pl. ix-
- 3pl. e ~ e' ~ eb'

Ergative markers are used for subjects of transitive verbs and possessors of nouns. The phonological form depends on whether it is followed by a consonant or vowel, as shown here:

(4) Ergative pronominal inflections:

\[
\begin{array}{ll}
\text{C} & \text{V} \\
1\text{sg.} & \text{nu-} \sim \text{in-} \\
2\text{sg.} & \text{a-} \\
3\text{sg.} & \text{u-} \\
1\text{pl.} & \text{qa-} \\
2\text{pl.} & \text{i-} \\
3\text{pl.} & \text{ki-} \\
\end{array}
\]

The final suffix in each of (1) and (2), called the status suffix, encodes transitivity and finiteness: \(-ik\) is used for an intransitive verb and \(-o\) for a transitive verb. (The status suffix is omitted in certain nonfinal positions. Both \(-ik\) and \(-o\) are for finite clauses, as opposed to “dependent” status. This problem set deals only with finite forms.) The initial prefix \(k(a)\)- seen in examples (1) and (2) marks imperfective aspect.

Here are some paradigms (morpheme boundaries are shown only for a few forms):\(^2\)

\(^2\) x- is the past perfective prefix.
Problem Set 4

(i) b'iin (‘walk’)  
- k-in-b'iin-ik ‘I walk’  
- k-at-b'iin-ik ‘you walk’  
- ka-b'iin-ik ‘s/he walks’  
- kojb'iinik ‘we walk’  
- kixb'iinik ‘you (pl.) walk’  
- keb'iinik ‘they walk’

(ii) chap (‘grab’)  
- k-in-u-chap-o ‘s/he grabs me’  
- katuchapo ‘s/he grabs you’  
- kuchapo ‘s/he grabs him/her’  
- kojuchapo ‘s/he grabs us’  
- kixuchapo ‘s/he grabs you (pl.)’  
- ke'uchapo ‘s/he grabs them’

(iii) to (‘help’)  
- x-nu-to’-o/xinto’o ‘I helped him/her’  
- xato’o ‘you helped him/her’  
- xuto’o ‘s/he helped him/her’  
- xqato’o ‘we helped him/her’  
- xito’o ‘you (pl.) helped him/her’  
- xkito’o ‘they helped him/her’

Here are some examples with argument NPs:

(5) Aninaq k-e-b'iin ri ixoqiib'.  
    rapidly IMPF-3PL.ABS-walk DEF women  
    “The women walk rapidly.”

(6) X-e'-u-chap ka'iib' kuuk ri tz’i’.  
    PPRF-3PL.ABS-3SG.ERG-grab two squirrel DEF dog  
    “The dog grabbed two squirrels.”

(7) X-u-chap jun kuuk ri nu-taat.  
    PPRF-3SG.ERG-grab one squirrel DEF 1SG.ERG-father  
    “My father grabbed a squirrel.”

Based on the foregoing, let us consider the morphological structures of the intransitive verb in example (1) and the transitive verb in example (2). For background on sublexical structure, see Problem 2.4, “Noun incorporation in Greenlandic”. We will assume the following sublexical (morphemic) structures for the one-word sentences (1) and (2) (some of the functional annotations are omitted):

(8)

```
V
↑ = ↓  ...  ...  ↑ = ↓  
Af_asp  Af_abs  V_stem  Af_stat
  |         |         |         |         |
  k-     at-   b'iin   -ik
```

“You (sg.) walk”

---

<sup>3</sup> PPRF = past perfective aspect.
Some morpHEME entries are as follows:

\[(k- \ Af_{asp} \ (\uparrow \ ASP) = \text{IMPF})\]
\[(b'iin \ V_{stem} \ (\uparrow \ PRED) = \text{\textquoteleft walk\textquoteright}((\uparrow \ SUBJ))\)]
\[(chap \ V_{stem} \ (\uparrow \ PRED) = \text{\textquoteleft grab\textquoteright}((\uparrow \ SUBJ),(\uparrow \ OBJ))\)]
\[(-ik \ Af_{stat} \ (\uparrow \ FIN) = + \]
\[\neg((\uparrow \ OBJ))\]
\[(-o \ Af_{stat} \ (\uparrow \ FIN) = + \]
\[((\uparrow \ OBJ))\]
\[u-/r- \ Af_{erg} \ ...\]
\[at- \ Af_{abs} \ ...\]

The existential constraints associated with the status suffixes, namely \(\neg((\uparrow \ OBJ))\) and \((\uparrow \ OBJ))\), encode (in)transitivity by prohibiting or requiring an OBJ function.

**Task XIII** Complete the analysis of examples (1) and (2) by providing entries for the pronominal inflections \(u-/r-\) and \(at-\) and adding functional annotations to the sublexical c-structures in (8) and (9). (You may modify the above entries if needed.) Calculate the f-structures.

In addition to their role in marking the subjects of transitive verbs, ergative markers can appear on nouns to mark the possessor. Here are some possessed nouns:

\[(nu-teem \ \text{\textquoteleft my chair\textquoteright}) \quad w-ab\textquoteleft iix \ \text{\textquoteleft my cornfield\textquoteright}\]
\[(a-teem \ \text{\textquoteleft your chair\textquoteright}) \quad aw-ab\textquoteleft iix \ \text{\textquoteleft your cornfield\textquoteright}\]
\[(u-teem \ \text{\textquoteleft his/her chair\textquoteright}) \quad r-ab\textquoteleft iix \ \text{\textquoteleft his/her cornfield\textquoteright}\]
\[(qa-teem \ \text{\textquoteleft our chair\textquoteright}) \quad q-ab\textquoteleft iix \ \text{\textquoteleft our cornfield\textquoteright}\]
\[(i-teem \ \text{\textquoteleft your (pl.) chair\textquoteright}) \quad iw-ib\textquoteleft iix \ \text{\textquoteleft your (pl.) cornfield\textquoteright}\]
\[(ki-teem \ \text{\textquoteleft their chair\textquoteright}) \quad k-ab\textquoteleft iix \ \text{\textquoteleft their cornfield\textquoteright}\]

A full phrase (here, \textit{ri a Xuan}) optionally expresses the possessor:\(^4\)

\(^4\) CL = classifier; \(a\) is the classifier used for names.
Let us posit a DP analysis of nominals like (12): the determiner (if any) is the head; the possessor phrase (ri a Xwan) appears in the specifier of DP; and the main noun (u-wuu) is the complement of D.

We will assume that common nouns allow a variant lexical entry in which the noun governs a poss (possessor) function. (The noun in (15) is derived from (14) by a general lexical rule that adds a poss function; see Section 13.2, example (29).) Further lexical entries follow.

Ergative markers also appear on prepositions to mark the object of the preposition, as illustrated in these examples:
Let us assume these prepositions have a PRED feature and govern an object; for example, the PRED value for the P Stem umaal is ‘by⟨↑OBJ⟩’.

**Task XIV** Propose analyses of possessives and PPs by providing the following for the inflected word nuteem (‘my chair’) and examples (12), (17), and (18): (i) lexical entries for the morphemes; (ii) c-structures, including functional annotations; (iii) the sublexical (morphemic) structures, including functional annotations; and (iv) f-structures.

*Hint*: Note that a given pronominal inflection can serve multiple functions. Absolutive inflections function as subject (of an intransitive V) or object (of a transitive V). Ergative inflections mark the subjects of transitive verbs, possessors of nominals, and objects of prepositions. Try to keep the specifications for the morphemes constant across these different functions by allowing the context itself to determine the grammatical function, where appropriate.

Propose c- and f-structures for (21) and (22):  

(21) \( ri \ u-tz’ii’ \ ri \ a-taat \)  
\( \text{def 3sg.erg-dog def 2sg.erg-father} \)  
“your father’s dog”  

(22) \( ri \ u-tz’ii’ \ ri \ u-taat \ ri \ a \ Xwan \)  
\( \text{def 3sg.erg-dog def 3sg.erg-father def cl John} \)  
“John’s father’s dog”  

**Task XV** As shown in the table in (3) above, the third-person singular absolutive pronominal inflection is a “zero morpheme,” that is, when no overt absolutive marker appears on the verb, the absolutive argument (subject of intransitive or object of transitive) is interpreted as third-person singular. Can you think of a way to capture this without positing a silent morpheme? Illustrate your proposal with an analysis of the form \( ka-b’iin’-ik \) (IMPF-walk-intr ‘s/he walks’).

**P4.4 Subject agreement in West Flemish**

This problem further explores variation in syntactic categories of verbal elements across languages. A verb can be of the categories V, I or C. Nothing in our theory prevents a verbal element from being lexically specified with more than one syntactic category.
West Flemish is a dialect of Dutch spoken in Belgium. Like many of the Germanic languages, West Flemish is subject to the verb second constraint: the finite verb alternates between final position in subordinate clauses and second position in main declarative clauses. Consider the following sentences (note that ee in (1b) is actually eet – the same alternation appears with goa(t), i.e. the /t/ drops before a consonant):

(1)  

a. … _da_ Marie _dienen_ boek _gelezen_ eet.  
    that _that_ book _read_ has  
    “… that Marie read that book.”  

b.  _Marie ee_ _dienen_ boek _gelezen_.  
    has _that_ _book_ _read_  
    “Marie read that book.”

**Task XVI** Assuming that the phrase structure rules and lexical entries for West Flemish are analogous to those you developed in the problem for German (P4.1), provide full analyses of (1a,b).

**P4.4.1 Subject agreement in subordinate clauses**

Verbs in subordinate clauses show very minimal agreement with their subject. There are only two distinct forms: one for third person singular and second person, and the other for third person plural and first person:

(2)  

a. … _gie/zie/gunder_ goat.  
    you.sg/she/you.pl go  

b. … _ik/wunder/zunder_ goan.  
    I/we/they go

**Task XVII** Provide morpholexical specifications for the verbs *goat* and *goan* in (2). As finite subordinate verbs, to what category do they belong?

A particularly interesting aspect of West Flemish is that the complementizer in subordinate clauses also agrees with the subject of the subordinate clause, agreeing in both person and number. This complementizer agreement is obligatory with both pronominal and nonpronominal subjects:

(3)  

a. … _dan-k (ik) goan._  
    that-I (I) go  
    “… that I go.”  

b. … _da-j (gie) goat._  
    that-you (you.sg) go
As can be seen in (3), pronominal subjects are optional in subordinate clauses; they appear only when the subject is stressed. Thus, either of the following versions of (3c) is fully grammatical (although with different pragmatic effects):

(4)  a.  ... da-se goat.
     that-she goes
     “... that she goes.”

b.  ... da-se zie goat.
     that-she she goes

Full NP subjects, on the other hand, co-occur with different forms of the complementizer and are not optional, as can be seen in (3g, h).

**Task XVIII** Provide morpholexical specifications for the complementizers in examples (3b, c, d, g, h). Also provide specifications for the subject pronouns in (3b, c, e). How do your specifications capture the facts concerning the distributonal differences between pronominal and full DP subjects mentioned above?

**Task XIX** Give full analyses of (3g) and (4a, b).

**P4.4.2 Subject agreement in main clauses**

While the finite verb shows little agreement with its subject in subordinate clauses, this is not the case in main clauses. Rather, in main clauses the verb shows full person and number agreement with its subject. This agreement takes the same form as the complementizer agreement discussed above:

(5)  a.  Morgen goan-k (ik).
     tomorrow go-I (1)
     “I go tomorrow.”
go-you (you.sg)

c. *Morgen goa-se* (zie).
goes-she (she)

d. *Morgen goa-me* (wunder).
go-we (we)

e. *Morgen goa-j* (gunder).
go-you (you.pl)

go-they (they)

g. *Morgen goa Marie.*
goes M.

h. *Morgen goan Marie en Pol.*
go M. and P.

Note that, as with the inflected complementizer in subordinate clauses, subject pronominals are optional in main clauses while full DP subjects are not.

**Task XX** Provide morpholexical specifications for the verbs in (5b, c, d, g, h). To what category do these words belong?

**Task XXI** What is the generalization that characterizes the distribution of the subject agreement suffixes in both main and subordinate clauses?

**Task XXII** Provide full analyses for (5c), both with and without the subject pronoun.
Problem Set 5

P5.1 Discontinuous dependencies in open complement constructions

P5.1.1 Dutch dependent clauses

Below are given some fragments of Dutch complement constructions – some grammatical, some not – which you will examine using the lexicon and grammar given in (4) and (5). The word order in (1)–(3) is that for embedded complements; we shall ignore nonembedded structures in this problem.

(1) ... Jan Piet Marie zag helpen zwemmen
(2) ... Jan Piet Marie zag zwemmen
(3) ... Jan Piet zag helpen zwemmen

(4) Lexicon:
   a. helpen V (↑ PRED) = ‘help ⟨↑ subj) (↑ obj) (↑ xcomp)⟩’
      (↑ xcomp subj) = (↑ obj)
   b. Jan N (↑ PRED) = ‘Jan’
      (↑ num) = sg
   c. Marie N (↑ PRED) = ‘Marie’
      (↑ num) = sg
   d. Piet N (↑ PRED) = ‘Piet’
      (↑ num) = sg
   e. zag V (↑ PRED) = ‘see ⟨↑ subj) (↑ obj) (↑ xcomp)⟩’
      (↑ tense) = past
      (↑ subj num) = sg
      (↑ xcomp subj) = (↑ obj)
   f. zwemmen V (↑ PRED) = ‘swim ⟨↑ subj⟩’
(5) Grammar:

a. \[ S \rightarrow NP \quad \uparrow = \downarrow \] 
   \[ \quad \uparrow = \downarrow \]

b. \[ VP \rightarrow (NP \quad \uparrow = \downarrow) \quad (VP \quad \uparrow = \downarrow) \quad (\bar{V} \quad \uparrow = \downarrow) \]

c. \[ \bar{V} \rightarrow V \quad \uparrow = \downarrow \quad (\bar{V} \quad \uparrow = \downarrow) \]

d. \[ NP \rightarrow N \quad \uparrow = \downarrow \]

Task I For each string in (1)–(3), determine whether it is a grammatical instance of S. If it is, display the c-structure and f-structure. If not, indicate what is wrong with it. Note that several different c-structure analyses are possible for each of these strings, but only one tree actually leads to a well-formed f-structure.

Task II What generalization can you state about how the various words and phrases contributing to the composition of the open complements (xcomps) are realized in the c-structure?

### P5.1.2 Japanese causatives

In this problem, we shall examine some facts about causativization in Japanese. This phenomenon is exemplified by the following sentence:

(1) **Reiko ga Taroo o hasir-ase-ta.**

   NOM ACC run-cause-past

   “Reiko made Taroo run.”

The verb hasiraseta is made up of three morphemes. Word-initially we find the verb stem hasir- (‘run’). Immediately following this is the causative morpheme -ase- (which has an alternative form -sase- that occurs with vowel-final stems). Finally, the morpheme -ta is the past tense marker.

Analyzing causative verbs as single words

We assume here that hasiraseta is a single word. The hyphens added in the various examples designate morpheme boundaries. This signifies that the partial bracketing in (2) is imposed on sentences like (1):

(2) **[Reiko ga Taroo o hasir-ase-ta]**

   NOM ACC run-cause-past
Hence, no morpheme which makes up a subpart of the word *hasirasetta* may be bracketed together with any NP argument to form a phrase, since that would lead to an overlapping of phrases:

\[(3) \ \text{Reiko ga} \quad [1 \ \text{Taroo o} \quad [2 \ \text{hasir}_1 \ -\text{ase-ta}_2]_2] \]

\[\text{NOM} \quad \text{ACC} \quad \text{run-CAUSE-PAST} \]

Some discussion is in order about this analysis, since it has sometimes been assumed that this form is actually composed of several words. In favor of our analysis, we cite facts which suggest that both *-sase-* and *-ta* are best treated as affixes and not as independent words. First we note that *-sase-* and *-ta* co-occur with a very restrictive class of formatives that could plausibly be analysed as verbal affixes. Other words are forbidden from occurring in the same environments. Let us take as an example the form in (4), constructed from the verb root *tabe-* ('eat'):

\[(4) \ \text{tabe-sase-ta} \ \text{‘caused (someone) to eat’} \]

Only a very small number of formatives may intervene between *tabe-* and *-sase-* or between *-sase-* and *-ta*. For instance, we have the constructions in (4) and (5):

\[(5) \ \text{tabe-sase-rare-ta} \ \text{‘was made to eat’} \]

\[\text{Tony ga Reiko ni nattoo} \quad \text{tabe-sase-rare-ta.} \]

\[\text{NOM DAT fermented soybeans eat-CAUSE-PASS-PAST} \]

“Tony was made to eat fermented soybeans by Reiko.”

\[(6) \ \text{tabe-sase-kake-ta} \ \text{‘attempted to make (someone) eat’} \]

\[\text{Taroo ga Reiko ni doku iri keiki o} \quad \text{tabe-sase-kake-ta.} \]

\[\text{NOM DAT poison exist cake ACC eat-CAUSE-ATTEMPT-PAST} \]

“Taro tried to make Reiko eat cake with poison in it.”

The form *-rare-* (alternatively *-are-*), when the stem is consonant-final) is the passive morpheme. Adding *-kake-* to a verbal form adds a meaning akin to ‘try’ or ‘attempt’. Some speakers, though not all, also accept forms like that in (7), constructed from the verb stem *hik-* (‘hit’), where the passive morpheme precedes the causative morpheme:

\[(7) \ \text{hik-are-sase-ta} \ \text{‘caused (something) to be hit’} \]

\[\text{Booryokudan no kumichoo ga keisatsushochoo o} \quad \text{kuruma ni} \]

\[\text{gang GEN leader NOM police chief ACC car Dat} \quad \text{hik-are-sase-ta.} \]

\[\text{hit-PASS-CAUSE-PAST} \]

“The gang leader had the police chief run over by a car.”
Outside of this very small class of formatives including -rare- and -kake- that can be inserted into causative constructions, the vast majority of words are forbidden from occurring in such positions. Take, for instance, the word dake (‘only’). This provides a telling test, because dake displays an extremely free distribution in sentences of Japanese. Note that Japanese contains certain expressions which are composed of two or more words that are rarely separable. One such expression is benkyoo suru (‘study’, literally ‘study do’). Dake is one of the few formatives that may intervene between benkyoo and suru to yield a grammatical sentence:

(8) Taroo ga benkyoo dake suru.
    nom study only do
    “Taro does nothing but study.”

Even though dake can appear between tightly bound syntactic units, as we saw in (8), it cannot be inserted in the environments shown in (9) and (10):

(9) *tabe dake sase-ta
(10) *tabe-sase dake ta

To explain this array of facts, we might analyze morphemes like -rare- and -kake- as verbal suffixes, and we could then propose that the forms in (5)–(7) are all single words, formed by regular morphological processes of affixation. The meanings associated with these forms make the approach seem plausible, since similar meanings are encoded morphologically in other languages. Note further that this approach would explain the restrictiveness of the set of formatives that may intervene between a verb stem and -sase- or between -sase- and -ta, since universally the affixes of a language tend to constitute a closed class. Other words, even those with extreme freedom of occurrence such as dake, would be forbidden from occurring within causative constructions for the simple reason that words do not occur in the middle of other words.

The most compelling argument that causative forms such as hasiraseta and tabesaseta are words is to be found in the suprasegmental phonology of Japanese. A full exposition of the relevant facts and generalizations would be too long to detail here; however, the basic line of argumentation is the following. Poser (1984) has demonstrated that Japanese verbal affixes have the characteristic of influencing the accentual properties of the words in which they occur. This phenomenon arises with markers of tense, aspect, and the like, which are accepted uncontroversially as affixes. However, the rules in question do not apply across word boundaries; they apparently apply word-internally only. Now the formatives -sase-, -rare-, etc. all pattern as normal verbal affixes in this phonological respect, combining with the preceding verb stem to create a single word, and helping to determine the accentual pattern of the resultant form in the predictable way.

The relevance of the foregoing discussion to the present problem lies in the fact that we would like to maintain a strong hypothesis about the relation between...
words and syntactic phrasing, namely that no syntactic phrase may violate a word boundary in the fashion displayed in (3). Providing an analysis of the Japanese causative construction which adheres to this hypothesis is the substance of the task set for this problem.

Consequences of the one-word analysis of causatives

This analysis suggests that Japanese causatives involve a phenomenon similar to that described in the Greenlandic exercise in Problem Set 2. Recall that Greenlandic exhibits incorporated forms in which a single word provides information about the pred, tense, and so on for the f-structure corresponding to a clause, while also providing information about the obl f-structure to be inserted within that clausal f-structure. By simply changing obl in the preceding sentence to xcomp, we have a description of the situation in Japanese causatives. In both cases it seems that it is not only words and syntactic phrases that encode grammatical functions in sentences, but that morphemes which are subparts of words also give rise to such functions. In fact, the information encoded in a causative verb like hasirasetan is sufficient to infer quite a bit about the content of the f-structure which we would associate with the whole sentence. This suggests that we should construct an analysis such that with only the fragmentary tree in (11), we would be able to derive the partial f-structure shown in (12):

\[
(11) \quad \cdots \\
| \quad V \\
| \quad hasirasetan \\
\]

\[
(12) \quad f_n \\
\quad \left[ \begin{array}{c}
\text{TENSE} \\
\text{PRED} \\
\text{OBJ} \\
\text{XCOMP}
\end{array} \right]
\quad f_n \left[ \begin{array}{c}
\text{PRED} \\
\text{SUBJ}
\end{array} \right]
\quad \langle (f_n \text{OBJ})(f_n \text{XCOMP}) \rangle
\quad \langle (f_m \text{SUBJ}) \rangle
\]

Thus, as was done in the Greenlandic problem, we must provide the morphology with the capability to express generalizations about f-structure.

One such proposal (Ishikawa 1985) takes the form of employing rewriting rules to describe morphological structure, and providing these rewriting rules with functional annotations, so that functional annotations are applied to sublexical constituents, such as stems and affixes, and units formed out of these. Simplifying
Ishikawa’s proposal somewhat, we could employ here the following sublexical rewriting rules to construct complex verbs in Japanese:

\[(13) \quad V \rightarrow V_{\text{stem}} \quad \text{Aff}_{\text{infl}} \quad \uparrow = \downarrow \quad \uparrow = \downarrow \]

\[(14) \quad V \rightarrow V_{\text{stem}} \quad \text{Aff}_{\text{drv}} \quad (\uparrow \text{xcomp}) = \downarrow \quad \uparrow = \downarrow \]

If we write morphological rules in this fashion, *hasirasetan* will have a sublexical tree structure like the one in (15):

\[(15)
\begin{array}{c}
\text{V} \\
\uparrow = \downarrow \\
V_{\text{stem}} \\
(\uparrow \text{xcomp}) = \downarrow \\
\uparrow = \downarrow \\
\text{Aff}_{\text{drv}} \\
\downarrow \\
\text{hasir} \\
\downarrow \\
\text{ase} \\
\text{ta}
\end{array}
\]

Using the lexical specifications in (16)–(18) for *hasir-*, *(s)ase-*, and *-ta*, and adding to *(s)ase-* the control schema specified by the default rule of functional control (Chapter 12), we can derive from (15) the desired partial f-structure displayed above in (12).

\[(16) \quad \text{hasir-} \quad V_{\text{stem}} \quad (\uparrow \text{pred}) = \text{‘run} \langle (\uparrow \text{subj}) \rangle’
\[(17) \quad -(s)ase- \quad \text{Aff}_{\text{drv}} \quad (\uparrow \text{pred}) = \text{‘cause} \langle (\uparrow \text{subj}) (\uparrow \text{obj}) (\uparrow \text{xcomp}) \rangle’
\[(18) \quad -ta \quad \text{Aff}_{\text{infl}} \quad (\uparrow \text{tense}) = \text{PAST}
\]

More facts about causatives

Japanese noun phrases may optionally contain case-marking particles such as *ga* and *o*. The relationship between case markers and grammatical functions and thematic roles is not a simple one; however, for the purposes of this exercise all NPs will be presented with a case marker, and we shall avoid any exceptional or “quirky” case phenomena. Thus you may assume that a constituent marked with nominative case is the subj, one marked with accusative case is the obj, and one marked with dative case is an obj. The example in (19) (repeated from (1)) displays a “causer” subj and a “causee” obj:

\[(19) \quad \text{Reiko ga Taroo o hasir-ase-tan.}
\]

\[
\begin{array}{llll}
\text{NOM} & \text{ACC} & \text{run-CAUSE-PAST} \\
\text{“Reiko made Taroo run.”}
\end{array}
\]
Alternatively, the causee may be realized as an OBJ$_{\theta}$:

(20) \textbf{Reiko ga Tony ni natto o tabe-sase-ta.}  
\textit{nom dat fermented.soybeans acc eat-cause-past}  
\textit{“Reiko made Tony eat fermented soybeans.”}

Hence, -(s)ase- will have an alternative PRED:

(21) ‘cause $\langle (\uparrow \text{subj}) (\uparrow \text{OBJ}_{\theta}) (\uparrow \text{xcomp}) \rangle$’

Another interesting fact about the causative construction in Japanese is that the morpheme -(s)ase- may occur more than once within a verb.

(22) \textbf{Reiko ga Sachiko ni Taroo o hasir-ase-sase-ta.}  
\textit{nom dat acc run-cause-cause-past}  
\textit{“Reiko made Sachiko make Taro run.”}

(23) \textbf{Reiko ga Sachiko ni Tony ni natto o tabe-sase-sase-ta.}  
\textit{nom dat dat fermented.soybeans acc eat-cause-cause-past}  
\textit{“Reiko made Sachiko make Tony eat fermented soybeans.”}

Some speakers of Japanese find even three iterations of -(s)ase- possible.

**Task III** Assume an analysis of the internal structure of causative verbs like that given above. Write a set of syntactic rules to admit examples (19), (20), (22), and (23). Your rules should ensure that the various NPs in the sentence are associated with the proper arguments of the causative verb to create well-formed f-structures, and they should respect the bracketing displayed in (2). You should be guided by, but not blindly copy, the analysis of Dutch.

**Task IV** Display the c-structure and f-structure for example (23).

**Word order in causative constructions**

Finally, it is interesting to note that Japanese allows fairly free scrambling of preverbal constituents. Below is a limited selection of the possible reorderings of the sentences in (19), (20), (22), and (23):

(24) \textbf{Taroo o Reiko ga hasir-ase-ta.}  
\textit{acc nom run-cause-past}  
\textit{“Reiko made Taro run.”}

(25) \textbf{Tony ni Reiko ga natto o tabe-sase-ta.}  
\textit{dat nom fermented.soybeans acc eat-cause-past}  
\textit{“Reiko made Tony eat fermented soybeans.”}
Task V  If your rules do not already account for the ordering possibilities in examples (29)–(30), try to revise them so that they will. The foregoing is not an exhaustive account of the word order possibilities in these constructions, so you should not worry if your rules include or exclude orders not presented here.

P5.2  Case and grammatical functions

P5.2.1  “Quirky” case in Icelandic

Icelandic has one of the richest inflectional system of any modern Germanic language. There are four cases (nominative, accusative, dative, genitive) and three genders (masculine, feminine, neuter). In simple sentences, the regular case of the subject is nominative and that of the object is accusative, as in (1) and (2):

(1)  Stelpurnar dansa.
    the.girls.nom dance.3.pl
    “The girls dance.”
The arguments of some verbs, however, appear to exhibit rather different case-marking patterns:

(3) a. *Mér býður við setningafræði.
    me.dat be.nauseated.3.sg by syntax
    “I abhor syntax.”

b. Verkjanna gætir ekki.
    the.pains.gen be.noticeable.3.sg not
    “The pains are not noticeable.”

c. Hrútana fleiddi.
    the.rams.acc flood.3.sg.past
    “The rams were caught in the flood-tide.”

(4) a. Henni finnst Ólafur leiðinlegur.
    her.dat find.3.sg Olaf.nom boring.nom
    “She finds Olaf boring.”

b. Stelpunum finnst Ólafur leiðinlegur.
    the.girls.dat find.3.sg Olaf.nom boring.nom
    “The girls find Olaf boring.”

In this problem we will consider the question of what grammatical function should be associated with the non-nominative NPs in sentences like those in (3) and (4). Following is some evidence which bears on this issue.

**Word order**

As in most Germanic languages other than English, in Icelandic the finite verb in a declarative sentence must occupy second position. While it is normally the subject that precedes the verb, it need not be. If some other constituent precedes the verb, because of the verb second constraint the subject cannot also precede the verb:

(5) a. Harald elskar María.
    Harald.acc love.3.sg Mary.nom
    “Harold, Mary loves.”

b. *Harald María elskar.
    Harald.acc Mary.nom love.3.sg

In direct questions, however, the verb appears first, immediately followed by the subject:

(6) a. Elskar María Harald?
    love.3.sg Mary.nom Harald.acc
    “Does Mary love Harold?”
b. *Elskar Harald María?
   love.3.sg Harald.acc Mary.nom

Now compare the word order variations possible with respect to (4a):

(7) a. Ólafur finnst henni leiðinlegur.
   Olaf.nom find.3.sg her.dat boring.nom
   “Olaf she finds boring.”

b. *Ólafur henni finnst leiðinlegur.
   Olaf.nom her.dat find.3.sg boring.nom

(8) a. Finnst henni Ólafur leiðinlegur?
   find.3.sg her.dat Olaf.nom boring.nom
   “Does she find Olaf boring?”

b. *Finnst Ólafur henni leiðinlegur?
   find.3.sg Olaf.nom her.dat boring.nom

These examples illustrate word order with a finite auxiliary verb:

(9) a. Ég hef aldrei barið Siggu.
   I have.1.sg never hit Sigga.acc
   “I have never hit Sigga.”

b. Sigga hefur aldrei barið mig.
   Sigga have.3.sg never hit me.acc
   “Sigga has never hit me.”

c. Siggu hef ég aldrei barið.
   Sigga.acc have.1.sg I never hit
   “Sigga, I have never hit.”

d. *Siggu hefur ég aldrei barið.
   Sigga.acc have.3.sg I never hit

Reflexivization

Next consider the following pattern of reflexivization possibilities for many speakers of Icelandic:

(10) a. Sigga barði mig með diíkuni sinni/*hennar.
   Sigga.nom hit.3.sg me.acc with doll.dat her.refl/her
   “Sigga hit me with her (Sigga’s) doll.”

b. Ég barði Siggu með diíkuni hennar/*sinni.
   I.nom hit.1.sg Sigga.acc with doll her/her.refl
   “I hit Sigga with her (Sigga’s) doll.”
c. Siggu barði í ég með dúkkuni hennar/*sinni.
   Sigga.acc hit.1.sg I.nom with doll her/her.refl
   “Sigga, I hit with her (Sigga’s) doll.”

Now compare the reflexivization possibilities in the following sentence:

(11) Henni finnst bróðir sinn/*hennar leiðinlegur.
   her.DAT find.3.sg brother.nom her.refl/her boring.nom
   “She finds her brother boring.”

Ellipsis

Finally, consider the following pattern of possible ellipses. (The symbol e in these sentences is simply intended to indicate which constituent would appear if there were no ellipsis. Note also that the transitive verb grafa (‘bury’) which occurs in these sentences also has an intransitive meaning, ‘dig’. It is therefore actually only under the intended transitive reading that (12c) is ungrammatical; but that is the only reading you need be concerned with here.)

(12) a. þeir fluttu líkið og þeir grófu það.
   they.nom move.3.pl.past the.corpse and they.nom buried it
   “They moved the corpse and they buried it.”
   b. þeir fluttu líkið og e grófu það.
   they.nom move.3.pl.past the.corpse and buried it
   c. *þeir fluttu líkið og þeir grófu e.
   they.nom move.3.pl.past the.corpse and they.nom buried

(13) a. Líkið hræddi þá og þeir grófu það.
   the.corpse scare.3.sg.past them and they buried it
   “The corpse scared them and they buried it.”
   b. *Líkið hræddi þá og þeir grófu e.
   the.corpse scare.3.sg.past them and they buried
   the.corpse scare.3.sg.past them and buried it

Now consider the following sentence:

(14) Hann segist vera duglegur en e finnst verkefnið
    He.nom says.self.3.sg be.inf diligent but find.3.sg the.homework
    of þungt.
    too hard
    “He says he is diligent, but finds the homework too hard.”
Problem Set 5

Task VI What grammatical function would you associate with the dative argument of the verb finnast which occurs in (4), (7), (8), (11), and (14)? Justify your answer on the basis of the foregoing data.

Task VII What generalization seems to describe the subject agreement exhibited by the verb in Icelandic? Providing an account of this agreement pattern will be addressed later in this problem set.

P5.2.2 Second predicates in Russian

So-called second predicates in Russian (adjectives or nouns) agree in number and gender with the controlling NP. Sometimes they also agree in case, as in (1) and (2), but sometimes they have to be in the instrumental, as in (3)–(6):

(1) Ivan čitaet *ugrjumym/ugrjumyj.
   Ivan.NOM reads *gloomy.INS.MASC.SG/gloomy.NOM.MASC.SG
   “Ivan reads, gloomy.”

(2) Oni prišli domoj *ustalymi/ustalye.
   They.NOM came home *tired.INS.PL/tired.NOM.PL
   “They came home tired.”

(3) On okazalsja durakom/*durak.
   He.NOM turned out to be fool.INS/*fool.NOM
   “He turned out to be a fool.”

(4) On stal lenivym/*lenivyj.
   He.NOM became lazy.INS/*lazy.NOM
   “He became lazy.”

(5) On eē sčital krasivoj/*krasivuju.
   He.NOM her.ACC considered pretty.INS.FEM/*pretty.ACC.FEM
   “He considered her pretty.”

(6) On eē našel umnoj/*umnuju.
   He.NOM her.ACC found clever.INS.FEM/*clever.ACC.FEM
   “He found her clever.”

While second predicates that agree in case (as in (1) and (2)) can be added to practically any verb, those in the instrumental (as in (3)–(6)) have a relatively restricted distribution.

Task VIII What grammatical function(s) would you associate with second predicates in Russian? Give arguments for your proposal.

Task IX Provide lexical entries for the forms in (1)–(6) of the verbs čitat’ (‘read’), prijti (‘come’), okazat’sja (‘turn out to be’), stat’ (‘start to be’), sčitat’ (‘consider’), and najti (‘find’).

Task X Give full analyses (c-structures and f-structures) of (1) and (4).
P5.2.3 Icelandic case marking and control

Regular case marking

In P5.2.1, we saw some phenomena regarding case marking in Icelandic. Here we will delve into a specific treatment of case marking in Icelandic and its interactions with complex syntactic structures such as those involving control.

Recall that in simple sentences in Icelandic, the regular case of the subject is nominative and that of the object accusative. Let us adopt the following hypotheses about regular case assignment:

(1) **Case assigners:**
   a. The subject–person agreement affix of verbs assigns nominative case to the subject.
   b. The verb root of transitive verbs assigns accusative case to the object.

(2) **Case-marked forms:**
   The case inflections of nominals *constrain* the case value.

The case assignments in (1) carry case-defining equations, such as \( (↑ \text{SUBJ CASE}) = \text{NOM} \) and \( (↑ \text{OBJ CASE}) = \text{ACC} \). The case-marked forms governed by (2) carry constraint equations, such as \( (↑ \text{CASE}) = \text{c NOM} \) and \( (↑ \text{CASE}) = \text{c ACC} \). Hence, a case-marked form can appear only in a syntactic environment where a case assigner will satisfy its constraint features. This provides a simple account of examples such as (3) and (4):

(3) *Haraldur elska-r Maríu.*
Harold.nom love-3.sg Mary.acc
“Harold loves Mary.”

(4) *Haraldr elska-r Maríu.*
Harold.acc love-3.sg Mary.Acc

For example, (3) would have the annotated c-structure shown in (5):

(5)

```
S
  ↑ = ↓
  NP
  ↓
  VP
  ↑
  Haraldur
  ↑ = ↓
  V
  ↑
  elskar
  ↑ = ↓
  NP
  ↑
  Maríu
  ↑ = ↓
  V
  ↑
```

\( (↑ \text{PRED}) = \text{‘Harold’} \)
\( (↑ \text{CASE}) = \text{c NOM} \)

\( (↑ \text{SUBJ}) = \text{SG} \)
\( (↑ \text{OBJ}) = \text{ACC} \)

\( (↑ \text{PRED}) = \text{‘Mary’} \)
\( (↑ \text{CASE}) = \text{c ACC} \)
Task XI  Explain in detail why (4) is ungrammatical.

Hypothesis (1a) leaves the subject case of infinitive verbs (which lack subject–
person agreement affixes) unspecified. By this means we can account for examples
(6) and (7):

(6) þeir segja Harald elska Maríu.
they.nom say.3.pl Harold.acc love.inf Mary.acc
“They say Harold loves Mary.”
Lit.: “They say Harold to love Mary.”
(7) Haraldur er sagður elska Maríu.
Harold.nom is.3.sg said.nom love.inf Mary.acc
“Harold is said to love Mary.”

For example, (6) would have the annotated c-structure shown in (8):

Task XII (Challenge)  Explain in detail how hypothesis (1a) accounts for (6) and
(7). Note that (7) is a passivized version of (6) and that the passive participle
sagður agrees in case with its subject.

Irregular case marking

Verbs may govern irregular case on their objects, as in (9) and (10):

(9) a. þeir björguðu stúlkunni.
they.nom rescued the.girl.dat
“They rescued the girl.”

b. þeir luku kirkjunni.
they.nom finished the.church.dat
“They finished the church.”
(10) a. Stúlkan beið mín.
    the.girl.NOM awaited me.GEN
    “The girl awaited me.”

b. Við vitjuðum Ólafs.
    we.NOM visited Olaf.GEN
    “We visited Olaf.”

Let us adopt the following hypotheses about irregular case assignment:

(11) Irregular case assigners:
    a. The verb roots of verbs that govern irregular case assign irregular case.
    b. Regular case assignment follows irregular case assignment and is optional.

Hypothesis (11b) implies that regular case is the default case assignment, specifying accusative objects and nominative subjects only if these grammatical arguments have not been assigned irregular case.

Task XIII Explain in detail how (9a) is analyzed. Explain how the ungrammatical *þeir björguðu mín* (‘they.NOM rescued me.GEN’) is ruled out.

Some indication that the irregularly case-marked nominals in (9) and (10) may indeed be objects (and not, say, obliques) comes from passivization:

(12) a. Stúlkunni var bjargað.
    the.girl.DAT was rescued
    “The girl was rescued.”

b. Kirkjunní var lokíð.
    the.church.DAT was finished
    “The church was finished.”

c. Mín var beðíð.
    me.GEN was awaited
    “I was awaited.”

d. Ólafs var vitjað.
    Olaf.GEN was visited
    “Olaf was visited.”

Task XIV (Challenge) Assuming that the dative and genitive nominals in (12) are subjects of the passivized verbs, how would you account for their case?

Clear evidence that the irregularly case-marked nominals in (9) and (10) are indeed objects comes from functional control, as in (13):
Problem Set 5

(13) a. Hann segir stúlkunni (i barnaskap sínum) hafa verið
he.NOM says the.girl.DAT (in foolishness self’s) have.INF been
rescued
“He says in his foolishness that the girl has been rescued.”
Lit.: “He says the girl (in his/her foolishness) to have been rescued.”

b. Hann segir mín (i barnaskap sínum) hafa verið beðið.
he.NOM says me.gen (in foolishness self’s) have.INF been awaited
“He says in his foolishness that I have been awaited.”
Lit.: “He says me in his foolishness to have been awaited.”

Note that in the position in which it occurs in (13a), the optional adjunct i barnaskap sínum can modify either the matrix subject or the complement subject. If it followed the complement auxiliary hafa, however, it would only be able to modify the complement subject. This suggests that on the reading where it modifies the matrix subject, the c-structure of (13a) is as in (14):

(14)

Task XV Explain why stúlkunni is good in (13a), while the accusative form stúlkunna is ungrammatical. It is possible to passivize the matrix verb segir of (14). Predict the case of the passivized subject (‘the girl’).

Task XVI Finally, recall from P5.2.1 your analysis of constructions such as the following:

(15) Verkjanna gætur ekki.
the.pains.gen be.noticeable.3.sg not
“The pains are not noticeable.”

(16) Stelpunum finnst Olafur leiðinlegur.
the.girls.dat find.3.sg Olaf.nom boring
“The girls find Olaf boring.”

Does your analysis require any changes to be made to the verb’s agreement specifications to account for the agreement patterns in such constructions? If so, what would you propose?
Anaphoric control

In addition to bare infinitives such as *hafa* which occurs in (13), Icelandic also has infinitives construed with *að*, a homophone of the finite complementizer *að* (‘that’), such as *að verða*, which is shown in (17):

\[
(17) \quad Stúlkan \quad vónast \quad til \quad að \quad vérða \quad elskuð.
\]

the.girl.nom hopes toward to be.inf loved

“The girl hopes to be loved.”

While the bare infinitive complement of a verb like *segir* (‘say’) in (13) is treated as involving functional control, there is evidence that the *að* infinitive complement of a verb like *vónast* (til) (‘hope (for)’) involves anaphoric control. For example, *að* infinitives, but not bare infinitives, appear in constructions in which there appears to be no overt controller:

\[
(18) \quad Að \quad senda \quad þig \quad heim \quad aftur \quad væri \quad langbest.
\]

to send.inf you home back would.be best

“To send you back home would be best.”

Task XVII Assuming that the complement *að verða elskuð* in (17) does involve anaphoric control, what case would you predict to be shown by the matrix subject *stúlka* (‘girl’) in (17) if the regular verb *elska* (‘love’) were replaced by the irregular verb *bjarga* (‘rescue’) which we saw in (9a), (12a), and (13a)? Justify your answer.

P5.3 Anaphoric binding

P5.3.1 Finnish possessive suffixes I

In Finnish, the possessor can be marked with a suffix on the noun. The suffix appears after the case markers. Examples of this are shown in (1)–(4). (Note that the case for *kirja* in (1)–(10) is NOM.)

\[
(1) \quad Kirja-ni \quad on \quad punainen.
\quad book-1.sg.px is \quad red
\quad “My book is red.”
\]

\[
(2) \quad Kirja-si \quad on \quad punainen.
\quad book-2.sg.px is \quad red
\quad “Your (sg.) book is red.”
\]
Task XVIII  Write the morpholexical specifications for -ni.

It is possible to have an overt possessive pronoun in addition to the possessive suffix, as shown in (5)–(6):

(5)  (Minun) kirja-ni  on punainen.
    1.sg.gen book-1.sg px is red
    “My book is red.”

(6)  (Teidän) kirja-une on punainen.
    2.pl.gen book-2.pl px is red
    “Your (pl.) book is red.”

Task XIX  Write morpholexical specifications for minun, and revise the specifications for -ni if necessary.

So far we have only looked at first and second person. Third-person possessors do not follow exactly the same pattern as first- and second-person possessors. Consider examples (7)–(10):

(7)  Pojan  kirja  on punainen.
    boy.gen book is red
    “The boy’s book is red.”

(8)  Hänen  kirja-nsa  on punainen.
    3.sg.gen book-3px is red
    “His book is red.”

(9)  Poikien  kirja  on punainen.
    boys.gen book is red
    “The boys’ book is red.”

(10) Heidän  kirja-nsa  on punainen.
    3.pl.gen book-3px is red
    “Their book is red.”

Note that the third-person possessive pronouns preceding the head noun in (8) and (10) are not optional. If the pronouns hänen or heidän are left out, the sentence becomes ungrammatical:

(11)  *Kirja-nsa on punainen.
Task XX  Write morpholexical specifications for hänen, -nsa, and pojan.

In sentences like (8) and (10) above, the third-person possessive pronouns are obligatory. However, in sentences such as (12) and (13), there cannot be a third-person possessive pronoun. (Note that in (12)–(16), kirjaa has partitive case.)

(12)  
Hänₐ lukee kirjaa-nsaₐ.  
3.sg.nom reads book-3px  
“Heₐ is reading hisₐ book.”

(13)  
Pekkaₐ lukee kirjaa-nsaₐ.  
Pekka reads book-3px  
“Pekkaₐ is reading hisₐ book.”

In (12), he is reading his own book, and Pekka in (13) is also reading his own book. Now consider (14)–(16):

(14)  
Hänₐ lukee Pekkaₐ kirjaa.  
3.sg.nom reads Pekkaₐ.gen book  
“Heₐ is reading Pekkaₐ’s book.”

(15)  
Hän lukee (minun) kirjaa-ni.  
3.sg.nom reads 1.sg.gen book-1.sg.px  
“He is reading my book.”

(16)  
Hänₐ lukee hänenₐ kirjaa-nsa.  
3.sg.nom reads 3.sg.gen book-3px  
“Heₐ is reading hisₐ book.”

Note the difference in meaning between (12) and (16). Sentence (16) can never be taken to mean that he is reading his own book. It must be someone else’s book. In task XXI, you will be asked to provide an analysis for (16). Before solving task XXI, consider examples (17) and (18) (all = allative case):

(17)  
Pekkaₐ antaa häneₐ-lle kirja-nsaₐₐ.  
Pekka gives 3.sg-all book-3px  
“Pekkaₐ gives him/herₐ hisₐ book.”

(18)  
Pekkaₐ lantaa hänenₐₐ-lle hänenₐₐ kirjaa-nsa.  
Pekka gives 3.sg-all 3.sg.gen book-3px  
“Pekkaₐ gives him/herₐ hisₐ/herₐ book.”

In (17), the only possible interpretation is that Pekka is giving his own book. Example (18), however, cannot be interpreted that way. The owner of the book is either the person who is receiving the book (although that is a little odd with
respect to meaning), or it is some third person who is not mentioned in this sentence but known from the context.

Task XXI  Write morpholexical specifications for hän in example (16). If necessary, revise those for hänen and -nsa. Explain how your analysis accounts for examples (13), (14), and (16). Finally, display the c-structures and f-structures for (12) and (16). Do not worry too much about the exact position of the possessive pronouns. If you want to think about it, here is a DP for you (note: this phrase is perfectly grammatical in Finnish):

(19) Tämä minun kirja-ni

this my book-1.sg.px

“this book of mine”

P5.3.2  Finnish possessive suffixes II

The best way of solving the first part of the Finnish problem seems to be to work from the assumption that the binder of the anaphoric -nsa must be a subject. This hypothesis accounts nicely for examples like (1) and (2). Note that in Finnish, different verbs can select for different types of infinitive; you do not need to worry about that here.

(1) Hän, auttaa minua pese-mään auto-nsa,.

3.sg helps me wash-INF car-INF.3px

“He, helps me wash his car.”

(2) Eeva, käski minua korjaamaan pois tavara-nsa,.

Eeva ordered me take-INF away things-INF.3px

“Eeva ordered me to take her things away.”

Task XXII  Explain how the analysis you have developed for the Finnish possessive suffixes accounts for (1) and (2).

Now consider sentences (3)–(6):

(3) Minä auttan häntä, pese-mään auto-nsa,.

1 help him wash-INF car-INF.3px

“I help him wash his car.”

(4) Kalle, auttaa Leenaa, pese-mään auto-nsa,ij,.

Kalle helps Leena wash-INF car-INF.3px

“Kalle helps Leena wash his/her car.”

(5) Kalle, auttaa Leenaa, pese-mään hanen,i,j/k auto-nsa.

Kalle helps Leena wash-INF 3.sg.gen car-INF.3px

“Kalle helps Leena wash his/her (= Kalle’s or someone else’s) car.”
Problem Set 5

(6) Kalle, käskee minua pese-mään hanen, i/k auto-nsa.
Kalle orders me wash-INF 3.SG.GEN CAR-3PX
“Kalle orders me to wash his/her (= Kalle’s or someone else’s) car.”

(For pragmatic reasons, Leenaa is the binder in (4); but in the right pragmatic context, it is possible to interpret Kalle as the binder.)

In (5), the car can be either Kalle’s or someone else’s, but not Leena’s. These examples seem to show that the anaphoric -nsa can be bound by an object.

Task XXIII Try to come up with a way to account for the examples above without abandoning the subjective binding hypothesis. In your solution, provide f-structures for examples (1), (3), and (5).

Task XXIV Explain how it is possible for both (2) and (6) to be grammatical.

P5.3.3 Japanese reflexives

The binding relationship of the reflexive pronoun zibun (‘self’) has been one of the most intensively studied topics in modern Japanese syntax. We will present here only some of the interesting problems it presents. See the references to this problem set for further information.

The following three sets of examples suggest a simple generalization governing the anaphoric binding properties of zibun. (Note: the morpheme wa marks a topic constituent. For the purposes of this exercise you should simply assume that a constituent marked with wa bears whatever grammatical function is required in order for the sentence to be well-formed.)

   NOM DAT [self GEN matter] ACC talk-PAST
   “John talked to Bill about his (John’s, not Bill’s) concern.”

      NOM DAT [self GEN photo] ACC show-PAST
      “John showed Bill a picture of himself (John, not Bill).”

(2) a. John wa Mary o [zibun no ie] de korosi-ta.
    TOP ACC [self GEN house] in kill-PAST
    “John killed Mary in his (not her) house.”

    b. Mary wa John ni [zibun no ie] de koros-are-ta.
       TOP by [self GEN house] in kill-PASS-PAST
       “Mary was killed by John in her (not his) house.”
(3) a. Mary wa John ga [zibun no ie] de korosi-ta.
    top nom [self gen house] in kill-past
    “Mary, John killed (her) in his (not her) house.”

b. John ni-ua Mary ga [zibun no ie] de koros-are-ta.
    by-top nom [self gen house] in kill-pass-past
    “By John, Mary was killed in her (not his) house.”

Task XXV In terms of our theory of anaphoric binding, what featural analysis of zibun will account for examples (1)–(3)? Explain how your analysis accounts for the examples.

Evidence from coordination

Coordinated relative clauses in Japanese exhibit an interesting pattern with respect to the constituents they allow to be missing. The examples in (4) and (5) are all well-formed noun phrases (the symbol e is included only as a guide to what constituent would appear were the clause not relativized):

(4) a. [s e Takasi o nagutte] [s e Satoru o ketobasita]
    subj acc hit subj acc kicked
    to Reiko ga omotteiru] to Sachiko ga sinjiteiru]
    comp nom think comp nom believe
    otoko
    man
    “the man who hit Takasi and who Sachiko believes Reiko thinks
    kicked Satoru”

b. e hon o yonde, e rekoodo o kiita gakusei
    subj book acc read subj record acc listened.to student
    “the student who read a book and who listened to a record”

(5) a. [s Takasi ga e nagutte] [s Reiko ga e Satoru ga e
    nom obj hit nom nom obj ketobasita] to utagateiru] otoko
    kicked comp doubt man
    “the man who Takasi hit and who Reiko doubts that Satoru
    kicked”

b. Takasi ga e kisusite, Reiko ga e nagutta onna
    nom obj kissed nom obj hit woman
    “the woman whom Takasi kissed and Reiko hit”

c. Takasi ga e tatete, Reiko ga e itta ie
    nom obj built nom obj go, went house
    “the house which Takasi built and to which Reiko went”
The examples in (6), however, are all ungrammatical:

(6) a. \*[s Takasi ga e nagutte] [s [s e Satoru o ketobasita]
   \nom obj hit \subj \acc kicked
to Reiko ga omotteiru] to Sachiko ga sinjiteiru] otoko
   \comp \nom think \comp \nom believe \man
   “the man whom Takasi hit and who Sachiko believes Reiko thinks
   kicked Satoru”

   b. *e kawaikute, Reiko ga e hon o watasita kodomo
   \subj cute \nom obl go \book acc handed \child
   “the child who was cute and to whom Reiko handed a book”

   c. *Reiko ga e hon o watasite, e Takasi o nagutta
   \nom obl go \book acc handed \subj \acc hit
   otoko
   man
   “the man to whom Reiko handed a book and who hit Takasi”

Task XXVI State a generalization about the facts represented in (4)–(6): what types of relative clauses can be coordinated?

Consider now the following examples in which causative verbs appear in some
of the relative clauses (note that these causative verbs are just the same sort as
those discussed in P5.1.2):

(7) e Takasi o nagutte, Reiko ni Satoru o ketobas-ase-ta
   \subj \acc hit \subj \dat \acc kick-cause-past
   otoko
   man
   “the man who hit Takasi and who caused Reiko to kick Satoru”

(8) e Takasi o nagutte, Reiko ga e Satoru o ketobas-ase-ta
   \subj \acc hit \nom obj \acc kick-cause-past
   otoko
   man
   “the man who hit Takasi and who Reiko caused to kick Satoru”

(9) *e Takasi o nagutte, Reiko ga Satoru ni e ketobas-ase-ta
   \subj \acc hit \nom \dat obj \acc kick-cause-past
   otoko
   man
   “the man who hit Takasi and who Reiko caused Satoru to kick”
(10) "Takasi ga e nagutte, e Reiko ni Satoru o ketobas-ase-ta
nom obj hit subj dat acc kick-cause-past
otoko
man
“the man who Takasi hit and who caused Reiko to kick Satoru”

(11) Takasi ga e nagutte, Reiko ga e Satoru o ketobas-ase-ta
nom obj hit nom obj acc kick-cause-past
otoko
man
“the man who Takasi hit and who Reiko caused to kick Satoru”

(12) Takasi ga e nagutte, Reiko ga Satoru ni e ketobas-ase-ta
nom obj hit nom dat obj acc kick-cause-past
otoko
man
“the man who Takasi hit and who Reiko caused Satoru to kick”

Task XXVII Explain how the facts in (7)–(12) fit in with your answer to task XXVI.

We can now consider some apparent counterexamples to the generalization considered in task XXV:

nom dat self gen matter acc talk-cause-past
“John made Bill talk about his (either John’s or Bill’s) concern.”
nom self gen matter acc talk-past
“Bill talked about his concern.”

nom dat self gen matter acc talking-receive-past
“John received from Bill the favor of talking about his (either
John’s or Bill’s) concern.”
nom self gen matter acc talk-past
“Bill talked about his concern.”

(15) a. John wa Mary ni [zibun no uti] de ne-kom-are-ta.
top by self gen house in sleep-absorb-pass-past
“John was embarassed by Mary’s becoming bedridden in his/her
house.”
b. Mary ga [zibun no uti] de ne-kon-da.
nom self gen house in sleep-absorb-past
“Mary became bedridden in her house.”
The examples in (13)–(15) involve a causative verb and other complex predicates. Note in particular that (15a) illustrates a construction called the indirect passive, in which the passive subject is interpreted as being adversely affected by the event described. Whereas the direct passive in Japanese, which was illustrated in (2b), can be analyzed much like the English passive, the indirect passive has been analyzed similarly to the Japanese causative, as have been constructions with the formative te morau as in (14a).

Task XXVIII Explain why the examples in the (a) sentences of (13)–(15) are not truly counterexamples to the analysis you gave in task XXV.

Another pattern of binding

While all of the above examples fall under a single generalization, there are further examples that do not. For example, there are certain oblique agent phrases in direct passive constructions that can serve as antecedents of zibun:


exist-PART comp] acc let.know-PASS-PAST

“Taro was informed by Ziro that there is a man who looks just like him (Taro or Ziro).”


inform-PASS-PAST

“John was informed by Mary of the result of his/her exam.”

Next, there are certain other oblique phrases that can serve as the antecedent of zibun, such as the following oblique source phrases with the predicate meaning ‘hear’:


hear-PAST

“Hanako heard from Taro that she/he had won.”


ACC become-PAST comp] ACC hear-PAST

“Bill heard from John that it had been decided that Hanako would defend herself/him (Hanako/Bill or John).”
Finally, note the contrast between (18) and (19), which differ only in the main verb:

(18)  Bill wa John ni [Mary ga zibun o nikunde-i-ru koto] o 
      TOP  DAT [ NOM self ACC hate-PRG-PART COMP] ACC 
      kii-ta.
      hear-PAST
      “Bill heard from John that Mary hated herself/him (Bill or John).”

(19)  Bill wa John ni [Mary ga zibun o nikunde-i-ru koto] o 
      TOP  DAT [ NOM self ACC hate-PRG-PART COMP] ACC 
      hanasi-ta.
      tell-PAST
      “Bill told John that Mary hated herself/him (Bill, not John).”

**Task XXIX**  What do the nonsubject binders in examples (16)–(18) have in common? How can you revise your analysis in task XXV to account for these examples?
Problem Set 6

P6.1 Unaccusatives

The following data suggest that, at least in some languages, intransitive verbs do not form a homogeneous class. Your task will be to study the data given below and offer an account of this phenomenon.

P6.1.1 Italian

Subjects in Italian can either precede or follow the verb phrase, as shown in (1)–(3). The subjects in the (b) sentences are sometimes referred to as inverted subjects:

(1) a. Giovanni arriva.
Giovanni arrive.3.sg
“Giovanni arrives.”
b. Arriva Giovanni.

(2) a. Giovanni telefona.
Giovanni telephone.3.sg
“Giovanni telephones.”
b. Telefona Giovanni.

1 Some speakers strongly prefer a version of (3b) in which the object is definite, as in:

(i) Scrive la lettera Giovanni.

However, variation with respect to the definiteness of the object (and related issues such as whether the object requires a focus interpretation) is orthogonal to our main point here, so we set it aside.
(3)  

a.  
Giovanni scrive una lettera.  
Giovanni write.3.sg a letter  
“Giovanni writes a letter.”

b.  
Scrive una lettera Giovanni.

The verb agrees in person and number with both a preverbal and a postverbal subject. This is shown in (4) and (5), where the verbs ‘arrive’ and ‘telephone’ agree with a plural subject:

(4)  

a.  
Maria e Giovanni arrivano.  
Maria and Giovanni arrive.3.pl  
“Maria and Giovanni arrive.”

b.  
Arrivano Maria e Giovanni.

(5)  

a.  
Maria e Giovanni telefonano.  
Maria and Giovanni telephone.3.pl  
“Maria and Giovanni telephone.”

b.  
Telefonano Maria e Giovanni.

It is also possible for no c-structure subject to be present at all:

(6)  

Arrivano.  
arrive.3.pl  
“They arrive.”

Thus we can write the following c-structure rules to express the positions of the subjects in the sentences above. The comma between the two daughter nodes in (R1) indicates that they can be reordered with respect to each other:

(R1)  
S → (NP (↑ subj) = ↓), VP ↑ = ↓

(R2)  
VP → V ↑ = ↓ (NP (↑ obj) = ↓) PP* (↑ (↓ case)) = ↓

Although intransitive verbs are often thought of as a single syntactic class, certain phenomena suggest that this is not the case in Italian. We will examine one such phenomenon, the process of ne-cliticization, and then consider the evidence it provides for distinguishing between two classes of intransitive verbs in Italian.

Ne-cliticization

In a sentence like (7a) below, the NP tre dischi volanti (‘three flying saucers’) can be partially pronominalized by means of the partitive clitic ne, which appears
immediately before the finite verb of the clause. As shown in (7b), the result looks like a discontinuous phrase ne ... tre, roughly meaning ‘three of them’:

(7) a. *Giovanni ha visto tre dischi volanti.
    Giovanni have.3.sg seen three discs flying
    “Giovanni saw three flying saucers.”

b. Giovanni *ha visto tre.
    Giovanni of.them have.3.sg seen three
    “Giovanni saw three (of them).”

Assuming that the verb ‘see’ selects both subj and obj, note that in (7) above it is the object NP which permits the ne-cliticization. Examples (8) and (9) illustrate, moreover, that ne-cliticization is prohibited from a subject NP and from an oblique grammatical argument:

(8) a. *Tre ragazzi hanno visto i dischi volanti.
    three boys have.3.pl seen the discs flying
    “Three boys saw the flying saucers.”

b. *Tre ne hanno visto i dischi volanti.

(9) a. Giovanni ha parlato a due uomini.
    Giovanni have.3.sg spoken to two men
    “Giovanni spoke to two men.”

b. *Giovanni ne ha parlato a due.

To summarize, ne-cliticization seems to be possible only from an object grammatical argument, never from a subject or from an oblique. To make this point more obvious, here are the lexical forms for the verbs used in (7)–(9):

(L1) vedere V (↑pred) =’see ((↑subj), (↑obj))’

(L2) parlare V (↑pred) =’speak ((↑subj), (↑oblgo))’

Let us now see how ne-cliticization operates on intransitive verbs. If ne-cliticization requires an object, it should be impossible with intransitive verbs. In (10) and (11) this prediction is confirmed:

(10) a. Molti studenti arrivano.
    many students arrive.3.pl
    “Many students arrive.”

b. *Molti ne arrivano.

(11) a. Molti studenti telefonano.
    many students telephone.3.pl
    “Many students telephone.”

b. *Molti ne telefonano.
However, from a postverbal subject, *ne*-cliticization is possible with certain verbs but not with others. A transitive verb does not permit *ne*-cliticization from its postverbal subject:

(12) a. *Esamineranno il caso molti studenti.*

examine.fut.3.pl the case many students

“Many students will examine the case.”

b. *Ne esamineranno il caso molti.*

But now compare the intransitive examples in (13) with (14):

(13) a. *Arrivano molti studenti.*

arrive.3.pl many students

“Many students arrive.”

b. *Ne arrivano molti.*

of.them arrive.3.pl many

“Many of them arrive.”

(14) a. *Telefonano molti studenti.*

telephone.3.pl many students

“Many students telephone.”

b. *Ne telefonano molti.*

*Arrivare* and *telefonare* illustrate two different classes of Italian intransitive verbs. In Table P6.1, more verbs of each class are listed. Following existing terminology we will refer to these types of verbs as “unaccusatives” and “unergatives” respectively.

**Task I** Modify the above analysis to account for (13) and (14). Give lexical entries for *arrivare* and *telefonare*, as well as any devices (lexical or syntactic) necessary for your account of the facts. *Hint:* Assume that the account of *ne*-cliticization given above is correct.

**Task II** Give derivations for (10a), (11a), (13a), and (14a).

Some evidence from word order

Presented below are some additional facts about word order in Italian which may help you decide between several different analyses you may have arrived at for tasks I and II. Some verbs may occur with infinitival verb phrase complements, marked with either *di* or *a*. In the following examples you will observe a contrast between two such verbs, *pensare* and *riuscire*. *Pensare* is unergative and *riuscire* is unaccusative.
Table P6.1  Pattern of Italian verbs allowing ne-cliticization from postverbal nominals

<table>
<thead>
<tr>
<th>Allows ne-cliticization</th>
<th>Disallows ne-cliticization</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNACCUSATIVE</td>
<td>UENERGATIVE</td>
</tr>
<tr>
<td><em>arrivato</em> ‘arrived’</td>
<td><em>telefonato</em> ‘called up’</td>
</tr>
<tr>
<td><em>caduto</em> ‘fell’</td>
<td><em>sorriso</em> ‘smiled’</td>
</tr>
<tr>
<td><em>tornato</em> ‘returned’</td>
<td><em>leticato</em> ‘quarreled’</td>
</tr>
<tr>
<td><em>partito</em> ‘left’</td>
<td><em>tossito</em> ‘coughed’</td>
</tr>
<tr>
<td><em>rimasto</em> ‘remained’</td>
<td><em>taciuto</em> ‘was silent’</td>
</tr>
<tr>
<td><em>esistito</em> ‘existing’</td>
<td><em>dormito</em> ‘slept’</td>
</tr>
<tr>
<td><em>cresciuto</em> ‘grew’</td>
<td><em>assistito</em> ‘attended’</td>
</tr>
<tr>
<td><em>scoppiato</em> ‘exploded’</td>
<td><em>viaggiato</em> ‘traveled’</td>
</tr>
<tr>
<td><em>svenuto</em> ‘fainted’</td>
<td><em>scherzato</em> ‘joked’</td>
</tr>
<tr>
<td><em>uscito</em> ‘came out’</td>
<td><em>barato</em> ‘cheated’</td>
</tr>
<tr>
<td><em>scesco</em> ‘came down’</td>
<td><em>mentito</em> ‘lied’</td>
</tr>
<tr>
<td><em>salito</em> ‘came up’</td>
<td><em>lottato</em> ‘struggled’</td>
</tr>
<tr>
<td><em>scappato</em> ‘escaped’</td>
<td><em>abortito</em> ‘aborted’</td>
</tr>
<tr>
<td><em>capitato</em> ‘happened’</td>
<td><em>abbaiato</em> ‘barked’</td>
</tr>
<tr>
<td><em>risultato</em> ‘turned out’</td>
<td><em>ronzato</em> ‘buzzed’</td>
</tr>
<tr>
<td><em>diventato</em> ‘became’</td>
<td><em>civettato</em> ‘flirted’</td>
</tr>
<tr>
<td><em>apparso</em> ‘appeared’</td>
<td><em>russato</em> ‘snored’</td>
</tr>
<tr>
<td><em>crollato</em> ‘collapsed’</td>
<td><em>tremato</em> ‘trembled’</td>
</tr>
<tr>
<td><em>morto</em> ‘died’</td>
<td><em>resistito</em> ‘resisted’</td>
</tr>
<tr>
<td><em>nato</em> ‘was born’</td>
<td><em>nuotato</em> ‘swam’</td>
</tr>
<tr>
<td><em>impazzito</em> ‘went crazy’</td>
<td><em>camminato</em> ‘walked’</td>
</tr>
<tr>
<td><em>arrossito</em> ‘blushed’</td>
<td><em>barcollato</em> ‘staggered’</td>
</tr>
<tr>
<td><em>andato</em> ‘went’</td>
<td><em>esitato</em> ‘hesitated’</td>
</tr>
</tbody>
</table>

Both verbs select for an infinitival complement, as shown in (15) and (16):

(15)  Giovanni pensa di studiare linguistica.
Giovanni think.3.sg to study-INF linguistics
“Giovanni considers studying linguistics.”

(16)  Giovanni riesce a prendere il libro.
Giovanni succeed.3.sg to take-INF the book
“Giovanni succeeds in taking the book.”

And both can have the subject inverted just as easily. Even though (17) and (18) are not perfectly natural sentences, there is no contrast between them:
(17) *Pensa di studiare linguistica Giovanni.*
think.3.sg to study.inf linguistics Giovanni
“Giovanni considers studying linguistics.”

(18) *Riesce a prendere il libro Giovanni.*
succeed.3.sg to take.inf the book Giovanni
“Giovanni succeeds in taking the book.”

However, with the unergative verb *pensare*, it is difficult to get the nominal immediately after the verb, whereas with the unaccusative verb *riuscire* it is completely grammatical.²

(19) ??*Pensa Giovanni di studiare linguistica.*

(20) *Riesce Giovanni a prendere il libro.*

**Task III**  Is the contrast between (19) and (20) predicted by the analysis you gave in task I? If so, explain how. Is the lack of contrast between (17) and (18) also predicted? If so, how? If your analysis does not make these predictions, state what kinds of predictions your analysis does make.

**P6.1.2 Russian**

In certain negative sentences in Russian, some nominals may optionally occur in the genitive case, a construction that is called the “genitive of negation.” The subjects of certain intransitive verbs alternate with this genitive of negation, as shown in (1)–(3). Note that the subjects in sentences (a) of (1)–(3) are in the nominative, as is commonly the case in Russian tensed clauses, and agree with the verb in number, person, and sometimes also gender (with past-tense verbs). Unlike the nominative subject, the genitive of negation triggers no agreement on the verb: in sentences (b) of (1)–(3) the verb is marked for third-person singular (neuter with the past-tense form in (3b)):

(1) a. *Takie strany ne suščestvujut.*
such.nom.pl country.nom.pl neg exist.3.pl
“Such countries do not exist.”

b. *Takix stran ne suščestvuet.*
such.gen.pl country.gen.pl neg exist.3.sg
“Such countries do not exist.”

² Again, there is speaker variation here; some speakers reject both of these examples.
Certain intransitive verbs, however, disallow this alternation, as shown in (4)–(6):

(4) a. \textit{Ni odin rebenok ne prygnul.} \\
not one child.nom.masc.sg neg jumped.3.masc.sg \\
“No child jumped.”

b. * \textit{Ni odnogo rebenka ne prygnulo.} \\
not one child.gen.masc.sg neg jumped.3.neut.sg

(5) a. \textit{Na zavode nikakie ženščiny ne rabotajut.} \\
at factory no women.nom.pl neg work.3.pl \\
“No women work in the factory.”

b. * \textit{Na zavode nikakih ženščin ne rabotaet.} \\
at factory no women.gen.pl neg work.3.sg

(6) a. \textit{Takie sobaki ne kusajutsja.} \\
such dogs.nom.pl neg bite.3.pl \\
“Such dogs do not bite.”

b. * \textit{Takix sobak ne kusaetsja.} \\
such dogs.gen.pl neg bite.3.sg

Subjects of transitive verbs also disallow alternation with the genitive of negation:

(7) a. \textit{Ni odna gazeta ne pečataet takuju} \\
not one newspaper.nom.sg neg prints.3.sg such erundu. \\
nonsense.acc.sg \\
“No newspaper prints such nonsense.”

b. * \textit{Ni odnoj gazety ne pečataet takuju} \\
not one newspaper.gen.sg neg prints.3.sg such erundu. \\
nonsense.acc.sg
Pattern of Russian verbs allowing alternation between nominative subject and genitive of negation

<table>
<thead>
<tr>
<th>Allows genitive of negation</th>
<th>Disallows genitive of negation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNACCUSATIVE</strong></td>
<td><strong>UNERGATIVE</strong></td>
</tr>
<tr>
<td>suščestvovat'</td>
<td>prygnut'</td>
</tr>
<tr>
<td>prijiti</td>
<td>rabotat'</td>
</tr>
<tr>
<td>rasti</td>
<td>kusat'sja</td>
</tr>
<tr>
<td>ostat'sja</td>
<td>zažigat'sja</td>
</tr>
<tr>
<td>nabodit'sja</td>
<td>tancevat'</td>
</tr>
<tr>
<td>slucat'sja</td>
<td>pit'</td>
</tr>
<tr>
<td>okazat'sja</td>
<td></td>
</tr>
<tr>
<td>proishodit'</td>
<td></td>
</tr>
<tr>
<td>pojavit'sja</td>
<td></td>
</tr>
<tr>
<td>byt'</td>
<td></td>
</tr>
</tbody>
</table>

(8) a. **Studenty ne smotrajte televizor.**
    student.nom.pl neg watch.3.pl television
    “Students don’t watch television.”

b. **Studentov ne smotrit televizor.**
    student.gen.pl neg watch.3.sg television

Let us return to the intransitive verbs in (1)–(6). Those in (1)–(3), i.e. suščestvovat' (‘exist’), rasti (‘grow’), and prijiti (‘arrive’), allow the alternation of the nominative subject with the genitive of negation, while those in (4)–(6), i.e. prygnut' (‘jump’), rabotat' (‘work’), and kusat'sja (‘bite’), disallow such alternation. Again, we can say that we are dealing with two classes of intransitive verbs which, following the terminology introduced in P6.1.1, will be called “unaccusatives” and “unergatives.” Table P6.2 lists a few more members of these two verb classes in Russian.

There are a number of syntactic properties by which subjects in Russian may be distinguished from other grammatical functions. The fact that it is with subjects that the verb agrees was mentioned above. It is also the case that subjects in Russian act as antecedents of reflexives and as controllers of so-called gerund constructions, shown in (9) and (10), respectively:

(9) **Zakončiv rabotu, Ivan pošel domoj.**
    having.finished work.acc went home
    “Having finished work, Ivan went home.”

(10) **Ivan ne byl v svoej komnate.**
    Ivan.nom neg was in his.refl room
    “Ivan, was not in his, room.”
The genitive of negation, however, is not generally acceptable as an antecedent for a reflexive or as the controller of a gerund, as shown in (11) and (12):

(11) *Zakončiv rabotu, Ivana bol’še net.*  
Having finished work, Ivan.gen any.longer is.not  
“Having finished work, Ivan is no longer here.”

(12) *Ivana ne bylo v svoej komnate.*  
Ivan.gen neg was in his.refl room  
“Ivan was not in his room.”

It is also interesting to note here that the genitive of negation can alternate with objects. Russian objects normally appear in the accusative case:

(13) On videl knjigu.  
He.nom saw book.acc  
“He saw a book.”

But in negative sentences an object can appear in the genitive. Thus, here again we encounter the genitive of negation:

(14) a. On ne videl knjigu.  
He.nom neg saw book.acc  
“He did not see the book.”  
b. On ne videl knjigi.  
He.nom neg saw book.gen  
“He did not see the book.”

Task IV  Provide an account of the distribution of the genitive of negation. (It is not necessary to give an explanation for, or include in your analysis, the fact that these genitive phrases occur in negative sentences.)

Task V  Show how the verbs in the (a) and (b) sentences of (1)–(3) are related.

Task VI  Give analyses for (1a) and (1b).

Finally, it is interesting to note that passive predicates allow the alternation of nominative subjects and genitives of negation, as shown in (15):

(15) a. Ni odin mal’čik ne byl ubit.  
Not one.nom boy.nom neg was killed  
“Not one boy was killed.”  
b. Ni odnogo mal’čika ne bylo ubito.  
Not one.gen boy.gen neg was killed  
“Not one boy was killed.”
Task VII  Explain the interaction of the genitive of negation with the passive.

P6.1.3  Empty there in English

Otto Jespersen, in his fascinating book *A Modern English Grammar on Historical Principles, Part VII: Syntax* (1961) describes some properties of sentences with what is sometimes called “the empty *there.*” A portion of his discussion (pp. 107–114) is excerpted below with permission of Munksgaard International Publishers. Your task will be to explore these properties and attempt to find an analysis which explains them:

3.11  The empty, or, as I have called it elsewhere, the existential *there* differs from the local adverb *there*
(1) by having weak stress and consequently having the vowel [e] reduced to [ə],
(2) by losing its local meaning; hence the possibility of combining it with local adverbs [see 3.12 below],
(3) by being a quasi-subject, thus e.g. in an infinitival nexus and with an *ing* [see 3.14 below],
(4) by the tendency to have the verb in singular form with a plural subject [see 3.14 below],
(5) by the word-order: *there is nothing wrong,* but *∗there nothing is wrong …*
Thus it is not quite correct to say with NED [A New English Dictionary, 1884–1922, Oxford] (*there* 4) that “Grammatically there is no difference between *There comes the train* and *There comes a time when,* etc.; but while in the former *there* is demonstrative and stressed, in the latter it has been reduced to a mere anticipative element occupying the place of the subject which comes later.”

3.12  The empty *there* can be connected in the same sentence with indications of place: … *But there is no one there | … and there, sure enough, crusted with the red rust, there lay an iron shoe-buckle …*

3.13  *There* has often been described as preparatory subject, as anticipatory subject (… cf. *anticipative* in NED), or as introductory …, but these epithets are misleading, for *there* need not precede the real subject …: *Men there were yet living who had seen him,* etc. Other examples of the place after the subject proper, many of them in questions: … *What is there to laugh at? | … The reason, if reason there was …*

3.14  The tendency in colloquial English to use *there is* before a plural word …:
… *In the intervals, Walter darling, there’s you.*
…
In all these sentences *there* occupies the place usually given to the subject, and might be termed a vicarious subject or quasi-subject …, while the other word is relegated to a second plane. This is especially obvious in the use of *there* as subject in infinitival and gerundial groups: *let there be light | I don’t want there to be | it was impossible for there to be … | account for there being something rather odd …*
There are other indications that *there* is felt as a kind of subject. Thus the use of tag-questions: *there is nothing funny about him, is there? …*
But if *there* is the subject, what about the other part: how are we to analyze it? It is as a rule more indefinite than ordinary subjects, which are the most special part of the sentence; and it does not take the usual place of a subject …

The chief use of *there*-sentences is to denote the more or less vague existence or coming into existence of something indefinite; thus very frequently with the verb *be*: *There’s someone at the door* | *If he comes, there will be trouble* | *What is there for dinner?* | *There is no time like the present* | *There is many a slip between cup and lip* | *There is no rule without some exception* | *There are as good fish in the sea as ever came out of it* (and many other proverbs).

The verb *be* is also found in passive constructions, which are very frequent in sentences with *there*: … *There had been a jeweller’s window smashed*.

Other verbs than *be* are found in *there*-sentences, but generally only those of a somewhat vague meaning, such as *come, appear, happen*, etc.: … *Early one morning, there came on shore five or six canoes of Indians* …

Transitive verbs with objects formerly were not at all rare with *there* (NED *there* 4 b, obs.; frequent in Chaucer). We do not say *There took a man a walk*, but *There was a man who took a walk*. But *take place* = ‘happen,’ may still be found; thus also *cross her path* = ‘come’: … *there took place between him and his son a violent and painful scene* … *If there crossed her path a man with a strong protective arm, he was whisked away* …

**Task VIII** Propose an analysis of this construction, including requisite c-structure rules and lexical forms, and defend your proposal with a reasoned argument based on your exploration of evidence like that given by Jespersen.

Jespersen’s own analysis of a sentence such as *There are many churches there* (p. 110) is formulated “3/s m V S m 3,” where “3/s” denotes “something which may either be called a tertiary or a lesser subject,” “V” denotes a verb, “S” denotes a subject, “3” denotes a tertiary, or adverbial, and since “there might be occasion to show that there is something unusual about both subjects,” the raised m (for “modified”) is added. Thus, Jespersen’s analysis is that both *there* and the noun phrase it displaces are subjects, though there is something funny about them. Would an equivalent analysis be possible within lexical-functional theory? If your analysis differs from Jespersen’s, can you derive contrasting predictions from the two analyses and find evidence to choose between them?

**P6.2 Reflexives: Bosnian/Croatian/Serbian**

Reflexive verbs pattern sometimes with transitive and sometimes with intransitive lexical forms. Below are given data on reflexives in Bosnian/Croatian/Serbian, and your task will be to provide an analysis.
Consider the alternations in (1)–(4):

(1) a. *Ana brani Petra/njega.*
   Ana defends Petar,ACC/him
   “Ana defends Petar/him.”

   b. *Ana ga brani.*
   Ana him,CL defends
   “Ana defends him.”

(2) a. *Ana brani Marija/nju.*
   Ana defends Marija,ACC/her
   “Ana defends Marija/her.”

   b. *Ana je brani.*
   Ana her,CL defends
   “Ana defends her.”

(3) a. *Ana brani mene.*
   Ana defends me
   “Ana defends me.”

   b. *Ana me brani.*
   Ana me,CL defends
   “Ana defends me.”

(4) a. *Ana brani sebe.*
   Ana defends REF.
   “Ana defends herself.”

   b. *Ana se brani.*
   Ana REF,CL defends
   “Ana defends herself.”

These examples suggest that there exists the following alternation between the clitic and nonclitic direct object (accusative) pronouns:

<table>
<thead>
<tr>
<th>Features</th>
<th>Full form</th>
<th>Clitic form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.sg</td>
<td>mene</td>
<td>me</td>
</tr>
<tr>
<td>3.m.sg</td>
<td>njega</td>
<td>ga</td>
</tr>
<tr>
<td>3.f.sg</td>
<td>nju</td>
<td>je</td>
</tr>
<tr>
<td>refl</td>
<td>sebe</td>
<td>se</td>
</tr>
</tbody>
</table>

However, (6) and (7) below indicate that the alternation between *sebe* and *se* may in fact be only apparent (note that *Petra* is in accusative case, and functions as object):

[Contextual explanation and examples related to (6) and (7) are omitted for brevity.]
Problem Set 6

(6) a. Ana brani mene uspešnije nego Petra.
Ana defends me more.successfully than Petar.ACC
“Ana defends me more successfully than she defends Petar.”
b. Ana me brani uspešnije nego Petra.
Ana me.cl defends more.successfully than Petar.ACC
“Ana defends me more successfully than she defends Petar.”

(7) a. Ana brani sebe uspešnije nego Petra.
Ana defends refl more.successfully than Petar.ACC
“Ana defends herself more successfully than she defends Petar.”
b. *Ana se brani uspešnije nego Petra.
Ana refl.cl defends more.successfully than Petar.ACC
c. Ana se brani uspešnije nego Petar.
Ana refl.cl defends more.successfully than Petar.nom
“Ana defends herself more successfully than Petar (defends himself).”

Another difference between sebe and se may be seen in the following sentences, which involve an adjunct construction introduced by kao (‘as’), in which the adjunct agrees in case with the argument that it modifies:

(8) a. Petar je njega prijavio kao podstanara.
Petar.nom aux him.acc registered as tenant.acc
“Petar registered him as a tenant.”
b. Petar ga je prijavio kao podstanara.
Petar.nom him.acc.cl aux registered as tenant.acc
“Petar registered him as a tenant.”

(9) a. Petar je sebe prijavio kao podstanara.
Petar.nom aux refl registered as tenant.acc
“Petar registered himself as a tenant.”
b. *Petar se je prijavio kao podstanara.
Petar.nom refl.cl aux registered as tenant.acc
c. Petar se prijavio kao podstanar.
Petar.nom refl.cl registered as tenant.nom
“Petar registered himself as a tenant.”

Task IX Based on the data above, propose and justify lexical form(s) for the verb braniti (‘defend’) which is used in (1)–(7).

Task X If you propose that there is more than one lexical form, show how they are related.
In Section 14.4.7 we saw examples of causative and applicative verb morphology in Chichewa. Chichewa argument structure morphology has attracted much interest among linguists. The data in this problem set are from Baker (1988), Alsina (1992), and Alsina and Mchombo (1993). (Note that the examples from Baker 1988 lack tone markings.) In this problem set you will use lexical mapping theory to analyze combinations of causative, applicative, and passive processes on a single Chichewa verb.

Chichewa has word order properties similar to English: the subject normally precedes the verb, and complements follow the verb, as shown in (1).

   waterpot sm-PAST-fall-FV
   “The waterpot fell.”
   zebras sm-PAST-hand-FV crowbar to girl
   “The zebras handed the crowbar to the girl.”

See Section 8.1 for more detail on Chichewa word order. Mtsuko (‘waterpot’) is the subject in (1a). In (1b), mbidzi (‘zebras’) is the subject, and mpiringidzo (‘crowbar’) is the direct object, followed by the prepositional phrase kwā mtsikana (‘to the girl’). The verb in these examples contains a subject agreement marker (sm), a past tense morpheme, the verb root, and a final vowel (fv).

Here is the argument structure for the verb gw (‘fall’) in (1a):

(2) gw ‘fall’ ⟨theme⟩
   IC [−r]

The theme argument is patientlike, hence its intrinsic classification (IC) is [−r]. Applying the subject role mapping principles, we arrive at the following:

(2′) gw ‘fall’ ⟨theme⟩
   IC [−r]
   Subject [−o]
   Default (n.a.)
   SUBJ

The default mapping principle would fill in positive values, but it does not apply here, since all features have already been specified.

Now consider the verb root perek (‘hand’) in (1b). Let us assume that the PP kwā mtsikana, like its English counterpart, has the grammatical function of OBLgoal. Consider the IC for this verb. According to our classification rules, the
theme is [−r]. Chichewa is an asymmetrical object language, so it does not allow two [−r] ICs in the same verb. Therefore the IC for perek is as follows:

\[
(3) \quad \text{perek ‘hand’ } \langle \text{agent recipient theme} \rangle \\
\text{IC } \quad [−o] \quad [−o] \quad [−r]
\]

**Task XI** Complete the derivation of the grammatical relations for perek, showing the lines for the subject role mapping, any default feature specifications, and the derived grammatical relations.

Chiche\-wa has a passive morpheme -edw/-idw that follows the verb root (-edw is used if the stem has no vowels or only mid vowels, and -idw is used elsewhere). Sentence (4) is the passive version of (1b):

\[
(4) \quad \text{Mprisingidzo zi-na-pérëk-édw-á kwá mtsikana (ndí mbidzi).} \\
\text{crowbar sm-past-hand-pass-fv to girl by zebras} \\
\text{“The crowbar was handed to the girl by the zebras.”}
\]

Let us assume the passive rule in Chapter 14, (26). As before, we assume that the optional by-phrase is an adjunct specialized for expressing the role that is suppressed by the passive. We will disregard by-phrases in this problem set.

**Task XII** Derive the passive verb perek-edw (shown in (4)). Start with the a-structure and IC in (3a); then show lines for the effects of passive, the subject mapping, defaults, and the derived grammatical relations.

Chiche\-wa also has a causative morpheme -ets/-its (-ets is used when the stem has no vowel or only mid vowels; -its is used elsewhere). The verb in sentence (5) is the causative version of the verb in (1a):

\[
(5) \quad \text{Mtiskana a-na-ú-gw-éts-á mtsuko.} \\
\text{girl sm-past-fall-caus-fv waterpot} \\
\text{“The girl made the waterpot fall.”}
\]

Here is the beginning of an LMT derivation of the causative verb form in (5). The line beginning with CAUS represents the morpholexical operation provided in Chapter 14, (63).

\[
(6) \quad \text{gw-ets ‘fall’ } \langle \text{theme} \rangle \\
\text{CAUS } \quad \langle \text{causer theme} \rangle \\
\text{IC } \quad [−o] \quad [−r] \\
\text{Subject} \\
\text{Default} \\
\text{GFs}
\]
Task XIII  Complete the LMT derivation in (6) by filling in the subject mapping, defaults, and grammatical functions (GFs).

Now consider the effect of applying the causative morpholexical operation (caus) to a transitive verb such as phik (‘cook’). There are two possible outcomes, shown in (7b,c):

(7)  

a. \[ \text{Kadźidzi a-na-phik-a (mańgu).} \]
\[ 1a \text{ owl 1 s-ps-cook-fv 6 pumpkins.} \]
"The owl cooked (the pumpkins)."

b. \[ \text{Nńgunu i-na-phik-its-a kadźidzi mańgu.} \]
\[ 9 \text{ porcupine 9 s-ps-cook-caus-fv 1a owl 6 pumpkins.} \]
"The porcupine made the owl cook the pumpkins."

c. \[ \text{Nńgunu i-na-phik-its-a mańgu kwá kádzidzi.} \]
\[ 9 \text{ porcupine 9 s-ps-cook-caus-fv 6 pumpkins to 1a owl.} \]
"The porcupine had the pumpkins cooked by the owl."

Task XIV  Give the LMT derivation for phik (‘cook’) as in (7a).

Now let us consider how to derive the two variant causatives in (7b,c). Assume that the grammatical functions are as in English: (7b) is a ditransitive, with obj followed by obj\_theme, while (10c) has an obj followed by obj\_goal. (As with the Japanese causatives in the earlier problem set, the “causee” argument can be marked with the “dative” or “goal” morphology, here the preposition kwa (‘to’).) The causativized verb has three arguments. The IC for the “causer” is given by the usual rules.

(8)  
\[ \text{phik-ets ‘cook’} \quad \langle \text{agent theme} \rangle \]
\[ \text{caus} \quad \langle \text{causer agent theme} \rangle \]
\[ \text{IC} \quad \langle \begin{array}{c} \text{[−o]} \quad \text{?} \quad \text{?} \end{array} \rangle \]

Now consider the semantically subordinate agent or causee (the owl in (7)). This participant is both an agent (of the cooking action) and a patient (of the causing action). Let us suppose that two alternative ICs are possible: [−r] corresponding to its patientlike status, or [−o] (for “other roles”) if it is conceived not as patientlike but rather as agentive.

When the agent is [−o], the theme is [−r], as is usual for patients or themes:

(9)  
\[ \text{phik ‘cook’} \quad \langle \text{agent theme} \rangle \]
\[ \text{caus} \quad \langle \text{causer agent theme} \rangle \quad (\text{phik-its ‘cause to cook’}) \]
\[ \text{IC} \quad \langle \begin{array}{c} \text{[−o]} \quad \text{[−o]} \quad \text{[−r]} \end{array} \rangle \]

However, if the agent is [−r] (qua patientlike role), then the theme role is a “secondary patient,” allowing a [+o] classification. It would violate the asymmetrical object parameter if there were [−r] ICs, so the [+o] is selected:
Problem Set 6

(10) **phik** ‘cook’  \langle agent theme \rangle  
**CAUS** \langle causer agent theme \rangle (phik-its ‘cause to cook’)  
**IC**  \([-\text{o}]\) \([-r]\) \([+\text{o}]\)

**Task XV**  Complete the two LMT derivations of the causative verb **phik-ets**.

Chichewa also has an applicative morpheme -er/ir (-er is used if the stem has no vowels or only mid vowels, and -ir is used elsewhere). The applicative construction is illustrated in (11b):

7.fool 7-pst-buy-fv 9.gift  
“The fool bought a gift.”

7.fool 7-pst-buy-APPL-fv 2.girls 9.gift  
“The fool bought the girls a gift.”

We will assume the applicative rule provided in Chapter 14, (70), repeated here:

(12) **Applicative rule**
Add the applicative morpheme -ir to the verb. Add an argument in the second position in the argument structure (i.e. just to the right of the first argument).

Hence the argument structure for **gul-ir** (‘buy-for’) in (11b) is derived from that of **gul** (‘buy’) in (11a) as follows:

(13) **gul** ‘buy’  \langle agent theme \rangle  
**APPL**  \langle agent **beneficiary** theme \rangle (gul-ir ‘buy for’)

The applied role (APPL) is the OBJ in (11b). Let us posit that the IC for applied roles is \([-r]\).

Although awkward, it is possible to get two causative morphemes on a single verb:

(14) *?Asilikáli a-na-vín-its-its-a atsikana kwá akáidi.*
soldiers sm-PAST-dance-CAUS-CAUS-fv girls to prisoners  
“The soldiers made the prisoners make the girls dance.”

We derive the verb in (15) by applying the causative rule twice, assuming one of the alternative ICs posited above for the causee argument:
Problem Set 6

(15) vin ‘dance’
    CAUS { theme }
    CAUS { causer theme }

Finally, note that the passive morpheme can be combined with either the causative or the applicative morpheme, on a single verb. Example (16a) uses an intransitive verb; (16b) is a causative; (16c) shows the effect of adding both a causative and a passive morpheme to the same verb. Examples (17) and (18) show the similar effects with transitive verbs.

    children sm-past-laugh-fv
    “The children laughed.”

    lizard sm-past-om-laugh-caus-fv children
    “The lizard made the children laugh.”

    children sm-past-laugh-caus-pass-fv (by lizard)
    “The children were made to laugh (by the lizard).”

    lizard sm-past-hit-fv children
    “The lizard hit the children.”

b. Anyání a-na-mény-éts-a áná kwábúluzi.
    baboons sm-past-hit-caus-fv children to lizard
    “The baboons made the lizard hit the children.”

c. Aná a-na-mény-éts-édw-ák kwábúluzí (ndí anyání).
    children sm-past-hit-caus-pass-fv to lizard (by baboons)
    “The lizard was made to hit the children (by the baboons).” (= (17b))

(18) a. Mnyamatá a-na-kólól-á chímanga.
    boy sm-past-harvest-fv corn
    “The boy harvested the corn.”

b. Catherine a-na-kólól-éts-á mnyamatá chímanga.
    Catherine sm-past-harvest-caus-fv boy corn
    “Catherine made the boy harvest the corn.”

c. Mnyamatá a-na-kólól-éts-édw-ák chímanga
    (ndí Catherine).
    boy sm-past-harvest-caus-pass-fv corn
    (by Catherine)
    “The boy was made to harvest corn (by Catherine).”

Example (19) combines an applicative and a passive morpheme (cf. (11) above):
(19) Atsíkana a-na-gúl-ír-ídw-á mphátsó (ndí chitsíru).
    girls SM-PAST-buy-APPL-PASS-FV gift (by fool)
    “The girls were bought a gift (by the fool).”

Task XVI  Give full LMT derivations for the following verb forms:

    sék-éts-édw ‘laugh-CAUS-PASS’ (in (16c))
    mény-éts-édw ‘hit-CAUS-PASS’ (in (17c))
    kólól-éts-édw ‘harvest-CAUS-PASS’ (in (18c))
    gúl-ír-ídw ‘buy-APPL-PASS’ (in (19))

Be sure that the argument structures and grammatical relations in your LMT derivations correctly reflect the interpretations of the example sentences. Explain your solutions in prose and discuss any issues or problems that arise.

Task XVII  There is a regular relationship between the order in which the operations on the argument structure are performed in the derivation and the left-to-right order in which the morphemes appear relative to the verb stem. What is that relationship?
Solutions to Selected Problems

Problem Set 1

P1.1 Warlpiri

Task I

C-structure for (1):

\[
\begin{align*}
S & \quad \uparrow = \downarrow \\
(\uparrow \text{SUBJ}) = \downarrow \quad \text{NP} & \quad \uparrow = \downarrow \\
& \quad \text{Aux} & \quad (\uparrow \text{OBJ}) = \downarrow \quad \text{NP} \quad \uparrow = \downarrow \\
& \quad \text{kurdu-jarra-rlu} & \quad \text{wajilipi-nyi} & \quad \text{maliki}
\end{align*}
\]

\[
\begin{align*}
\text{kurdu-jarra-rlu} & \quad (\uparrow \text{PRED}) = \text{‘child’} & \quad (\uparrow \text{NUM}) = \text{DUAL} & \quad (\uparrow \text{CASE}) = \text{ERG}
\\
\text{wita-jarra-rlu} & \quad (\uparrow \text{ADJ PRED}) = \text{‘small’} & \quad (\uparrow \text{NUM}) = \text{DUAL} & \quad (\uparrow \text{CASE}) = \text{ERG}
\\
\text{maliki} & \quad (\uparrow \text{PRED}) = \text{‘dog’} & \quad (\uparrow \text{NUM}) = \text{SGL} & \quad (\uparrow \text{CASE}) = \text{ABS}
\end{align*}
\]

C-structure for (2):

\[
\begin{align*}
S & \quad \uparrow = \downarrow \\
(\uparrow \text{SUBJ}) = \downarrow \quad \text{NP} & \quad \uparrow = \downarrow \\
& \quad \text{Aux} & \quad (\uparrow \text{OBJ}) = \downarrow \quad \text{NP} \quad \uparrow = \downarrow \\
& \quad \text{kurdu-jarra-rlu} & \quad \text{maliki} & \quad \text{wita-jarra-rlu}
\end{align*}
\]

\[
\begin{align*}
\text{kurdu-jarra-rlu} & \quad (\uparrow \text{PRED}) = \text{‘child’} & \quad (\uparrow \text{NUM}) = \text{DUAL} & \quad (\uparrow \text{CASE}) = \text{ERG}
\\
\text{maliki} & \quad (\uparrow \text{PRED}) = \text{‘dog’} & \quad (\uparrow \text{NUM}) = \text{SGL} & \quad (\uparrow \text{CASE}) = \text{ABS}
\\
\text{wita-jarra-rlu} & \quad (\uparrow \text{ADJ PRED}) = \text{‘small’} & \quad (\uparrow \text{NUM}) = \text{DUAL} & \quad (\uparrow \text{CASE}) = \text{ERG}
\end{align*}
\]
C-structure for (3):

\[
\begin{array}{c}
S \\
| \quad \downarrow \\
\text{NP} & \quad \text{Aux} & \quad \text{V} & \quad \text{NP} \\
\quad \uparrow & \quad \uparrow & \quad \uparrow & \quad \uparrow \\
ka-pala & \quad \text{maliki} & \quad \text{wajili-p-nyi} & \quad \text{wita-jarra-rlu} \\
\text{N} & \quad \text{N} & \quad \text{N} & \quad \text{N} \\
\quad \uparrow & \quad \uparrow & \quad \uparrow & \quad \uparrow \\
\text{↑ ASPECT} = \text{PR. IMP.} & \quad \text{↑ SUBJ NUM} = \text{DUAL} & \quad \text{↑ TENSE} = \text{NONPAST} & \quad \text{↑ ADJ PRED} = \text{′small′} \\
\text{(↑ PRED) = ′dog′} & \quad \text{(↑ NUM) = \text{SG}} & \quad \text{(↑ CASE) = \text{ERG}} & \quad \text{(↑ NUM) = \text{DUAL}} \\
\text{(↑ CASE) = \text{ABS}} & \quad \text{(↑ NUM) = \text{DUAL}} & \quad \text{(↑ CASE) = \text{ERG}} & \quad \text{(↑ CASE) = \text{ERG}} \\
\end{array}
\]

F-structure for (1), (2), and (3):

\[
\begin{array}{c}
\text{PRED} \quad \text{′chase}(f_1, f_2)′ \\
\text{SUBJ} \quad f_1 : \quad \begin{array}{c}
\text{PRED} \quad \text{′child′} \\
\text{NUM} \quad \text{DUAL} \\
\text{CASE} \quad \text{ERG} \\
\text{ADJ} \quad [\text{PRED} \quad \text{′small′}] \\
\end{array} \\
\text{OBJ} \quad f_2 : \quad \begin{array}{c}
\text{PRED} \quad \text{′dog′} \\
\text{NUM} \quad \text{SG} \\
\text{CASE} \quad \text{ABS} \\
\end{array} \\
\text{TENSE} \quad \text{NONPAST} \\
\text{ASPECT} \quad \text{PRESENT.IMPERFECT} \\
\end{array}
\]

\[\text{Problem Set 2}^{1}\]

\[\text{P2.1 Spanish}\]

\[\text{Task I}\]

\[
\begin{array}{c}
\text{VP} \quad \rightarrow \quad \uparrow = \downarrow \\
\quad \left( \quad \begin{array}{c}
\text{NP} \quad \text{(↑ OBJ)} = \downarrow \\
\quad \left( \quad \downarrow \text{ANIM} \quad = \text{c} \quad \right) \\
\end{array} \quad \right) \quad \left( \begin{array}{c}
\text{PP} \quad \text{(↑ OBJ)} = \downarrow \\
\end{array} \right) \\
\text{NP} \quad \rightarrow \quad \text{N} \quad \uparrow = \downarrow \\
\end{array}
\]

\[^{1}\text{Henceforth in these solutions, the lexical information in terminal nodes will be abbreviated as simply the word form. The rest of the relevant lexical entries will have been provided either in the problem set or as (part of) the solution to previous tasks.}\]
Task II

C-structure for (1a):

F-structure for (1a):

```
PRED  'see[\(f_1,f_2\)]'
TENSE  PAST

SUBJ  \(f_1\):
  [PRED  'Juan']
    [NUM  SG]
      [GEND  MASC]
        [ANIM  +]

OBJ  \(f_2\):
  [PRED  'something']
    [ANIM  -]
```

C-structure for (2a):

F-structure for (2a):

```
PRED  'see[\(f_1,f_2\)]'
TENSE  PAST

SUBJ  \(f_1\):
  [PRED  'Juan']
    [NUM  SG]
      [GEND  MASC]
        [ANIM  +]

OBJ  \(f_2\):
  [PRED  'someone']
    [ANIM  +]
      [CASE  ACC]
```

Task III

```
\[
\overline{V} \rightarrow \uparrow \uparrow \left( \begin{array}{c}
\uparrow \downarrow \left( \begin{array}{c}
\uparrow \downarrow \left( \begin{array}{c}
\downarrow \left[\text{ANIM} = c - \right]
\end{array}\right)
\end{array}\right)
\end{array}\right)\begin{array}{c}
\uparrow \downarrow \left( \begin{array}{c}
\downarrow \left[\text{ANIM} = c - \right]
\end{array}\right)
\end{array}\right)
\end{array}\right)\]```
Task IV

C-structure for (3a):

\[
S \\
(\uparrow \text{SUBJ}) = \downarrow \\
\text{NP} \\
\uparrow = \downarrow \\
\text{VP} \\
\uparrow = \downarrow \\
\text{N} \\
\uparrow = \downarrow \\
\text{juan} \\
\uparrow = \downarrow \\
\text{V} \\
\uparrow = \downarrow \\
\text{P} \\
\uparrow = \downarrow \\
\text{NP} \\
\uparrow = \downarrow \\
\text{PP} \\
\uparrow = \downarrow \\
\text{N} \\
\uparrow = \downarrow \\
\text{PP} \\
\uparrow = \downarrow \\
\text{V} \\
\uparrow = \downarrow \\
\text{V} \\
\uparrow = \downarrow \\
\text{V} \\
\uparrow = \downarrow \\
\text{V} \\
\uparrow = \downarrow \\
\text{PP} \\
\uparrow = \downarrow \\
\text{PP} \\
\uparrow = \downarrow \\
\text{P} \\
\uparrow = \downarrow \\
\text{P} \\
\uparrow = \downarrow \\
\text{P} \\
\uparrow = \downarrow \\
\text{P} \\
\uparrow = \downarrow \\
\text{N} \\
\uparrow = \downarrow \\
\text{Pedro}
\]

F-structure for (3a):

\[
\begin{align*}
\text{PRED} & : \text{‘see } \langle f_1, f_2 \rangle \text{’} \\
\text{TENSE} & : \text{PAST} \\
\text{SUBJ} f_1 : & \begin{cases} \\
\text{PRED} & : \text{‘Juan’} \\
\text{NUM} & : \text{SG} \\
\text{GEND} & : \text{MASC} \\
\text{ANIM} & : + \\
\end{cases} \\
\text{OBJ} f_2 : & \begin{cases} \\
\text{PRED} & : \text{‘Pedro’} \\
\text{NUM} & : \text{SG} \\
\text{GEND} & : \text{MASC} \\
\text{ANIM} & : + \\
\text{CASE} & : \text{ACC} \\
\end{cases}
\end{align*}
\]

C-structure for (3b):

\[
\begin{align*}
S \\
(\uparrow \text{SUBJ}) = \downarrow \\
\text{NP} \\
\uparrow = \downarrow \\
\text{VP} \\
\uparrow = \downarrow \\
\text{N} \\
\uparrow = \downarrow \\
\text{juan} \\
\uparrow = \downarrow \\
\text{CL} \\
\uparrow = \downarrow \\
\text{lo} \\
\uparrow = \downarrow \\
\text{vió}
\end{align*}
\]

F-structure for (3b):

\[
\begin{align*}
\text{PRED} & : \text{‘see } \langle f_1, f_2 \rangle \text{’} \\
\text{TENSE} & : \text{PAST} \\
\text{SUBJ} f_1 : & \begin{cases} \\
\text{PRED} & : \text{‘Juan’} \\
\text{NUM} & : \text{SG} \\
\text{GEND} & : \text{MASC} \\
\text{ANIM} & : + \\
\end{cases} \\
\text{OBJ} f_2 : & \begin{cases} \\
\text{PRED} & : \text{‘pro’} \\
\text{NUM} & : \text{SG} \\
\text{GEND} & : \text{MASC} \\
\text{PERS} & : 3 \\
\text{CASE} & : \text{ACC} \\
\end{cases}
\end{align*}
\]
Task VI

lo CL ( (↑ PRED) = ‘pro’ )
   (↑ CASE) = ACC
   (↑ NUM) = SG
   (↑ PERS) = 3
   (↑ GEND) = MASC

los CL ( (↑ PRED) = ‘pro’ )
   (↑ CASE) = ACC
   (↑ NUM) = PL
   (↑ PERS) = 3
   (↑ GEND) = MASC

P2.2 Moroccan Arabic

Task VII

mšat V (↑ PRED) = ‘go ((↑ SUBJ))’
   (↑ SUBJ PRED) = ‘pro’
   (↑ ASPECT) = PERF
   (↑ SUBJ NUM) = SG
   (↑ SUBJ GEND) = FEM
   (↑ SUBJ PERS) = 3

šratu V (↑ PRED) = ‘buy ((↑ SUBJ), (↑ OBJ))’
   (↑ SUBJ PRED) = ‘pro’
   (↑ ASPECT) = PERF
   (↑ SUBJ NUM) = SG
   (↑ SUBJ GEND) = FEM
   (↑ SUBJ PERS) = 3
   (↑ OBJ PRED) = ‘pro’
   (↑ OBJ NUM) = SG
   (↑ OBJ GEND) = MASC
   (↑ OBJ PERS) = 3

lib P (↑ CASE) = OBL go ∨ (↑ CASE) = OBL exp
   (↑ OBJ PRED) = ‘pro’
   (↑ OBJ NUM) = SG
   (↑ OBJ GEND) = MASC
   (↑ OBJ PERS) = 3
Task VIII

C-structure for (1b):  F-structure for (1b):

\[
\begin{align*}
S & \quad \text{PRED} \quad \text{'go}(f_1)' \\
\uparrow = \downarrow & \quad \text{ASPECT} \quad \text{PERF} \\
V & \quad \text{SUBJ} \quad f_1 : \quad \begin{bmatrix}
\text{PRED} & \text{'pro'} \\
\text{NUM} & \text{SG} \\
\text{GEND} & \text{FEM} \\
\text{PERS} & \text{3}
\end{bmatrix}
\end{align*}
\]

\[
\begin{align*}
\uparrow = \downarrow & \\
\text{mšat}
\end{align*}
\]

C-structure for (2a):  F-structure for (2a):

\[
\begin{align*}
S & \quad \text{PRED} \quad \text{'buy}(f_1, f_2)’ \\
\uparrow = \downarrow & \quad \text{ASPECT} \quad \text{PERF} \\
\text{NP} & \quad \text{SUBJ} \quad f_1 : \quad \begin{bmatrix}
\text{PRED} & \text{'girl'} \\
\text{NUM} & \text{SG} \\
\text{GEND} & \text{FEM} \\
\text{PERS} & \text{3}
\end{bmatrix}
\end{align*}
\]

\[
\begin{align*}
\text{šrat} & \quad \text{OBJ} \quad f_2 : \quad \begin{bmatrix}
\text{PRED} & \text{'bread'} \\
\text{NUM} & \text{SG} \\
\text{GEND} & \text{MASC} \\
\text{PERS} & \text{3}
\end{bmatrix}
\end{align*}
\]

C-structure for (2b):  F-structure for (2b):

\[
\begin{align*}
S & \quad \text{PRED} \quad \text{'buy}(f_1, f_2)’ \\
\uparrow = \downarrow & \quad \text{ASPECT} \quad \text{PERF} \\
\text{NP} & \quad \text{SUBJ} \quad f_1 : \quad \begin{bmatrix}
\text{PRED} & \text{'girl'} \\
\text{NUM} & \text{SG} \\
\text{GEND} & \text{FEM} \\
\text{PERS} & \text{3}
\end{bmatrix}
\end{align*}
\]

\[
\begin{align*}
\text{šratu} & \quad \text{OBJ} \quad f_2 : \quad \begin{bmatrix}
\text{PRED} & \text{'pro'} \\
\text{NUM} & \text{SG} \\
\text{GEND} & \text{MASC} \\
\text{PERS} & \text{3}
\end{bmatrix}
\end{align*}
\]
C-structure for (3a):

\[ S \]

\[
\begin{array}{c}
\uparrow = \downarrow \\
V & NP & (\uparrow \text{OBJ}) = \downarrow \\
\text{e\={t}a} & N & (\uparrow \text{OBJ}) = \downarrow \\
& & P \\
muh\text{end} & lektab & l \\
& & N \\
& & edderri
\end{array}
\]

F-structure for (3a):

\[
\begin{array}{c}
\text{PRED} & \text{‘give}\langle f_1, f_2, f_3\rangle' \\
\text{ASPECT} & \text{PERF} \\
\text{SUBJ} f_1 : & \text{PRED} \text{‘Mohend’} \\
& NUM \text{SG} \\
& \text{GEND} \text{MASC} \\
& \text{PERS 3} \\
\text{OBJ} f_2 : & \text{PRED} \text{‘book’} \\
& NUM \text{SG} \\
& \text{PERS 3} \\
\text{OBL}_\text{go} & \text{CASE} \\
\text{OBJ} f_3 : & \text{PRED} \text{‘boy’} \\
& NUM \text{SG} \\
& \text{PERS 3} \\
& \text{GEND} \text{MASC}
\end{array}
\]

C-structure for (4b):

\[ S \]

\[
\begin{array}{c}
\uparrow = \downarrow \\
V & PP & (\uparrow \text{SUBJ}) = \downarrow \\
\text{m\={s}aw} & P & \downarrow \\
& & \text{N} \\
& \text{lih} & \text{leflus}
\end{array}
\]
F-structure for (4b):

\[
\begin{aligned}
&PRED \quad \text{‘lose } \langle f_1, f_2 \rangle' \\
&ASPECT \quad \text{PERF} \\
&\text{SUBJ } \ f_1 : \begin{bmatrix}
&PRED \quad \text{‘money’} \\
&NUM \quad \text{PL} \\
&PERS \quad 3
\end{bmatrix} \\
&\text{OBJ } \ f_2 : \begin{bmatrix}
&PRED \quad \text{‘pro’} \\
&NUM \quad \text{SG} \\
&PERS \quad 3 \\
&GEND \quad \text{MASC}
\end{bmatrix}
\end{aligned}
\]

**P2.3 Irish**

Task XI

*chuirfinn* V  
\((↑ PRED) = \text{‘apply-for } \langle (↑ \text{SUBJ}), (↑ \text{obl}, \text{OBJ}) \rangle'\) 
\((↑ \text{SUBJ PRED}) = \text{‘pro’}\) 
\((↑ \text{SUBJ PERS}) = 1\) 
\((↑ \text{SUBJ NUM}) = \text{SG}\) 
\((↑ \text{COND}) = +\) 
\((↑ \text{LOC}) = c +\)

*chuirféa* V  
\((↑ PRED) = \text{‘apply-for } \langle (↑ \text{SUBJ}), (↑ \text{obl}, \text{OBJ}) \rangle'\) 
\((↑ \text{SUBJ PRED}) = \text{‘pro’}\) 
\((↑ \text{SUBJ PERS}) = 2\) 
\((↑ \text{SUBJ NUM}) = \text{SG}\) 
\((↑ \text{COND}) = +\) 
\((↑ \text{LOC}) = c +\)

*chuirfeadh* V  
\((↑ PRED) = \text{‘apply-for } \langle (↑ \text{SUBJ}), (↑ \text{obl}, \text{OBJ}) \rangle'\) 
\((↑ \text{COND}) = +\) 
\((↑ \text{LOC}) = c +\)
Task XII

C-structure for (7a):

```
S
  ↑ = ↓  (↑ SUBJ) = ↓  ↑ = ↓  (↑ (↓ CASE)) = ↓
  V       NP        Part          PP
    ↑ = ↓    ↑ = ↓    ↑ = ↓
  chuir   N      Part
          ↑ = ↓
        mé  féin
```

F-structure for (7a):

```
PRED  ‘apply-for (f₁, f₂)’
LOC    +
TENSE  PAST
SUBJ    f₁:
  NUM  SG
  PERS  1
  REFL  +
  CASE  OBL ar
OBL ar
OBJ    f₂:
  DEF    +
  DEIXIS DISTANT
```

C-structure for (7b):

```
S
  ↑ = ↓  (↑ SUBJ) = ↓  ↑ = ↓  (↑ (↓ CASE)) = ↓
  V       NP        Part          PP
    ↑ = ↓    ↑ = ↓    ↑ = ↓
  chuirfinn Part
          ↑ = ↓
        féin
```
F-structure for (7b):

\[
\begin{align*}
\text{PRED} & \quad \text{‘apply-for} \langle f_1, f_2 \rangle' \\
\text{LOC} & \quad + \\
\text{COND} & \quad + \\
\text{SUBJ} f_1 : & \quad \begin{cases}
\text{PRED} & \quad \text{‘pro’} \\
\text{NUM} & \quad \text{SG} \\
\text{PERS} & \quad 1 \\
\text{REFL} & \quad +
\end{cases} \\
\text{OBL}_{ar} & \quad \begin{cases}
\text{CASE} & \quad \text{obl} \\
\text{OBJ} f_2 : & \quad \begin{cases}
\text{PRED} & \quad \text{‘job’} \\
\text{DEF} & \quad + \\
\text{DEIXIS} & \quad \text{DISTANT}
\end{cases}
\end{cases}
\end{align*}
\]

**P2.4 Noun incorporation in Greenlandic**

**Task XIII**

-\textit{-garpoq} \ V_{\text{suff}} (\uparrow \text{PRED}) = \text{‘have} \langle (\uparrow \text{SUBJ}), (\uparrow \text{OBL}) \rangle’
  
  (\uparrow \text{MOOD}) = \text{INDIC}
  
  ( (\uparrow \text{SUBJ PRED}) = \text{‘pro’} )
  
  (\uparrow \text{SUBJ PERS}) = 3
  
  (\uparrow \text{SUBJ NUM}) = \text{SG}
  
  (\uparrow \text{SUBJ CASE}) = \text{ABS}
  
  (\uparrow \text{OBL CASE}) = \text{INST}

-\textit{-sivoq} \ V_{\text{suff}} (\uparrow \text{PRED}) = \text{‘get} \langle (\uparrow \text{SUBJ}), (\uparrow \text{OBL}) \rangle’
  
  (\uparrow \text{MOOD}) = \text{INDIC}
  
  ( (\uparrow \text{SUBJ PRED}) = \text{‘pro’} )
  
  (\uparrow \text{SUBJ PERS}) = 3
  
  (\uparrow \text{SUBJ NUM}) = \text{SG}
  
  (\uparrow \text{SUBJ CASE}) = \text{ABS}
  
  (\uparrow \text{OBL CASE}) = \text{INST}

**Task XIV**

\textit{-qimmeqarpoq} \ V (\uparrow \text{PRED}) = \text{‘have} \langle (\uparrow \text{SUBJ}), (\uparrow \text{OBL}) \rangle’
  
  (\uparrow \text{MOOD}) = \text{INDIC}
  
  ( (\uparrow \text{SUBJ PRED}) = \text{‘pro’} )
  
  (\uparrow \text{SUBJ PERS}) = 3
  
  (\uparrow \text{SUBJ NUM}) = \text{SG}
  
  (\uparrow \text{SUBJ CASE}) = \text{ABS}
  
  (\uparrow \text{OBL PRED}) = \text{‘dog’}
  
  (\uparrow \text{OBL CASE}) = \text{INST}
Solutions to Selected Problems

\[\text{sapangarsivoq} \quad V \quad (\uparrow \text{PRED}) = '\text{get}((\uparrow \text{SUBJ}), (\uparrow \text{OBL}))'\]

\((\uparrow \text{MOOD}) = \text{INDIC} \quad (\uparrow \text{SUBJ PRED}) = '\text{pro}' \quad (\uparrow \text{SUBJ PERS}) = 3 \quad (\uparrow \text{SUBJ NUM}) = \text{SG} \quad (\uparrow \text{SUBJ CASE}) = \text{ABS} \quad (\uparrow \text{OBL PRED}) = '\text{bead}' \quad (\uparrow \text{OBL CASE}) = \text{INST}\]

Task XV

\[V \rightarrow N_{\text{stem}}\quad V_{\text{suff}}\]

\((\uparrow \text{OBL}) = \downarrow \quad \uparrow = \downarrow\]

Task XVI

C-structure for (11):

F-structure for (11):

\[
\begin{align*}
\text{PRED} & \quad \text{MOOD} \quad \text{INDIC} \\
\text{SUBJ} f_1 & \quad \text{NUM} \quad \text{SG} \\
& \quad \text{PERS} \quad 3 \\
& \quad \text{CASE} \quad \text{ABS} \\
\text{OBL} f_2 & \quad \text{PRED} \quad '\text{big}' \\
& \quad \text{CASE} \quad \text{INST} \\
& \quad \text{NUM} \quad \text{SG}
\end{align*}
\]

C-structure for (14):

F-structure for (14):

\[
\begin{align*}
\text{PRED} & \quad \text{MOOD} \quad \text{INDIC} \\
\text{SUBJ} f_1 & \quad \text{NUM} \quad \text{SG} \\
& \quad \text{PERS} \quad 3 \\
& \quad \text{CASE} \quad \text{ABS} \\
\text{OBL} f_2 & \quad \text{PRED} \quad '\text{one}' \\
& \quad \text{CASE} \quad \text{INST} \\
& \quad \text{NUM} \quad \text{PL}
\end{align*}
\]
Problem Set 4

P4.1 German word order

Task I

Note: This CP rule is based only on the examples in (1) and (2), and is added to later in the problem. In the IP and VP rules, the alternatives DP and NP can of course be collapsed using the X’ theory of Chapter 6:

\[
\begin{align*}
\text{CP} & \longrightarrow \text{C} \quad \text{IP} \\
& \uparrow = \downarrow \quad \uparrow = \downarrow \\
\text{IP} & \longrightarrow \text{DP/NP} \quad I' \\
& (\uparrow \text{ subj}) = \downarrow \quad \uparrow = \downarrow \\
I' & \longrightarrow \text{VP} \quad I \\
& \uparrow = \downarrow \quad \uparrow = \downarrow \\
\text{VP} & \longrightarrow \text{DP/NP} \\
& (\uparrow \text{ obj}) = \downarrow \quad \left( \begin{array}{c} \text{V} \\ \uparrow = \downarrow \end{array} \right) \\
\text{DP} & \longrightarrow \left( \begin{array}{c} \text{D} \\ \uparrow = \downarrow \end{array} \right) \quad \text{NP} \\
& \uparrow = \downarrow \\
\text{NP} & \longrightarrow \text{N} \\
& \uparrow = \downarrow
\end{align*}
\]
Task II

C-structure for (1a):

\[
\text{C-structure for (1a):}
\]

\[
\begin{array}{c}
\text{CP} \\
\downarrow \quad \downarrow \\
\text{C} \quad \text{IP} \\
\downarrow \quad \downarrow \\
\text{NP} \quad \text{IP} \\
\downarrow \quad \downarrow \\
\text{I} \quad \text{I} \\
\downarrow \quad \downarrow \\
\text{VP} \quad \text{NP} \\
\downarrow \quad \downarrow \\
\text{Karl} \quad \text{Buch} \\
\end{array}
\]

F-structure for (1a):

\[
\begin{bmatrix}
\text{PRED} & \text{buy}(f_1,f_2) \\
\text{TENSE} & \text{PAST} \\
\text{MOOD} & \text{DECL} \\
\text{SUBJ} & f_1: \text{PRED} \text{‘Karl’} \\
\text{OBJ} & f_2: \text{PRED} \text{‘book’} \\
\end{bmatrix}
\]

C-structure for (2a):

\[
\text{C-structure for (2a):}
\]

\[
\begin{array}{c}
\text{CP} \\
\downarrow \quad \downarrow \\
\text{C} \quad \text{IP} \\
\downarrow \quad \downarrow \\
\text{NP} \quad \text{IP} \\
\downarrow \quad \downarrow \\
\text{I} \quad \text{I} \\
\downarrow \quad \downarrow \\
\text{VP} \quad \text{NP} \\
\downarrow \quad \downarrow \\
\text{hat} \quad \text{Buch} \\
\end{array}
\]

\[
\begin{array}{c}
\text{gekauft} \\
\downarrow \quad \downarrow \\
\text{D} \quad \text{NP} \\
\downarrow \quad \downarrow \\
\text{das} \quad \text{Buch}
\end{array}
\]
F-structure for (2a):

\[
\begin{array}{c}
\text{PRED} & \text{‘buy} (f_1, f_2)’ \\
\text{TENSE} & \text{PRES} \\
\text{ASPECT} & \text{PERF} \\
\text{MOOD} & \text{DECL} \\
\text{SUBJ} & f_1: [\text{PRED} ‘Karl’] \\
\text{OBJ} & f_2: [\text{PRED} \ ‘book’] \\
\end{array}
\]

Task III

Finite verbs in main clauses appear in the same position as complementizers in subordinate clauses: C. The following new morpholexical specifications are needed to account for (3a) and (4b). No new c-structure rules are necessary.

\[
\text{kaufte} \quad C \quad (\uparrow \text{PRED}) = \text{‘buy}\langle \langle \uparrow \text{SUBJ}, (\uparrow \text{OBJ}) \rangle \rangle \\
(\uparrow \text{TENSE}) = \text{PAST}
\]

\[
\text{hat} \quad C \quad (\uparrow \text{TENSE}) = \text{PRES} \\
(\uparrow \text{ASPECT}) = \text{PERF}
\]

Task IV

C-structure for (3a):

```
CP
   (↑ TOP) = ↓
   ↑ = ↓
   NP  C’
   ↑ = ↓
   ↑ = ↓
   ↑ = ↓
   N   C   IP
       ↑ = ↓
       ↑ = ↓
       Karl  kaufte  ↑ = ↓
               VP
       ↑ = ↓
       (↑ OBJ) = ↓
       DP
       ↑ = ↓
       D   NP
          ↑ = ↓
          ↓
          das
          ↑ = ↓
          N
          ↑
          Buch
```

F-structure for (3a):

\[
\begin{array}{c}
\text{PRED} & \text{‘buy}(f_1, f_2)’ \\
\text{TENSE} & \text{PAST} \\
\text{TOP} & f_1: [\text{PRED} ‘Karl’] \\
\text{SUBJ} & f_2: [\text{PRED} ‘book’] \\
\text{OBJ} & \text{DEF} + \\
\end{array}
\]
Task VI

One possibility:

\[
daß \quad C \quad (↑ MOOD) = DECL \quad (↑ TENSE) \quad \neg(↑ TOP)
\]

\[
kaufte \quad C \quad (↑ PRED) = \text{‘buy ((↑ subj), (↑ obj))’} \quad (↑ TENSE) = PAST \quad (↑ TOP)
\]

\[
bat \quad C \quad (↑ TENSE) = PRES \quad (↑ ASPECT) = PERF \quad (↑ TOP)
\]

In view of the default \((↑ SUBJ) = (↑ TOP)\), this solution requires a constraint that \(TOP\) constituents are sentence-initial. (Compare the principle of clause prominence of DFS in Chapter 9.)
P4.2 Person and number marking in Wambaya

Task VII

gininga  I  (↑ TENSE) = PAST
          ( (↑ SUBJ PRED) = ‘pro’ )
          (↑ SUBJ PERS) = 3
          (↑ SUBJ NUM) = SG
          (↑ SUBJ GEND) = MASC
          ( (↑ OBJ PRED) = ‘pro’ )
          (↑ OBJ PERS) = 1
          (↑ OBJ NUM) = SG

Task VIII

C-structure for (3a)

\[
\begin{array}{c}
\text{IP} \\
\uparrow = \downarrow \\
\text{I} \\
\uparrow = \downarrow \\
\neg (\uparrow \text{FOC}) \\
\text{V} \\
\uparrow = \downarrow \\
\text{n} \text{g} \text{a} \text{j} \text{b} \text{i} \\
\uparrow = \downarrow \\
\text{g} \text{i} \text{n} \text{i} \text{g} \text{a} \\
\uparrow = \downarrow \\
\text{n} \text{g} \text{a} \text{w} \text{u} \text{r} \text{n} \text{i} \text{j} \text{i} \\
\uparrow = \downarrow \\
\text{a} \text{l} \text{a} \text{n} \text{g} \text{i} \text{n} \text{i} \\
\end{array}
\]

F-structure for (3a):

\[
\begin{bmatrix}
\text{PRED} & \text{‘see} (f_1, f_2)’ \\
\text{TENSE} & \text{PAST} \\
\text{SUBJ} & f_1: \\
 & \begin{bmatrix}
\text{PRED} & \text{‘boy’} \\
\text{CASE} & \text{ERG} \\
\text{PERS} & 3 \\
\text{NUM} & \text{SG} \\
\text{GEND} & \text{MASC}
\end{bmatrix} \\
\text{OBJ} & f_2: \\
 & \begin{bmatrix}
\text{PRED} & \text{‘pro’} \\
\text{CASE} & \text{ABS} \\
\text{PERS} & 1 \\
\text{NUM} & \text{SG}
\end{bmatrix}
\end{bmatrix}
\]
C-structure for (3b)

F-structure for (3b)

C-structure for (3c)

F-structure for (3c)

Task IX

\[
gininga  \quad (\uparrow \text{TENSE}) = \text{PAST} \\
((\uparrow \text{SUBJ PRED}) = \text{‘pro’}) \\
(\uparrow \text{SUBJ PERS}) = 3 \\
(\uparrow \text{SUBJ NUM}) = \text{SG} \\
(\uparrow \text{SUBJ GEND}) = \text{MASC} \\
(\uparrow \text{OBJ PERS}) = 1 \\
((\uparrow \text{OBJ PRED}) = \text{‘pro’} \\
((\uparrow \text{OBJ NUM}) = \text{SG})
\]
Task X

C-structure for (4c)

\[
\begin{align*}
\text{IP} & \quad \uparrow = \downarrow \\
\text{I} & \quad \uparrow = \downarrow \\
\neg(\uparrow \text{FOC}) & \quad \uparrow = \downarrow \\
V & \quad \uparrow = \downarrow \\
\text{ngajbi} & \quad \text{giminga} \\
\text{NP} & \\
\text{SUBJ} = \downarrow \\
\text{ngirra} & \\
\end{align*}
\]

F-structure for (4c)

\[
\text{PRED} \quad \text{‘see} \langle f_1, f_2 \rangle\text{’} \\
\text{TENSE} \quad \text{PAST} \\
\text{SUBJ} \quad f_1: \quad \begin{align*}
\text{PRED} & \quad \text{‘pro’} \\
\text{CASE} & \quad \text{ERG} \\
\text{PERS} & \quad 3 \\
\text{NUM} & \quad \text{SG} \\
\text{GEND} & \quad \text{MASC} \\
\end{align*} \\
\text{OBJ} \quad f_2: \quad \begin{align*}
\text{PRED} & \quad \text{‘pro’} \\
\text{CASE} & \quad \text{ABS} \\
\text{PERS} & \quad 1 \\
\text{NUM} & \quad \text{PL} \\
\end{align*}
\]

Task XI

The data about object agreement in Wambaya argue against an analysis in which the subject and object markers are always incorporated pronominals and the NPs (optional) adjuncts. If this were the case, there would be no way of accounting for the differences between constructions with singular and nonsingular objects. When the object is nonsingular, the corresponding NP is not optional but obligatory. The object marker in the auxiliary has a different function according to the number of the object: when the object is singular, it can carry the features (\(\uparrow \text{OBJ PRED}\)) = ‘pro’ and (\(\uparrow \text{OBJ NUM}\)) = sg; when the object is nonsingular, it cannot. Thus, only in constructions with a singular object can it function as an incorporated pronominal; when the object is nonsingular, it can only function as an agreement marker.
P4.4 Subject agreement in West Flemish

Task XVI

C-structure for (1a):

\[
\begin{array}{c}
\text{CP} \\
\text{IP} \\
\text{NP} \\
\text{VP} \\
\text{V} \\
\text{D} \\
\text{N} \\
\text{I} \\
\text{eet} \\
\text{gelezen} \\
\text{dienen} \\
\text{boek}
\end{array}
\]

F-structure for (1a):

\[
\begin{bmatrix}
\text{PRED} & \text{read}(f_1, f_2) \\
\text{TENSE} & \text{PRES} \\
\text{ASPECT} & \text{PERF} \\
\text{MOOD} & \text{DECL} \\
\text{SUBJ} & f_1: [\text{PRED} \ 'Marie'] \\
\text{OBJ} & f_2: [\begin{bmatrix} \text{PRED} & \text{book} \\
\text{DEF} & + \\
\text{DEIXIS} & \text{DISTANT} \end{bmatrix}]
\end{bmatrix}
\]
Task XVII

**goat**

I

(↑ PRED) = ‘go (↑ subj)’
(↑ TENSE) = PRES
(↑ SUBJ) = ↓
(↓ PERS) = 2 ∨ (↓ PERS) = 3
(↓ NUM) = SG

**goan**

I

(↑ PRED) = ‘go (↑ subj)’
(↑ TENSE) = PRES
(↑ SUBJ) = ↓
(↓ PERS) = 1 ∨ (↓ PERS) = 3
(↓ NUM) = PL

Task XVIII

**daj**

C

(↑ MOOD) = DECL
(↑ TENSE)
¬(↑ TOP)
(↑ SUBJ) = ↓
(↓ PRED) = ‘pro’
(↓ PERS) = 2
(↓ BIND) = β
Solutions to Selected Problems

dase C $(\uparrow \text{MOOD}) = \text{DECL}$
$(\uparrow \text{TENSE})$
$\neg(\uparrow \text{TOP})$
$(\uparrow \text{SUBJ}) = \downarrow$
  $(\downarrow \text{PRED}) = \text{‘pro’}$
  $(\downarrow \text{PERS}) = 3$
  $(\downarrow \text{NUM}) = \text{SG}$
  $(\downarrow \text{GEND}) = \text{FEM}$
  $(\downarrow \text{BIND}) = \beta$

da C $(\uparrow \text{MOOD}) = \text{DECL}$
$(\uparrow \text{TENSE})$
$\neg(\uparrow \text{TOP})$
$(\uparrow \text{SUBJ}) = \downarrow$
  $(\downarrow \text{PERS}) = 3$
  $(\downarrow \text{NUM}) = \text{SG}$
  $(\neg(\downarrow \text{BIND})$

dan C $(\uparrow \text{MOOD}) = \text{DECL}$
$(\uparrow \text{TENSE})$
$\neg(\uparrow \text{TOP})$
$(\uparrow \text{SUBJ}) = \downarrow$
  $(\downarrow \text{PERS}) = 3$
  $(\downarrow \text{NUM}) = \text{PL}$
  $(\neg(\downarrow \text{BIND})$

gie D $(\uparrow \text{PRED}) = \text{‘pro’}$
$(\uparrow \text{PERS}) = 2$
$(\uparrow \text{NUM}) = \text{SG}$
$(\uparrow \text{BIND}) = \beta$

zie D $(\uparrow \text{PRED}) = \text{‘pro’}$
$(\uparrow \text{PERS}) = 3$
$(\uparrow \text{NUM}) = \text{SG}$
$(\uparrow \text{GEND}) = \text{FEM}$
$(\uparrow \text{BIND}) = \beta$

gunder D $(\uparrow \text{PRED}) = \text{‘pro’}$
$(\uparrow \text{PERS}) = 2$
$(\uparrow \text{NUM}) = \text{PL}$
$(\uparrow \text{BIND}) = \beta$
Task XIX

C-structure for (3g):

\[
\begin{align*}
\text{CP} & \quad \text{IP} \\
\uparrow &= \downarrow & \uparrow &= \downarrow \\
\text{C} & & \text{NP} \\
\text{da} & & \text{I'} \\
\uparrow &= \downarrow & \uparrow &= \downarrow \\
\text{N} & & \text{I} \\
\text{Marie} & & \text{goat}
\end{align*}
\]

F-structure for (3g):

\[
\begin{align*}
\text{PRED} & : 'go(f_1)' \\
\text{TENSE} & : \text{PRES} \\
\text{MOOD} & : \text{DECL} \\
\text{SUBJ} f_1: & \\
\text{PERS} & : 3 \\
\text{NUM} & : \text{SG}
\end{align*}
\]

C-structure for (4a):

\[
\begin{align*}
\text{CP} & \quad \text{IP} \\
\uparrow &= \downarrow & \uparrow &= \downarrow \\
\text{C} & & \text{NP} \\
\text{dase} & & \text{I'} \\
\uparrow &= \downarrow & \uparrow &= \downarrow \\
\text{D} & & \text{I} \\
\text{zie} & & \text{goat}
\end{align*}
\]

F-structure for (4a):

\[
\begin{align*}
\text{PRED} & : 'go(f_1)' \\
\text{TENSE} & : \text{PRES} \\
\text{MOOD} & : \text{DECL} \\
\text{SUBJ} f_1: & \\
\text{PERS} & : 3 \\
\text{NUM} & : \text{SG} \\
\text{GEND} & : \text{FEM} \\
\text{BIND} & : \beta
\end{align*}
\]

C-structure for (4b):

\[
\begin{align*}
\text{CP} & \quad \text{IP} \\
\uparrow &= \downarrow & \uparrow &= \downarrow \\
\text{C} & & \text{NP} \\
\text{dase} & & \text{I'} \\
\uparrow &= \downarrow & \uparrow &= \downarrow \\
\text{D} & & \text{I} \\
\text{zie} & & \text{goat}
\end{align*}
\]

F-structure for (4b):

\[
\begin{align*}
\text{PRED} & : 'go(f_1)' \\
\text{TENSE} & : \text{PRES} \\
\text{MOOD} & : \text{DECL} \\
\text{SUBJ} f_1: & \\
\text{PERS} & : 3 \\
\text{NUM} & : \text{SG} \\
\text{GEND} & : \text{FEM} \\
\text{BIND} & : \beta
\end{align*}
\]
Task XX

goaj  C  \(( \uparrow \text{PRED}) = \text{‘go} \langle (\uparrow \text{SUBJ}) \rangle \)\)
\(( \uparrow \text{TENSE}) = \text{PRES}\)
\(( \uparrow \text{TOP})\)
\(( \uparrow \text{SUBJ}) = \downarrow\)
   \hspace{1em} \(( (\downarrow \text{PRED}) = \text{‘pro’})\)
   \hspace{1em} \(( \downarrow \text{PERS}) = 2\)
   \hspace{1em} \(( \downarrow \text{BIND}) = \beta\)

goase  C  \(( \uparrow \text{PRED}) = \text{‘go} \langle (\uparrow \text{SUBJ}) \rangle \)\)
\(( \uparrow \text{TENSE}) = \text{PRES}\)
\(( \uparrow \text{TOP})\)
\(( \uparrow \text{SUBJ}) = \downarrow\)
   \hspace{1em} \(( (\downarrow \text{PRED}) = \text{‘pro’})\)
   \hspace{1em} \(( \downarrow \text{PERS}) = 3\)
   \hspace{1em} \(( \downarrow \text{NUM}) = \text{SG}\)
   \hspace{1em} \(( \downarrow \text{GEND}) = \text{FEM}\)
   \hspace{1em} \(( \downarrow \text{BIND}) = \beta\)

goa  C  \(( \uparrow \text{PRED}) = \text{‘go} \langle (\uparrow \text{SUBJ}) \rangle \)\)
\(( \uparrow \text{TENSE}) = \text{PRES}\)
\(( \uparrow \text{TOP})\)
\(( \uparrow \text{SUBJ}) = \downarrow\)
   \hspace{1em} \(( \downarrow \text{PERS}) = 3\)
   \hspace{1em} \(( \downarrow \text{NUM}) = \text{SG}\)
   \hspace{1em} \(\neg(( \downarrow \text{BIND})\))

goan  C  \(( \uparrow \text{PRED}) = \text{‘go} \langle (\uparrow \text{SUBJ}) \rangle \)\)
\(( \uparrow \text{TENSE}) = \text{PRES}\)
\(( \uparrow \text{TOP})\)
\(( \uparrow \text{SUBJ}) = \downarrow\)
   \hspace{1em} \(( \downarrow \text{PERS}) = 3\)
   \hspace{1em} \(( \downarrow \text{NUM}) = \text{PL}\)
   \hspace{1em} \(\neg(( \downarrow \text{BIND})\))

Task XXI
The subject agreement suffixes attach to elements of category C.
Task XXII

C-structure for (5c), with subject pronoun

C-structure for (5c), without subject pronoun
F-structure for (5c)

\[
\begin{array}{c}
PRED & \text{‘go} (f_1)\text{’} \\
TENSE & \text{PRES} \\
TOP & [PRED \text{ ‘tomorrow’}] \\
SUBJ & f_1: \\
& \{ \text{NUM \text{SG}} \} \\
& \{ \text{GEND \text{FEM}} \} \\
& \{ \text{BIND \beta} \} \\
ADJ & \{ \}
\end{array}
\]
References for the Problems

Problem Set 1

P1.1 Warlpiri

P1.2 Monsters and How to Avoid Them
Lyons (1968), Bresnan (1982b).

Problem Set 2

P2.1 Spanish

P2.2 Moroccan Arabic

P2.3 Irish

P2.4 Noun Incorporation in Greenlandic
Sadock (1980).

Problem Set 3

P3.3 Ivatan Syntax
Reid (1966).

P3.4 Sinhala C-structure
Henadeerage (2002).

P3.5 Barasano C-structure
Problem Set 4

P4.1 German Word Order

P4.2 Person and Number Marking in Wambaya

P4.3 Head-Marking in K’ichee’
Telma Can Pixabaj and Nora England (p.c.).

P4.4 Subject Agreement in West Flemish

Problem Set 5

P5.1.1 Dutch dependent clauses
Bresnan et al. (1982).

P5.1.2 Japanese causatives
Ishikawa (1985).

P5.2.1 “Quirky” case in Icelandic

P5.2.2 Second predicates in Russian

P5.2.3 Icelandic case marking and control

P5.3.1–2 Finnish possessive suffixes I & II
Toivonen (2000).

P5.3.3 Japanese reflexives

Problem Set 6

P6.1.1 Italian

P6.1.2 Russian

P6.1.3 Empty There in English
Bresnan (1982a).
P6.2 Reflexives: Bosnian/Croatian/Serbian

P6.3 Passive, Causative, and Applicative in Chichewa
References


References


References


Bresnan, J., Kaplan, R. M. and Peterson, P. G. (1986). Coordination and the flow of information through phrase structure. Manuscript, Stanford University and Xerox PARC.


References


References


References


Jar, M. (n.d.). Reconstituted X′ constituents in LFG. Manuscript [John Maxwell III, Annie Zaenen, Ronald M. Kaplan, and Mary Dalrymple], Xerox PARC.


References


References


References


References


References


References


References


Language Index

Adioukrou 271
Apache, Jicarilla 179, 194
Arabic, Moroccan 96, 125, 358–361

Balinese 274, 346
Barasano 373–374
Bosnian/Croatian/Serbian 427–429
Bulgarian/Macedonian 207

Chinese 225, 276
Croatian see Bosnian/Croatian/Serbian
Czech 276

Dutch 19, 283, 391–392
Dyirbal 118, 341

English
   Middle 278–279
   Old 272, 276–279
   Ewe 255, 261–271, 274

Fijian 272
Finnish 118, 370–371, 407–411
Flemish, West 138, 207, 387–390
French 147–150, 156, 186–192
Fula 278–282

German 12, 197, 218–224, 276–277, 375–379, 388

Gokana 262–263, 271
Greenlandic, West 92–93, 96, 364–369

Hindi 19, 214–221
Hungarian 112, 119, 155, 209, 225, 346

Irish, Ulster 93, 95, 99, 114, 152–154, 361–364
Italian 19, 154, 274, 346, 417–422
Ivatan 110, 371–372

Japanese 19, 213, 392–398, 411–416
Jiwarli 101, 112, 115, 118

Kichaga 96, 154, 170
K’ichee’ 186, 382–387
Kihaya 169
Kiswahili 170, 217

Latin 265

Makua 170
Marathi 276, 347
Martuthunira 118
Mayali 118
Mohawk 118, 174
<table>
<thead>
<tr>
<th>Language</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navajo</td>
<td>118, 128, 156, 171–182, 185–186, 193–195, 224</td>
</tr>
<tr>
<td>Norwegian</td>
<td>258–261, 266, 275–285, 300, 346</td>
</tr>
<tr>
<td>Ojibwa</td>
<td>183</td>
</tr>
<tr>
<td>Palauan</td>
<td>154</td>
</tr>
<tr>
<td>Saami, Inari</td>
<td>370–371</td>
</tr>
<tr>
<td>Serbian</td>
<td>see Bosnian/Croatian/Serbian</td>
</tr>
<tr>
<td>Setawana</td>
<td>170</td>
</tr>
<tr>
<td>Sinhala</td>
<td>111, 372–373</td>
</tr>
<tr>
<td>Spanish</td>
<td>19, 154–155, 354–358</td>
</tr>
<tr>
<td>Swedish</td>
<td>12, 116, 147–150</td>
</tr>
<tr>
<td>Tagalog</td>
<td>102, 112, 115, 119, 235, 346</td>
</tr>
<tr>
<td>Thai</td>
<td>239–240</td>
</tr>
<tr>
<td>Turkish</td>
<td>188, 235</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>239–240</td>
</tr>
<tr>
<td>Welsh</td>
<td>111, 116, 130–135, 156</td>
</tr>
<tr>
<td>Yoruba</td>
<td>284</td>
</tr>
<tr>
<td>Zazaki (Zaza)</td>
<td>97</td>
</tr>
</tbody>
</table>
Subject Index

<table>
<thead>
<tr>
<th>(metavariable: mother node’s f-structure)</th>
<th>(metavariable: current node’s f-structure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ 51</td>
<td>↓ 51, 54–56, 70</td>
</tr>
<tr>
<td>→ (metavariable, off-path constraint) 64</td>
<td>← (metavariable, off-path constraint) 64</td>
</tr>
<tr>
<td>∈ (set membership) 70</td>
<td></td>
</tr>
<tr>
<td>α (a-structure to f-structure correspondence function) 324–325</td>
<td></td>
</tr>
<tr>
<td>φ (c-structure to f-structure correspondence function) see also constituent structure, correspondence to f-structure, correspondence function 74–76, 135–137, 316, 325–327</td>
<td></td>
</tr>
<tr>
<td>λ (labeling function) 316</td>
<td></td>
</tr>
<tr>
<td>θ (logical subject) see logical subject</td>
<td></td>
</tr>
<tr>
<td>∨ (disjunction) 59, 60–61, 106, 111, 318, 360</td>
<td></td>
</tr>
<tr>
<td>⇒ (conditional) 60–61, 71, 113–114, 141, 146, 203, 208, 219</td>
<td></td>
</tr>
<tr>
<td>⇒ (lexical rule mapping) 234, 294, 315–318</td>
<td></td>
</tr>
<tr>
<td>e (empty string) 42, 63, 66–67</td>
<td></td>
</tr>
<tr>
<td>+ see Kleene operators, plus</td>
<td></td>
</tr>
<tr>
<td>* see Kleene operators, star</td>
<td></td>
</tr>
</tbody>
</table>

adjectival passive construction 25–32, 36–37
informativeness 31–32
Sole Complement Constraint 27–28
telicity 30–31
theme subject condition 27, 29

adjective phrase (AP) complements 286–289, 293, 296, 306–307
adjoined-to nodes 105–107, 117, 124
adjunct function (ADJ) 16, 44, 46–47, 70, 94, 97, 99, 106, 109, 121, 197, 229–234, 317, 330
different from xcomp 286–289
in binding theory 229–231, 246–247, 281
adjunction see adjunct
adverb 30–31, 126, 140, 172, 202, 247, 426–427
AF see argument function
AF see nonargument function
and clitic doubling 154–156
formal theory of 151–156, 186–192
grammatical vs. anaphoric 160–171, 189–190, 258
in Chichewa 157–171, 430
in Finnish and Inari Saami 370–371

agreement (Continued)
in Navajo 171–182, 193–195
in Plains Cree 182–186
in Wambaya 380–382, 453
in West Flemish 207, 387–390
inverse 156, 182–186
similarity to incorporated pronouns 153–154
anaphor 64, 67, 160, 165, 189, 224,
229–239, 246, 253–285
anaphoric control 184, 307, 309–323,
407
vs. functional control 319–323
anaphoric linking 63, 69, 99, 162, 170,
174, 177
animacy hierarchy 96, 175–182, 186, 195,
276
annotated c-structure rules 52, 106–111,
353
argument function (af) 62, 100, 105–110,
114, 251, 305, 330–331
partial ordering of 331
argument realization see argument structure
argument structure (a-structure) 6–9, 19,
21–38, 41–42, 77, 94–97, 141,
162
as interface between syntax and lexical
semantics 326
athematic argument roles 332
binding 237–238, 254, 324–348,
430–435
different conceptions of 327–329
prominence see also lexical mapping
theory 348
syntactic classification of roles for
functions see also structure-function
theory of 329–333
aspect 31, 110, 128, 144, 347, 380–384,
394
asymmetrical object parameter (AOP) 332,
338–343, 432
a-structure see argument structure
athematic subject 304–308, 332
attribute 44–45, 46–47, 58–69,
73–76, 84–85, 138, 249–252,
284–285
binding constraints 174, 248–252, 274,
284–285
positive and negative 247–249
binding theory 189, 225, 229–253,
281–282, 299
and syntactic rank see rank
binding
by an operator see operator binding
domain 215–221, 233–237, 242–245,
247–251
principles see principle A, B, or C
binds relation 231–232
bound 231, 233
coindexing 231–232, 239
formalization of 247–253, 284–285
free 231
multiple satisfaction of binding
constraints 252
prominence principle on binding 212,
215, 217, 218–221, 244–245
functional hierarchy 97, 230, 231, 249,
251, 267
bound see binding theory
canonical structural realization of
functions see also structure-function
mapping principles 16–18, 67,
203–205
case 4–9, 23, 33–37, 60
assignment 60, 95–97, 112–114, 141,
202–209, 300, 308, 318, 320, 341
constructive 114, 141
categorial structure see constituent
structure
category 48–53, 97, 102–110, 112, 115,
117, 122–128, 135–138, 311, 316,
337
empty see empty category
functional see also X′-theory 103,
104–106
lexical see also X′-theory 103, 104–111,
116–117, 124–125, 137–138, 199,
289
mismatches 12–20, 198–199
causative verb see verb
CF see complement function
c-head see also X′-theory 127
<table>
<thead>
<tr>
<th>Subject Index</th>
<th>505</th>
</tr>
</thead>
<tbody>
<tr>
<td>clause prominence of discourse functions</td>
<td>209</td>
</tr>
<tr>
<td>codescription</td>
<td>48–54</td>
</tr>
<tr>
<td>cohead</td>
<td>51, 105, 106, 110–111, 117, 124, 129</td>
</tr>
<tr>
<td>and athematic subject</td>
<td>305</td>
</tr>
<tr>
<td>combinatorial constraint on functional heads</td>
<td>104, 314</td>
</tr>
<tr>
<td>COMP see grammatical function</td>
<td></td>
</tr>
<tr>
<td>complementizer phrase (CP)</td>
<td>3, 16–18, 102–104, 110, 121–125, 129, 137, 198–199, 323</td>
</tr>
<tr>
<td>complete nucleus see nucleus</td>
<td></td>
</tr>
<tr>
<td>and athematic subject</td>
<td>305</td>
</tr>
<tr>
<td>complex predicate</td>
<td>210, 326, 346–347</td>
</tr>
<tr>
<td>compositional</td>
<td>85–86, 92, 129</td>
</tr>
<tr>
<td>concord</td>
<td>156–157</td>
</tr>
<tr>
<td>CONCORD 186–192</td>
<td></td>
</tr>
<tr>
<td>configurational bias</td>
<td>5, 10, 324</td>
</tr>
<tr>
<td>design of grammar</td>
<td>7–9, 12–14, 21–22, 43, 72, 151, 154, 229, 231</td>
</tr>
<tr>
<td>language</td>
<td>118–119, 124–125, 157, 171, 238, 325, 337</td>
</tr>
<tr>
<td>conjunction</td>
<td>57, 59–60, 201–202</td>
</tr>
<tr>
<td>consistency see uniqueness</td>
<td></td>
</tr>
<tr>
<td>annotated c-structure</td>
<td>56, 70, 80, 83–84</td>
</tr>
<tr>
<td>annotation principles see structure-function mapping principles</td>
<td></td>
</tr>
<tr>
<td>correspondence to f-structure</td>
<td>48–58</td>
</tr>
<tr>
<td>crosslinguistic variation of see also phrase structure, criteria for; solution algorithm</td>
<td>89–94, 125</td>
</tr>
<tr>
<td>constraining equation see equations</td>
<td></td>
</tr>
<tr>
<td>context</td>
<td>79–82, 85, 92–93</td>
</tr>
<tr>
<td>control see anaphoric control; functional control</td>
<td></td>
</tr>
<tr>
<td>coordination</td>
<td>142, 201–203, 412–415</td>
</tr>
<tr>
<td>core grammatical function</td>
<td>21, 96–97</td>
</tr>
<tr>
<td>correspondence</td>
<td>1–19, 39, 43, 84, 90, 94, 105, 115, 122, 129–139, 159–160, 305</td>
</tr>
<tr>
<td>between c-structure and f-structure</td>
<td>48–58</td>
</tr>
<tr>
<td>Correspondence Architecture</td>
<td>1–2, 15–19, 72, 85</td>
</tr>
<tr>
<td>CP see complementizer phrase</td>
<td></td>
</tr>
<tr>
<td>c-structure see constituent structure</td>
<td></td>
</tr>
<tr>
<td>c-structure gap see empty category</td>
<td></td>
</tr>
<tr>
<td>defining equation see equations</td>
<td></td>
</tr>
<tr>
<td>dependent marking</td>
<td>114, 118–119, 141, 199–205, 208</td>
</tr>
<tr>
<td>design principles</td>
<td>41–43</td>
</tr>
<tr>
<td>consequences of:</td>
<td></td>
</tr>
<tr>
<td>apparent information flow through c-structure</td>
<td>83–84</td>
</tr>
<tr>
<td>fragmentability</td>
<td>79–82</td>
</tr>
<tr>
<td>noncompositionality in c-structure</td>
<td>84–85</td>
</tr>
<tr>
<td>nonconfigurationality</td>
<td>82</td>
</tr>
</tbody>
</table>
Subject Index

design principles (Continued)
  monotonicity 43, 73–85
  universality 42–43
  variability see also constituent structure, crosslinguistic variation of 41–42
df see discourse function
direct object see grammatical function
disconfigurational languages see nonconfigurational languages
discourse function, grammaticalized 67, 99, 100, 330
disjunction 59–61, 75, 77, 191
Discourse Representation Theory (DRT)
  semantics for LFG 264, 273, 285
ditransitive verb see verb
domain of a binder see binding theory
dominate relation 136
down arrow (↓) see ↓
DRT see Discourse Representation Theory
economy of expression 89–94, 119–124, 133, 135, 143, 192, 205–207
  and clitics 155–156
  and DP vs. NP 200
  and extraction gaps 205–207, 210–223
  and gerundive VPs 312, 318
ellipsis 137, 158, 401–402
  sloppy identity 241–243
  strict identity 241–242
emphatic reflexive see reflexive pronoun
empty category 62, 122, 133, 152, 197, 205–206, 210–223
  as last resort 92, 205, 210
empty string 42, 63, 66–67, 197, 249–251, 284
equations
  boolean combinations of 42, 59–61
  conditional 60, 61, 71, 141, 146, 203
  conjunction of 59–60
  constraining 59, 60–62
  defining 59–61
  disjunction of 59–61, 75, 77
  negation of 60, 143
e-type pronoun see pronoun types
  existential constraint 60, 61–62
  negative existential constraint 60, 61–62, 143, 146, 231, 250–251
  exocentricity 112–115, 125
  exocentric category 112–115, 117, 119, 139
  expletive see pronoun
  exponence, distributed 138–146
  extended coherence condition 62, 69, 162, 197, 230
  extended head 135, 136, 137–138, 198–199
  extended projection see also functional domain 16, 37, 110, 129, 372
  external argument 37, 327, 337–338
  external topic 69
  extraction see unbounded dependency
  extraction configuration 11, 17, 62, 69
f-description see functional description
  feature 45, 65, 84, 93, 138–139, 186–192, 230–232
  finite domain parameter 237, 255, 257–259
  focus (FOC) see grammatical function
  f-precedence see functional precedence
  free see binding theory
  f-structure see functional structure
  function-argument bi-uniqueness 334
functional
  ambiguity 127, 167–169
  category see category, functional
  description (f-description) 47, 53–71
  domain 129, 136, 138, 204, 209–210
  (f-structure) head see functional structure
  hierarchy 97, 217–220, 229–230, 251, 267
  in binding theory see binding theory
  instantiation 45, 56, 76
  precedence (f-precedence) 213, 214, 220, 244
  predication relation see functional control
Subject Index

projections see also combinatorial constraint on functional heads
schema 104, 106
formal definition of 44–46
head 51, 112, 129, 157
sets of 70–71
uncertainty 63–70, 204, 224, 230
in binding theory 247–253
inside-out 66, 67–69, 114, 122, 181, 197, 224, 230
outside-in 67, 224
functionality of structure see also economy of expression 92
gapping 158
gerundive VPs 309–323
and anti-binding principle 245–246, 274, 321
and mixed categories 323
DP domination requirement 316
null subjects in 317
possessor subject of 316
structure of 311–319
subject of 318
vs. participial 309–311
GF see grammatical function
glue semantics xv, 42, 285
ADJ(UNCT) 16, 44–45, 48, 62–63, 69–70, 77, 94, 97, 99, 100, 105–107, 208, 217, 229, 330
as equivalence classes of c-structure expressions 94–96
COMP 19, 44, 66–68, 95, 97, 107, 217, 229, 251, 330, 332
direct object 36, 126, 160, 165, 342, 428, 430
formal definition of 45
governable 62
hierarchy see functional hierarchy
indirect object see function
not primitives of syntactic theory 100
OBJ(ECT) 8–9, 17, 19, 42, 45, 60, 62, 94–99, 100, 107, 113–114, 183, 330–331
OBJ(ECT)_o 97, 99, 100, 107, 217, 229, 330, 331
OBL(IQUE)_o 97, 99, 100, 107, 217, 229, 330, 331
POSS(essor) 98–99, 100, 180–181, 249, 267–268, 315–318, 386
primary object 99
secondary object 99
XADJ 99
grammatical relation see grammatical function
head
marking 113–115, 118–119, 156–157, 171, 197, 207, 213, 224, 382–387
mobility see head movement
movement 129–135
Head-Driven Phrase Structure Grammar (HPSG) 323
Subject Index

hierarchy of grammatical functions see grammatical function

iconicity 89–90
idioms 29–30
INDEX 186–192
indirect object see grammatical function
infinitival complement 79–81, 236–237, 256–260, 323
information structure (i-structure) 5, 98
inside-out functional uncertainty see functional uncertainty
internal
argument 327, 338
subject 200
intervention constraint 321–323
inverse agreement see agreement
intonation 20, 33, 226, 247
IP see inflectional phrase

Kleene operators
plus (+) 42, 64
star (*) 42, 64

lexical
category see also X'-theory 102–107, 110–111, 116–117, 124–125, 127, 137–138, 199, 289
entry 22, 32, 37, 191, 248
redundancy rule 22, 77
lexical conceptual structure (LCS) 327
lexical integrity principle 41, 88, 90, 92, 93, 104, 146, 213
entry 22, 32, 37, 191, 248
redundancy rule 22, 77
lexical mapping theory 17, 22, 39, 77, 79, 100, 121, 183, 227, 324–348
lexicalist hypothesis see also lexical integrity principle 24, 32, 85, 327, 347
lexicality of relation changes 2, 19, 23–32
lexocentricity 112–115, 125
LMT see lexical mapping theory
locative inversion 297, 300, 346
logical subject (Ø) 265, 330–332, 335, 341
logocentric verb hierarchy 273

logophoric domain 263, 273, 275
logophoricity 241, 255–256, 261–276, 285
and Discourse Representation Theory 264, 273, 285
vs. point of view 273–274
long-distance dependency see unbounded dependency

mapping see correspondence function
maximal projection see also X'-theory 140
minimal
complete nucleus see nucleus
finite domain 284
nucleus condition see nucleus
minimality 249–250
monotonicity 43, 73–85
of relation changes 76–79
blocking 91, 146
competition with syntax 5, 88, 92, 94, 192

movement paradoxes 11–20
passivization of that complements 13
subject-auxiliary inversion 13–14
topicalization of that complements 12, 19
VP preposing 13, 15

negation 14, 24, 58, 60, 102, 109, 148–149, 201–202, 273, 288, 313, 422–426
negative
defining equation see equations
existential constraint see existential constraint
nominalization 24, 346
nonconfigurationality 3–10, 19, 82, 112–115, 125, 138–143, 351–352, 380–382
noncore grammatical function 96–97
nonnuclear pronoun see pronoun
nonobjective syntactic function [−o] see syntactic function
nonprojecting
category 123, 143
nodes 105, 106, 111, 123–124
word 116–117, 127, 155
noun incorporation 92–94, 364–369
NUCL(EAR) see pronoun features
nuclear pronoun see pronoun
complete 299
minimal 233
minimal complete 236, 299
minimal nucleus condition 250, 255, 285
object see also grammatical function
agentive 346
nonsubcategorized 332, 336–337
objective syntactic function [+o] see syntactic function
obviation 182, 186, 261, 323
off-path constraints 64–65, 250–252
open complement see grammatical function, XCOMP
operator binding of pronominals
f-precedence condition on 213–214, 244
in English 221–223
in German 218–222
in Hindi 215–218
in Malayalam 210–214
precedence and rank condition on 218
syntactic prominence condition on 217
syntactic rank condition on 216–218
thematic prominence condition on 217
and weak crossover see weak crossover
operator complex 225–226
Optimality theory (OT) xii, 89, 346
optionality 59, 77, 156, 257, 318
outside-in functional uncertainty see functional uncertainty
Parallel Projection Architecture see Correspondence Architecture
parallel structures 2, 9, 15, 19, 39, 42, 52, 82, 84, 89–90, 217
parsing 54, 76
partial ordering of argument functions see argument function
passive 12, 17–18, 21–38, 333–341, 345–346
passivization of that-complements 13
phrase structure 3–10
category see constituent structure
criteria for 3–4
rule see constituent structure
pied piping 225, 310
pivot 95, 273
POSS(ESSOR) see grammatical function
poverty of stimulus argument 2
PRED feature see also semantic feature/form
33, 45, 52, 57–58, 62–63, 132–133, 152, 155, 189–190, 387
predicate argument structure see argument structure
predicate complement see grammatical function, XCOMP
predication
relation 286–308
template 294–295, 315–316
predicative feature see also X′-theory 103, 126–128
prepositional phrase (PP) 99, 327
as complement
c-structure 301–304
f-structure 295–301
primary object see grammatical function
Principle A see also binding theory 233–237
Principle B see also binding theory 233–237
Principle C see also binding theory 238–245
and anti-binding 245
and control 245
definition 237
pro-drop 59, 154, 159–160, 175, 196, 358
projecting nodes 105
projection principle 37
prominence principle on binding see binding theory
pronoun
  features
    agr 151–153
    bind 151–152
optionality 154
incorporation 151–195
  in Chichewa 157–171
  in Irish 361–364
  in Moroccan Arabic 358–361
  in Navajo 171–186
  similarities to agreement 154
reflexive see reflexive pronoun
types
  anti-logophoric 255, 269–275
e-type 242–243
logophoric 254–256, 261–276, 285
nonnuclear 259–261
nuclear 254–255, 259–261
subjective 254–263
prosodic structure 42, 93
proto-roles structure 427–429
reflexive pronoun
  and a-structure binding 427–429
  and inalienable possession 281–283, 300
  and physical contexts 279–283
  as subject 234–236
  complex 278–279, 284
  emphatic 258, 260, 270, 275–278, 362
  “fake” 336–337
  in Finnish 407–411
  in Icelandic 237, 257, 275
  in Japanese 411–416
  in nominative case 237
  in Warlpiri 6
  local 229–239
  nonlocal 254–285
  simple 275
typology of 275–284
regular expressions 42, 64
relation changes 21–32
relational
design of grammar 9, 11–12, 15, 19, 22, 39
hierarchy see functional hierarchy
relative
  clause 193, 210–211, 310, 320
  pronoun 165, 310
restricted syntactic function [+r] see syntactic function
resultative construction 282, 336–337, 339, 347
scrambling 7, 67, 77, 92, 214–215, 218–221
  locality of 210
  vs. topicalization 207–210
secondary object see grammatical function
semantic
  feature 45, 57, 62, 151–155, 305
  form 44–45, 47
and operator condition on pronominal binding see operator binding of pronominals; see also weak crossover
referential dependence 241–245
and a-structure binding 427–429
and inalienable possession 281–283, 300
and physical contexts 279–283
as subject 234–236
complex 278–279, 284
emphatic 258, 260, 270, 275–278, 362
“fake” 336–337
in Finnish 407–411
in Icelandic 237, 257, 275
in Japanese 411–416
in nominative case 237
in Warlpiri 6
local 229–239
nonlocal 254–285
simple 275
typology of 275–284
regular expressions 42, 64
relation changes 21–32
relational
design of grammar 9, 11–12, 15, 19, 22, 39
hierarchy see functional hierarchy
relative
  clause 193, 210–211, 310, 320
  pronoun 165, 310
restricted syntactic function [+r] see syntactic function
resultative construction 282, 336–337, 339, 347
scrambling 7, 67, 77, 92, 214–215, 218–221
  locality of 210
  vs. topicalization 207–210
secondary object see grammatical function
semantic
  feature 45, 57, 62, 151–155, 305
  form 44–45, 47
and operator condition on pronominal binding see operator binding of pronominals; see also weak crossover
referential dependence 241–245
reflexive pronoun 6–9, 190
  and a-structure binding 427–429
  and inalienable possession 281–283, 300
  and physical contexts 279–283
  as subject 234–236
  complex 278–279, 284
  emphatic 258, 260, 270, 275–278, 362
  “fake” 336–337
  in Finnish 407–411
  in Icelandic 237, 257, 275
  in Japanese 411–416
  in nominative case 237
  in Warlpiri 6
  local 229–239
  nonlocal 254–285
  simple 275
  typology of 275–284
regular expressions 42, 64
relation changes 21–32
relational
design of grammar 9, 11–12, 15, 19, 22, 39
hierarchy see functional hierarchy
relative
  clause 193, 210–211, 310, 320
  pronoun 165, 310
restricted syntactic function [+r] see syntactic function
resultative construction 282, 336–337, 339, 347
scrambling 7, 67, 77, 92, 214–215, 218–221
  locality of 210
  vs. topicalization 207–210
secondary object see grammatical function
semantic
  feature 45, 57, 62, 151–155, 305
  form 44–45, 47
and operator condition on pronominal binding see operator binding of pronominals; see also weak crossover
referential dependence 241–245
reflexive pronoun 6–9, 190
  and a-structure binding 427–429
  and inalienable possession 281–283, 300
  and physical contexts 279–283
  as subject 234–236
  complex 278–279, 284
  emphatic 258, 260, 270, 275–278, 362
  “fake” 336–337
  in Finnish 407–411
  in Icelandic 237, 257, 275
  in Japanese 411–416
  in nominative case 237
  in Warlpiri 6
  local 229–239
  nonlocal 254–285
  simple 275
  typology of 275–284
regular expressions 42, 64
relation changes 21–32
relational
design of grammar 9, 11–12, 15, 19, 22, 39
hierarchy see functional hierarchy
relative
  clause 193, 210–211, 310, 320
  pronoun 165, 310
restricted syntactic function [+r] see syntactic function
resultative construction 282, 336–337, 339, 347
scrambling 7, 67, 77, 92, 214–215, 218–221
  locality of 210
  vs. topicalization 207–210
secondary object see grammatical function
semantic
  feature 45, 57, 62, 151–155, 305
  form 44–45, 47
semantic structure 42, 98
sentential complement see grammatical function, COMP
sets, in f-structure 70–71
sloppy identity see ellipsis
Sole Complement Constraint 28
solution algorithm 54–58
specifier see also X’-theory 105, 107, 111, 117, 124, 127–128, 137, 143, 225–226, 302
strict identity see ellipsis
structure-function mapping principles see correspondence function
structure-sharing 80, 290, 293, 323
and binding 250–251, 252
subcategoryization 62–63, 326, 336–337
subject see grammatical function
subject-auxiliary inversion 14, 16, 125
subject condition 266–269, 334
subject-topic default 17, 100, 122, 194, 241
suppression of arguments 339–342
in passive 18, 333
in unspecified object deletion 333, 340–341
recoverability of 333
syntactic function see also grammatical function
nonobjective syntactic function [−o] 330–331
objective syntactic function [+o] 330–331
restricted syntactic function [+r] 96, 330–331, 338
unrestricted syntactic function [−r] 96, 330–335, 337, 340
rank see rank, syntactic

telic verb see verb

thematic hierarchy 283, 329, 332, 335, 337
prominence 217, 244, 254, 259, 329
TOP(ic) see grammatical function
topicalization 77, 122, 196–226
in English 68, 98, 196–199
in Russian 70–71, 199–205
of that-complements 12, 20

that-complements
passivization of see passive
topicalization of see topicalization

trace see empty category
transformational grammar see
configurational design of grammar
transitive
alternation 289, 301–304
feature see also X’-theory 103, 126–128
verb see verb
tree admissibility conditions 49, 101, 104
unaccusative verb see verb
unergative verb see verb
unbounded dependency see also extraction
unification 75, 285
uniqueness condition 17, 45, 57, 69–71, 75, 84, 97, 102, 111, 115, 133, 135, 141, 152–153, 162, 167–168, 184, 197, 318, 320
universal grammar 1–3, 6–9, 11, 19, 21–22, 39, 43, 73, 89, 112, 151, 154, 229
unrestricted syntactic function [−r] see syntactic function
up arrow (↑) see ↑

value 44, 45–70, 74–76, 84–85, 104, 113–114, 152, 155, 189–190, 197, 204, 231–232, 251–252, 255, 290, 331, 403, 430

verb
verb (Continued)
  ditransitive 27, 96, 303, 331, 337–340, 345–346, 432
  telic 30–31
  unaccusative 29, 32, 36–38, 334–337, 346, 417–427
  unergative 29–32, 36–38, 335–337, 420–424

VP see verb
VP preposing 13, 15
weak crossover see also operator binding
  of pronominals 174–175, 193, 223–224
word
  functional 93
  syntactic 93
terminal node of c-structure tree 41–42, 52–54

X’ theory 101–104, 125–128
categorial features of 103, 126
cross-categorial parallelism 127–128
functional categories 102–107, 117, 138
functional projections 103–106, 118, 124–125, 137
XCOMP see grammatical function
WILEY END USER LICENSE AGREEMENT

Go to www.wiley.com/go/eula to access Wiley’s ebook EULA.