Algorithmic Acquisition of Focus Parameters

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Table of Contents.

Declaration. vi

Abstract. vii

Acknowledgements. viii

Abbreviations and Notation. ix

General abbreviations. ix

Algorithm notation. x

Glossing. xi

Focus computation. xiii

Focus tests. xiii

Abbreviated properties. xiv

Abbreviated heads. xv

Introduction. 1

Part I Algorithmic Parameter Acquisition 7

1. Background: The Minimalist Parameter Problem. 8

1.1 Introduction. 8

1.2 The benefits and drawbacks of lexicocentrism. 9

1.3 The ReCoS solution – emergent hierarchies of microparameters. 20

1.4 Conclusion 39

2. An Algorithm for Lexicocentric Parameter Acquisition. 40

2.1 Introduction. 40

2.2 An algorithmic formalisation of the ReCoS approach. 41

2.3 Application of the algorithm to non-syntactic domains 88

2.4 C-selection, unvalued features, and the uniqueness of the syntactic domain. 105

2.5 Conclusion 133

Part II On the Compositionality of Focus 135

3. A Unified Perspective for the Analysis of Focus. 136

3.1 Introduction. 136

3.2 The range of variation in focus expression. 137

3.3 Theoretical approaches to capturing this variation. 156

3.4 A semantic perspective on focus constructions. 165

3.5 Formalising complexity? 181

3.6 Conclusion 190

4. Semantic Tests for Focus. 191

4.1 Introduction. 191

4.2 Exhaustivity and exclusivity. 192

4.3 A selection of tests for focus. 195

4.4 Summary of tests applied to English. 203

5. Nepali NAI Focus. 204

5.1 Introduction. 204

5.2 The syntactic distribution of NAI. 206

5.3 Semantic tests applied to NAI focus. 213

5.4 A distinct type of focus in Nepali? 220

6. Focus Doubling in ASL, LSB, and BSL. 222

6.1 Introduction. 222

6.2 Focus doubling in ASL and LSB 224

6.3 Focus doubling in BSL – introduction. 250

6.4 “Rhetorical question” focus in BSL_2. 255

6.5 Focus doubling in BSL – syntactic difficulties. 263

6.6 Summary. 278

7. Emphatic Focus: A Compositional Approach. 279

7.1 Introduction. 279

7.2 The meaning of emphatic focus. 280

7.3 Focus doubling in BSL. 287

7.4 Focus doubling in LSB and ASL. 303

7.5 Conclusion. 308

8. Contrastive Reduplication as Extensional Focus. 310

8.1 Introduction. 310

8.2 Properties of the CR construction. 311

8.3 A Roothian approach to CR. 316

8.4 Extending the syntactic analysis. 324

8.5 Conclusion. 334

9. A Preliminary Typology of Focus. 335

9.1 Introduction. 335

9.2 Phonologically-motivated focus and the limits of compositionality. 336

9.3 Categorial scales of complexity. 349

9.4 Situating each construction. 354

9.5 A Preliminary Typology. 385

Part III Algorithmic Acquisition of Focus Parameters. 388

10. Algorithmic Acquisition of Focus Parameters. 389

10.1 Introduction. 389

10.2 A simplified background grammar. 390

10.3 Tabulation of the heads in each variety. 398

10.4 Determining an input for each variety. 437

10.5 Comparing the acquisitional trajectories of each fragment..... 458

10.6 Conclusion. 463

General Conclusion. 464

References. 466

Declaration.

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text.

It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University of similar institution except as declared in the Preface and specified in the text.

It does not exceed the prescribed word limit for the relevant Degree Committee.

Abstract.

This thesis connects two strands of inquiry. The first is an investigation into the form and determination of minimalist (Chomsky 1995) parameters, whose nature is uncertain compared to the well-defined principles and parameters approach of Chomsky (1981). One prominent approach (termed "lexicocentrism") confines variation to the features of heads in the lexicon, which, though minimal, places a significant acquisitional burden on the learner, and appears to predict unstructured variation, despite typological and diachronic evidence to the contrary. Roberts & Holmberg (2010), Roberts (2010c, 2012 *et seq.*) suggest these problems may be resolved if structure is provided by domain-general learning principles, which combine to create emergent hierarchies of microparameters. I develop this suggestion in detail, proposing a domain-general algorithm for categorisation and feature assignment which is applied to a number of toy linguistic examples.

The second strand concentrates on a specific area of syntactic variation: that of focus expression. This area exhibits vast diversity, with structures not only differing significantly across languages, but also within them. Moreover, most previous attempts to describe these differences either fail to account for the full range of variation seen, or rely heavily on the notion of construction. I suggest that two components are necessary to break these constructions down into their constituent heads. Firstly, I take focus to be unified by the invocation of alternatives (Krifka 2007), and building on Rooth's (1985, 1992, 1996) theory of alternative semantics, I argue that focus constructions may be described as an abstract relation between an expression and its alternatives. Secondly, a null hypothesis of compositionality allows these descriptions to shed light on syntactic structure. This approach is demonstrated for focus constructions in English, Nepali, ASL, LSB, and BSL, and the resulting analyses are shown to be acquirable by the domain-general algorithm, providing a new perspective on parameterisation.

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Abbreviations and Notation.

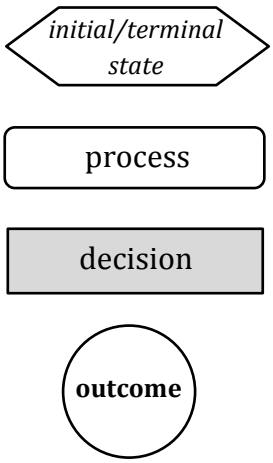
General abbreviations.

ASL	American Sign Language
BSL	British Sign Language
BSL_1	Dialect(s) described in Woll (1981), Deuchar (1983), Kyle & Woll (1985), Sutton-Spence & Woll (1999), Smith et al. (2011)
BSL_2	Dialect of my informant
LSB	Língua de Sinais Brasileira (Brazilian Sign Language)
LSF	Langue des Signes Française (French Sign Language)
Eng.	English
Nep.	Nepali
CED	Condition on Extraction Domains
CR	Contrastive Reduplication
FCI	Free Choice Item
LBC	Left Branch Condition
LF	Logical Form
PF	Phonetic Form
ReCoS	Rethinking Comparative Syntax
RQ	Rhetorical Question construction
SDA	Successive Division Algorithm
UG	Universal Grammar
T/C	Topic/Comment
S/V/O	Subject/Verb/Object
doub.	doubling
int.	intonational
mrk.	marked
pres.	presuppose/presupposition
quant.	quantification
L_x	The formal language x
G_x	The grammar generating L_x
D_x	A dataset compatible with L_x

Algorithm notation.

f	Feature
{{.}}	Multiset
{x, y, z, …}	Set of properties
<x, y, z, …>	Prominence order of properties
[X, Y, Z, …]	Bundle of privative categorial features
[αX, βY, γZ, …]	Bundle of binary categorial features, α, β, γ, … range over +/-
[x, y, z, …]	Bundle of non-categorial features
[vf]	Valued/interpretable feature
[uf]	Unvalued/uninterpretable feature
[uf^]	Unvalued/uninterpretable feature triggering movement
(αX, βY, γZ, …)	C-selectional feature, α, β, γ, … range over +/-
p	Property corresponding to [(v)p]
{p}	Property corresponding to [up]
<p, m(ove)>	Property corresponding to [up^]
{X, Ψ, Ω, …}	Property corresponding to (αX, βY, γZ, …), where [αX, βY, γZ, …] is the category with all and only the heads X, Ψ, Ω, …
{x | property.of.H(x)}	Input corresponding to a head H (original)
<H, {x | property.of.H(x)}>	Input corresponding to a head H (revised)
l	Description length
h	Number of heads in category
d	Ternary description of category

Flowchart notation:



Glossing.

Italics indicate prosodic prominence, **bold text** highlights information for the reader. Grammaticality/felicity is marked with the following symbols:

*	Ungrammatical
?	Questionable grammaticality
??	Very questionable grammaticality
%	Grammatical in some dialects
#	Infelicitous
#?	Questionable felicity

Leipzig glossing is followed where possible, with the following additional conventions used:

Makhuwa:

CJ	Conjoint form
DJ	Disjoint form
OM	Object marker
SM	Subject marker

Numbers refer to Bantu noun classes unless immediately followed by SG or PL.

Mayan languages:

A	A agreement paradigm
B	B agreement paradigm
AF	Agent focus (Kaqchikel)
DIST	Distal marker (Yucatec)
INCOMPL	Incompletive aspect (K'ichee', Yucatec)
SS	Status suffix (K'ichee')
TRANS	Transitive (Yucatec)

Nepali:

CONTRTOP	Contrastive topic
HAB	Habitual marker
NAI	Emphatic focus marker
PART	Discourse particle

Sinhala:

EMPH	emphatic particle
A	A form of verb
E	E form of verb

Yixing Chinese:

ASP	past aspect
ATTR	attributive marker

Miscellaneous:

A	differential object marker (Spanish)
DAATS'Í	modal association particle (Navajo)
KÍ	particle involved in verb doubling (Kabiye)
NI	emphatic assertion marker (Nupe)
VM	verbal marker (Podoko)

Sign language notation:

$\text{INDEX}_{(a)}$	Pronominal index (with locus a)
$\text{INDEX}_{\text{DET}}$	Index used as determiner (LSB)
w-o-r-d	Fingerspelling
(cont.)	Continuative aspect (ASL)

Non-manual markers are indicated above the text, with an underline indicating their scope. Their name follows that of the source material unless obviously equivalent to an already-named non-manual. The following markers are used:

br	Brow raise (ASL, BSL_1)
C-focus	contrastive focus (ASL, LSB)
cs	"cheek and shoulder" marking of temporal/spatial proximity (ASL)
E-foc	emphatic focus (ASL, LSB)
focus	focus (LSB)
hn	head nod (ASL, LSB, BSL_1)
hs	head shake (BSL_1)
I-focus	information focus (ASL, LSB)
lb	lean back (ASL)
neg	negation (ASL, LSB)
q	question (ASL)
r	relative (ASL)
t-c	base generated "topic-comment" topic (ASL, LSB)
top	topic (ASL, LSB, BSL_1)
wh-e	embedded wh-question (LSB)
whq	*wh*-question (ASL, LSB)
wonder	ponder/wonder marker (LSB)

Focus computation.

$[.]_{Foc}$	Descriptive indication of focus
$[.]_{F}$	Syntactic focus feature (Jackendoff 1972-style)
$[.]_{[vfoc]}$	Syntactic focus feature (revised)
$[[.]]^{o}$	Ordinary semantic value
$[[.]]^{f}$	Focus semantic value
constr(φ)	Construction applied to φ
ord	$[[constr(\varphi)]]^{o}$
ALT	$[[\varphi]]^{f}$
base	$[[\varphi]]^{o}$
R	Relation between ord and ALT
:	Presupposition condition on partial function
|.|	Degree marker (non-*wh*)
deg(.)	Degree marker (*wh*)
in	Relativises a degree-marked expression to a particular proposition
max(.)	Returns maximal subset of partially ordered set
min(.)	Returns minimal subset of partially ordered set
p.order(.)	Partially orders a set by property p
pl(.)	place(.)
th(.)	thing(.)
hu(.)	human(.)

Focus tests.

ADD	Addition of a proposition
ADDLIKELY	Addition of a more likely proposition
AND	Subsequent propositions conjoinable with “and”
BUT	Subsequent propositions conjoinable with “but”
CORR	Correction of a statement
DISCCON	Contrast in a discourse
ENTAIL	Entailment of a smaller set
EVEN	Compatibility with *even*
NO	Correctable with “no, …”
NUMEXACT	Exactness of numerals
OOTB	“Out-of-the-blue” response
OVERCOMP	Correction of overcomplete statements
QAC	Question-answer correspondence
SYNCON	Syntagmatic contrast
YESAND	Correctable with “yes, and…”
YESBUT	Correctable with “yes, but…”

Abbreviated properties.

arg	Argument
cat	Categoriser
comp	Complementiser
degr	Marks degree
excl	Exclusive
feat	Feature-assigner
fin	Head-final
final	Exhibits wh-finality
foc	Bears a [foc] feature
int	Interrogative
invis	Invisible to c-selection
lex	Lexical
log	Involved in logical expressions
low	Low in the nominal extended projection
mid	Middle of extended projection
n	Part of the nominal extended projection
nom	Involved in the construction of nominals
noun	Bears a [noun] feature
op	Open class
phi	Bears a [phi] feature
phon	Exists to satisfy phonological requirements
q	Involved in questions
spat	Spatial
sub	Subordinate
takes-det	Takes determiner
v	Verbal
wh	*wh*-form
whop	*wh*-operator
whq	Bears a [whq] feature
φ	Bears a [φ] feature
a, b, c, d, e	Unknown crosslinguistic property
w, x, y, z	Unknown language-specific property

Abbreviated heads.

?	Unknown/wildcard head
C_{mat}	Non-interrogative matrix C
Cop_{adj}	Adjectival copula
C_{rel}	Relative C
C_{sub}	Subordinate C
C_{wh}	*wh*-interrogative matrix C
Deg	Degree-marker (non-*wh*)
Deg_{feat}	[vdeg] feature-assigner
Deg_{wh}	Degree-marker (*wh*)
D_{wh}	*wh*-determiner
E-Foc	Emphatic focus
Foc_{feat}	[vfoc] feature-assigner
Foc_{phon}	Heads involved in phonologically-motivated structures
ind	Structurally-represented index
Op_{CR}	Contrastive reduplication operator
Op_{emph}	Emphasis operator
Op_{NAI}	NAI focus operator
Op_{whemph}	*wh*-emphasis operator
Q_{final}	Heads in involved in final *wh*-structures
$Q_{initial}$	Heads involved in initial *wh*-structures
Q_{medial}	Heads involved in medial *wh*-structures
SC_{RQ}	Small clause used in the formation of RQ structures
T-C	Base-generated topic-comment topic
Top_{feat}	[vtop] feature-assigner
Var	Variable-introducer

Introduction.

This thesis considers two interrelated questions:

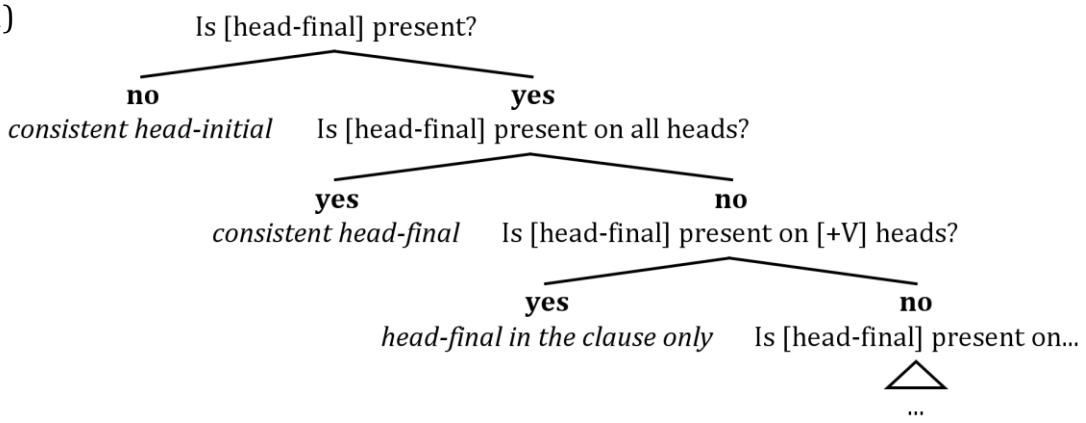
(i) How should parameters be approached from a minimalist perspective?

(ii) How can we account for the vast range of variation in focus expression without resorting to the notion of construction?

Part I concentrates on the first of these questions, with chapter 1 discussing the development of parametric theory, before outlining and critiquing a contemporary proposal. Under the principles and parameters architecture of government and binding theory (Chomsky 1981), language-specific differences were accounted for through the parameterisation of innate principles, providing a systematic explanation for the variant and invariant properties of language. However, research on specific proposals such as the null subject parameter has led to a proliferation of parametric options (see e.g. Roberts & Holmberg 2010), and the onset of the minimalist program (Chomsky 1995), in which innate structure is avoided wherever possible, has left few possible loci for parameters. One prominent minimalist proposal, termed the "Borer-Chomsky conjecture" by Baker (2008), is the suggestion that all parameters are lexicocentric, with variation simply being encoded as featural differences on heads in the lexicon. While this is extremely minimal, and accords with the range and granularity of variation seen, it is not without certain difficulties. In particular, it predicts variation to be unstructured, which is problematic in light of certain typological (Baker 2008) and diachronic (Roberts & Holmberg 2010, Biberauer & Roberts 2012b) evidence. Moreover, this lack of structure also increases the acquisitional burden for the learner, since there is no clear pathway through the learning space.

A specific solution to these difficulties is proposed in (Roberts & Holmberg 2010, Roberts 2010c, 2012 *et seq.*), and developed by the Rethinking Comparative Syntax (ReCoS) project. Lexicocentric parameters are retained, but their acquisition is argued to be structured via domain-general learning principles, leading to generalisations of features across heads, and the emergence of microparametric hierarchies such as the following:

(1)



(adapted from Biberauer et al. 2014b:110)

These hierarchies define an emergent learning pathway, and also provide a potential explanation for the structured nature of typological variation, while additionally allowing for fine-grained differences between varieties. Nevertheless, their progression from more general to more specific questions leaves the learner vulnerable to superset traps (Berwick 1985), with Biberauer (2011) and Branigan (2012) suggesting this problem may be averted if categorial distinctions occur alongside the distribution of features.

Chapter 2 begins with this suggestion, and develops an explicit algorithm for the creation of categories, and the construction of ReCoS-style hierarchies. This algorithm takes as its input a set of heads specified for their properties, and an order in which to consider these properties, and from this deterministically creates a categorial system with appropriately distributed features. As with the learning principles generating hierarchies such as (1), this algorithm is claimed to be domain-general, and so it is shown to be applicable to three cognitive domains in additional to syntax: the acquisition of phonological contrasts, phonotactic constraints, and conceptual structure. Syntax nevertheless shows certain properties not exhibited by these domains, and the remainder of the chapter suggests how the algorithm can be domain-specifically enriched to account for the valued/unvalued feature distinction, movement triggers, and c-selection. These modifications yield a general algorithm for syntactic acquisition and parameterisation, providing a putative answer to question (i).

Part II investigates one particular domain of the grammar where variation is rife: focus expression. Chapter 3 overviews the range of variation seen, which shows focus constructions to have considerable syntactic and semantic differences both within and across languages. Though many constructions and languages are considered, this is already apparent through the consideration of just six constructions across English and American Sign Language (ASL):

(2) a. I met [*John*]$_{\text{Foc}}$.

b. It was [*John*]$_{\text{Foc}}$ that I met.

c. I gave it to [*John*-John]$_{\text{Foc}}$.

(3) a. I-focus
[BOOK STOKOE]$_{\text{Foc}}$ INDEX$_1$ READ
'I read *Stokoe's book*.'

b. br hn
CHAIR PAINT WHO, [*l-e-e*]$_{\text{Foc}}$
'The one who painted the chair was Lee.'

c. hn
ANN [LIKE]$_{\text{Foc}}$ ICE-CREAM [*LIKE*]$_{\text{Foc}}$
'Ann really *likes* ice-cream.'

((2) English; (3) ASL, (3a) Lillo-Martin & Quadros 2008:169;
((3b) Wilbur 1994a:654; (3c) Petronio 1993:129)

(2a) and (3a) both occur in answer to *wh*-questions, yet have different realisations, with (2a) highlighting the focus via an intonational stress, and (3a) by fronting it to an initial position. (2b) and (3b) also differ structurally, with the former involving a cleft and the latter a "rhetorical question" structure, but both suggest that the focused item exhausts the list of possibilities. Finally (2c) and (3c) both involve a kind of doubling, but the first leads to a prototypical reading, and the second emphasis. As such, each language exhibits multiple focus constructions that differ from one another in both structure and meaning, some of which show similarities to constructions of other languages, and some of which do not.

However, the majority of previous attempts to describe these inter- and intralinguistic differences either fail to account for the full range of variation seen, or rely to some extent on the notion of construction. Since the elimination of this notion is one of the key advances of the principles and parameters perspective (Chomsky 1995:95), reliance on constructions is problematic, and so part II of the thesis addresses question (ii). To this end, the remainder of chapter 3 outlines a

semantic perspective by which constructions may be directly compared. Following Krika (2007), focus is taken to be unified by the invocation of alternatives, and building on Rooth's (1985, 1992, 1996) theory of alternative semantics, focus constructions are described as forming an abstract relation between an expression and its alternatives. When coupled with a null hypothesis of compositionality, these descriptions make it possible to break down constructions into their constituent heads, accounting for their behaviour without construction-specific mechanisms.

The remainder of part II constitutes a detailed demonstration of this approach. Chapter 4 outlines a number of semantic diagnostics to determine the properties of focus constructions, which are used to distinguish three English constructions, including those in (2a-b). Chapter 5 then introduces Nepali NAI focus (4a), which has an emphatic function, is more marked than intonational focus (4b), and exhibits unusual behaviour when attaching to *wh*-items and adjectives.

(4) a. Rameś-le [*kerā*]$_{\text{Foc}}$ k^{h}āyo
Ramesh-ERG banana ate
'Ramesh ate a *banana*.'

b. us-le [*kerā*]$_{\text{Foc}}$-**nai** k^{h}āyo
3SG-ERG banana-**NAI** ate
'He ate a *banana*.'

(Nepali)

The semantic tests of chapter 4 are applied to these two constructions, showing that while intonational focus (4a) is comparable to the English construction in (2a), NAI-marking (4b) is unlike any of the constructions reviewed in chapter 4, and so potentially encodes a distinct type of focus.

Chapter 6 then investigates the doubling construction of (3c) in some detail, also considering equivalent structures in Brazilian Sign Language (LSB) and two dialects of British Sign Language (BSL). While there are significant differences between varieties, all express emphasis, and exhibit unusual behaviour with *wh*-phrases and (in the case of BSL) adjectives. Consequently it is argued that the doubling construction in each of these languages as well as the NAI marking in (4b)

all encode emphatic focus. However, the semantic nature of this focus remains unclear, and so chapter 7 proposes that it is characterised by the presupposition that the degree of the focused item is at least as great as the degree of any of its alternatives. This combination of focus and degree is used to explain the unusual behaviour of *wh*-items and adjectives, since the former are taken to be inherently focal, and the latter to be inherently degree-marked. Moreover, the distribution of this meaning across heads allows for the development of compositional analyses of emphatic focus in each variety, that do not rely on the notion of construction, and explain the syntactic properties seen.

Chapter 8 follows this discussion with a similar investigation into the English contrastive reduplication (2c). While this clearly involves alternatives, they are not those expected under the Roothian approach to focus, since they are not alternatives to *John*, but different possible members of the extension of *John*. I nevertheless argue that these alternatives may be generated if the focus is not on *John* itself, but on a structurally-represented index. This suggestion leads to another compositional analysis of the construction that once again explains several of its syntactic properties.

Together, these analyses form an extended demonstration of the use of a null hypothesis of compositionality in the analysis of focus. However, this hypothesis does not always hold, and chapter 9 begins with a short consideration of those constructions where it does not, which are argued to be phonologically-motivated. Finally, each focus construction considered throughout the thesis is situated on categorial scales of structural and semantic complexity, concluding part II with a preliminary typology showing a field of variation that is broadly consistent with the assumptions made throughout this part of the thesis.

This leaves part III, which connects questions (i) and (ii) by using the algorithm of part I to parameterise focus in a number of varieties investigated in part II. In particular, three focus constructions in each of English, Nepali, ASL, LSB, and two dialects of BSL are combined with a background grammar to provide six grammar fragments, each corresponding to a single variety. Appropriate algorithmic inputs

for each of these fragments are constructed, allowing the algorithm to acquire a categorial system for each variety. Moreover, the algorithmic trajectories in each case can be compared in a tree, which forms the formal algorithmic equivalent of a parameter hierarchy.

Overall, this thesis argues that the differences between languages are acquired by a domain-general process of categorisation and feature assignment, and investigation of the pathways taken by this process can be seen as a kind of parametric analysis. In the case of focus, the range of variation means that this analysis is not straightforward. However, the description of focus constructions as relations between expressions and their alternatives, followed by the application of a null hypothesis of compositionality, allows constructions to be broken down into their constituent heads, and analysed just as any other structure.

Part I

Algorithmic Parameter Acquisition

1. Background: The Minimalist Parameter Problem.

1.1 Introduction.

This chapter considers two major questions in comparative linguistics – what form do parameters take, and how are they acquired? To this end, I briefly review the development of the field, providing justification for the so-called "lexicocentric" approach, which is adopted in this work. However, this perspective appears to predict unstructured variation, which does not fully accord with observed linguistic data. To resolve this difficulty, I introduce the Rethinking Comparative Syntax (ReCoS) approach, under which parameters remain lexicocentric, but organise themselves into emergent hierarchies as a result of domain-general acquisition processes. This provides a background for the formalisation of this approach in chapter 2, and situates the enquiries of this thesis within the field of parameter theory.

Section 1.2 begins by considering the conceptual appeal and empirical difficulties of the lexicocentric approach to variation, from comparative, historical, and acquisitional perspectives. Section 1.3 then presents the emergent hierarchies of the ReCoS project as a potential solution to these problems, but also outlines some resulting complications. Section 1.4 concludes, summarising these considerations, and setting the stage for the algorithm developed in the following chapter.

1.2 The benefits and drawbacks of lexicocentrism.[1]

Under the principles and parameters architecture of government and binding theory (Chomsky 1981), universal grammar (UG) was viewed as consisting of a number of innate principles, with some of these having a number of parametrised options. The values of these parameters were said to be set during the course of acquisition, providing a potential systematic explanation for both the variant and invariant properties of language.

One canonical example of a parameter in this tradition was the null subject parameter, which has its origins in Perlmutter (1971), and was later extended by Rizzi (1982) and Huang (1984), *inter alia*. While some languages require overt pronominal subjects, such as English and French, many others do not, including most Romance varieties, leading to the following contrast between Italian and English:

(1) a. Ø parla italiano
speaks Italian
'He/she speaks Italian.'
(Italian)

b. * Speaks English
(English)

Languages displaying the pattern in (1a) were therefore described as "pro-drop," with the (1b) types instead being "non-pro-drop." These options were thus viewed as two different settings of the null subject parameter. Perlmutter (1971) and Rizzi (1982) further argued that a positive setting of the null subject parameter in fact leads to a range of linguistic properties, summarised by Roberts & Holmberg (2010:16) as follows:

[1] This section draws on a similar discussion in Bazalgette (2011a:5-8).

(2) a. *The possibility of a silent, referential, definite subject of finite clauses.*

Demonstrated in (1).

b. *"Free subject inversion."*

Ha mangiato Giovanni
has eaten Giovanni
'Giovanni ate.'

(Italian)

c. *The apparent absence of complementiser-trace effects.*

Chi credi [che Ø partirà]
who think that leave-FUT
'Who do you think (*that) will leave?'

(Italian)

d. *Rich agreement inflection on finite verbs.*

A distinct morphological form for each combination of person and number.

(Roberts & Holmberg 2010:16, examples from Chomsky 1981:240)

This apparent cluster of linked phenomena is very much in line with the approach taken to explanation in government and binding theory, where "[i]n a tightly integrated theory with rich internal structure, change in a single parameter may have complex effects, with proliferating consequences in various parts of the grammar," (Chomsky 1981:6). This allowed Chomsky's (1965) goals of both descriptive and explanatory adequacy to be addressed, but at the cost of attributing large amounts of structure to UG.

With the onset of the minimalist program (Chomsky 1995), which attempts to reduce UG to only those components which are conceptually necessary, this solution became less stable. Since classical parametric theory relied on a complex UG, Chomsky (1995:6) sought to reduce this, suggesting that parameters may be "restricted to *formal features* with no interpretation at the interface," or even "restricted to formal features of functional categories (see Borer 1984, Fukui 1986, 1988)." Baker (2008a) terms this view the "Borer-Chomsky conjecture," stated as follows:

(3) All parameters of variation are attributable to the differences in the features of particular lexical items (e.g., the functional heads) in the lexicon.

(Baker 2008a:353)

This view in many ways appears attractive from a minimalist perspective, since parameter-setting simply becomes an aspect of the acquisition of lexical items (Borer 1984:29), and all variation is restricted to the lexicon, which is already required to be an idiosyncratic repository of information. Such approaches can therefore be termed lexicocentric, with lexicocentrism appearing to be one of the most minimal theories of syntactic variation possible. Below, I briefly review how the development of classical parametric theory added some empirical viability to this position, before turning to some difficulties that it creates.

1.2.1 Microparametric proliferation and the unravelling of clusters.

The classical null subject parameter, illustrated in (1) and (2), was proposed as a wide-reaching binary parameter provided by UG. However, it quickly became clear that Romance-style pro-drop was not the only type of null subject language, with Rizzi (1982:143) noting that a third type exists, which only allows expletive null subjects:

(4) a. Ø piove
rains
'It rains.'

b. el/*Ø vien
he comes
'He comes.'

(Paduan, Rizzi 1982:143 via Benincà 1980)

This is perhaps only a small variation on the parameter, but Huang (1984) later demonstrated that many East Asian languages liberally allow null pronouns in both subject and object position, yet have no verbal inflection for person or number:

(5) a. Ø kanjian ta le
see he ASP
'He saw him.'

b. Ta kanjian Ø le
he see ASP
'He saw him.'

(Mandarin Chinese, Huang 1984:533)

This division of the null subject parameter into increasingly more specific subtypes continued, with e.g. the introduction of partial null-subject languages by Holmberg (2005), which among other properties do not allow third person null-subjects in root clauses:

(6) a. Ø puhun englantia
speak-1SG English
'I speak English.'

b. Ø puhut englantia
speak-2SG English
'You speak English.'

c. Hän/*Ø puhuu englantia
3SG speak-3SG English
'He/she speaks English.'

(Finnish, Holmberg 2005:539)

The original notion of a binary null subject parameter is therefore fairly far from the modern picture of numerous subtypes, described in further detail by Biberauer et. al (2010), with Roberts & Holmberg (2010) giving a general overview. This trajectory of development, from wide-reaching binary parameters to a proliferation of different options, is characteristic of the gradual refinement of classical parametric proposals. See Biberauer (2008:15-23) and Roberts & Holmberg (2010:30-31) for an overview of other such cases, including head parameters, *wh*-movement parameters, and verb second parameters.

Alongside this decomposition into smaller parameters, the clusters of properties thought to be associated with specific parameter settings were thrown into question. In the case of the null subject parameter, the claim that the properties in (2) form a cluster amounts to claiming the following 6 biconditional universals:

(7) a. null subjects ↔ free subject inversion
b. null subjects ↔ no complementiser-trace effects
c. null subjects ↔ rich agreement
d. free subject inversion ↔ no complementiser-trace effects
e. rich agreement ↔ no complementiser-trace effects
f. rich agreement ↔ free subject inversion

Gilligan (1987) investigated these putative universals in a sample of 100 languages, and found only the following 4 unidirectional implications (via Croft 2003:80-84, Newmeyer 2004:202-206, 2005:88-92):

(8) a. free inversion → expletive null subjects
b. free inversion → no complementiser-trace effects
c. referential null subjects → expletive null subjects
d. no complementiser-trace effects → expletive null subjects

Different perspectives are taken on this discovery, with Newmeyer (2004, 2005) viewing it as a refutation of the clustering in (2), and Roberts & Holmberg (2005, 2010) arguing for a refinement of original predictions given the wider range of typologically diverse languages surveyed, and the greater number of null subject types known today. What is clear, though, is that the bidirectional implications in (7) do not entirely hold up in their original form, which parallels the move to gradually smaller parameters discussed above.

It is in part due to the above reasons that, as Baker (2008a:351) remarks, "[a] large portion of the field has moved away from looking for classical parameters to looking for microparameters, following the methodology and reasoning [of e.g.] Kayne (2005)." Unlike classical parameters, microparameters concern "very localised differences with small but nontrivial effects in the grammars of very closely related languages (alias dialects)," with "[l]arger differences among languages typically [being] thought to be the result of the accretion of many of these microparameters." Such a perspective appears directly compatible with

lexicocentrism, since in the majority of cases, the variation of features on individual heads seems unlikely to have large impacts on the grammar.[2] The proliferation of microparameters therefore adds support to lexicocentrism, and to some extent led to the development of this view. Notwithstanding, we shall see below that, though partially accurate, the predictions of a purely microparametric framework do not entirely match the distribution of evidence seen.

1.2.2 Remaining evidence for macroparameters.

We could therefore suppose that all points of variation are lexicocentric microparameters, which vary independently of one another. The phenomena described by classical parameters would then simply result from aggregates of microparameters, acting in concert to create broad differences between varieties. Baker (2008a:360) notes that this stance in fact makes specific predictions about the typological distribution of languages, as "one would expect a single normal distribution (i.e., a bell curve) of properties," with "many mixed languages of different types, and relatively few pure languages of one kind or another." When this view is applied to the head parameter, the prediction is that consistently head-initial languages and consistently head-final languages should be exceedingly rare. However, Baker (2008a:361) shows that when we compare the headedness of the verb phrase and the adpositional phrase crosslinguistically, it is the consistent varieties that are by far the most frequent:

[2] However, Baker (2008a:355) does point out that "a lexical parameter […] could have a substantial impact on the language generated, particularly if it concerned some very prominent item (such as the finite Tense node)." See Tsai (1994), Bazalgette (2011a) for possible cases of lexicocentric parameters having substantial impact, albeit with some generalisation across multiple items. Furthermore, it is likely that the majority of features on lexical items have more trivial effects.

(9) a. V-O and P-NP: 417 languages (consistent languages)

b. O-V and NP-P: 427 languages

c. V-O and NP-P: 38 languages (inconsistent languages)

d. O-V and P-NP: 10 languages

(Baker 2008a:361 based on Dryer 2005a, b[3])

While the existence of mixed varieties means that a simple binary head parameter is on its own untenable, the distribution also does not reflect the normal distribution predicted by independent microparameters. For this reason, Baker (2008a) argues that this is evidence for wide-scale macroparameters existing alongside microparameters, with other macroparameters governing polysynthesis and agreement (Baker 1996, 2008b). A number of additional modern proposals for macroparameters exist, including Huang's (2015) analyticity parameter, with others overviwed by Biberauer (2008:37-38).

Roberts & Holmberg (2010:36-38) add to Baker's (2008a) argument for macroparameters by noting the diachronic stability of certain linguistic properties over others. There is a vast amount of microparametric variation among Italo-Romance dialects, including in "the nature of object and subject agreement on past participles in compound tenses [and] the expression of various forms of finite and non-finite complementation." However, in addition to many other similarities, "all Italian dialects are SVO, […] all (except a small number of Rhaeto-Romansch varieties; see Benincà & Poletto (2005)) have complement clitics, none has a full morphological case system." By contrast, classical Latin has "OV order, a full morphological case system, the complete absence of pronominal clitics, no (active) compound tenses, and a system of complementation in which finite clausal subordination was a minority pattern."

If it is only independent microparameters that exist, then we would not expect this apparent typological change – instead, these properties should all vary equally in

[3] See e.g. Hawkins (1990, 1994, 2004), Dryer (1992) for performance and functional rather than parametric explanations of this phenomenon, and e.g. Newmeyer (1998, 2005), Mobbs (2008, 2015), Holmberg & Roberts (2010) for discussion.

both Italian dialects and Latin varieties. For this reason, Roberts & Holmberg (2010:38) instead suggest that one or more macroparameters may be involved. Further examples of diachronic macroparametric stability are considered by Biberauer & Roberts (2012b), contributing to a picture of variation where parameters of varying scope and stability exist alongside one another. While such macroparameters may be representable in a lexicocentric system, the nature of this representation is far from obvious (see footnote 2 above). Moreover, their diachronic stability presents yet another problem – if macro- and microparameters are both underlyingly encoded as features on heads in the lexicon, why are microparameters able to vary more freely?

1.2.3 Structuring the learning space.

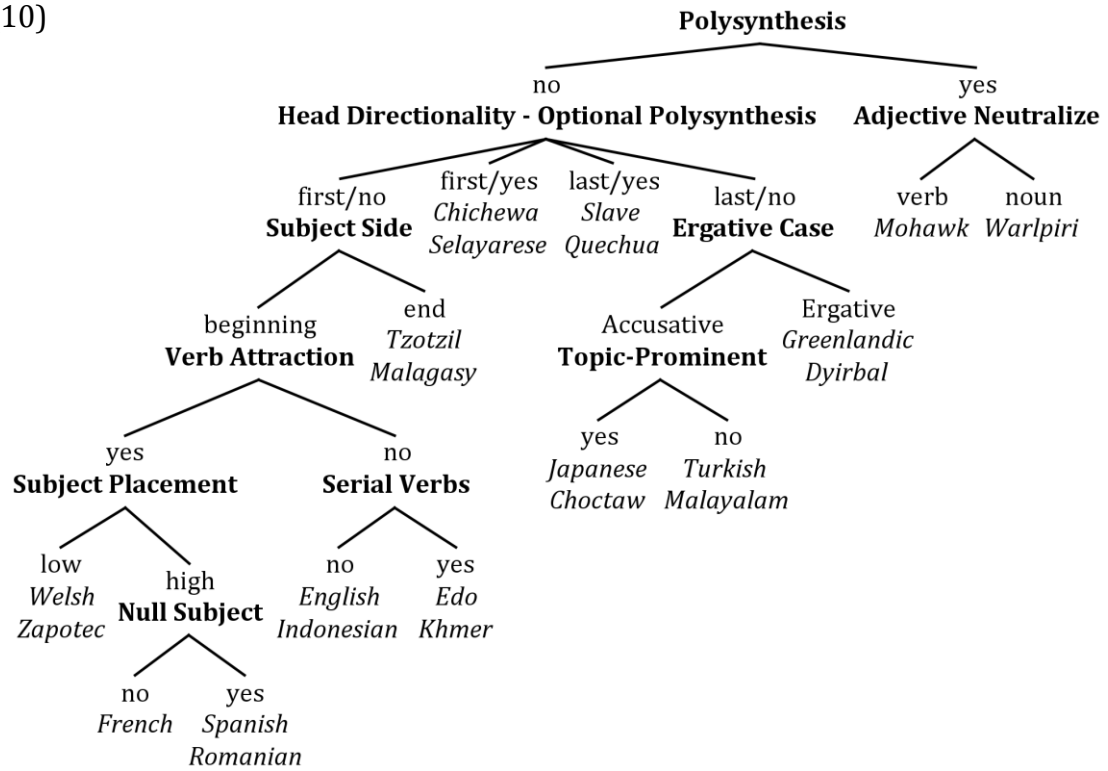
Even though classical parameter theory attributed significant structure to UG, the learning task was by no means a trivial one. While a finite and innate set of parameters essentially reduces syntactic acquisition to asking a series of questions, there remains significant mismatch between available evidence and the form of answers. For this reason *inter alia* Lightfoot (1989, 1991, 1999), Dresher (1999, 2003) have proposed that there exist linguistic cues associated with particular parametric values, though the nature, form, and existence of such cues is far from determined. Moreover, a number of different parameter-setting algorithms have been proposed, including guessing and error-driven refinement (Gibson & Wexler 1994), competition of grammars (Clark & Roberts 1993, Yang 2002), or deterministic examination of cues (Fodor 1998, Dresher 1999). Overall, while classical parameter theory makes acquisition easier, it still leaves many problems unsolved.

In early formulations of parameter theory, the number of parameters was thought to be not only finite but small. This led to a consequently small number of possible grammars – n independent binary parameters define 2^n grammars, and so 30 binary parameters yields 2^{30} = 1,073,741,824 possible grammars. Though this figure may already appear large, Kayne (2000:8) notes that if we assume "no two […] speakers have the same (syntactic) grammar[,] the number of syntactically

distinct languages/dialects is at least as great as the number of individuals presently alive (i.e. more than 5 billion)." If the number of extant grammars is in the order of billions, then the number of *possible* grammars is likely far greater, with 2^{30} being too small even for a lower bound (see e.g. Roberts 2001:89-90, Roberts & Roussou 2003:215-216). Nevertheless, since adding parameters increases the number of grammars exponentially (see Fodor 2001:734-736 for further discussion), with only a few more parameters, the numbers become more viable. But in solving one problem, we have created another: more possible grammars arguably puts more strain on a possible learning algorithm. For instance, Clark (1990) notes that even in a 30 parameter system, checking every grammar at the rate of one per second would take 34 years, and so this space cannot simply be searched exhaustively.

Thus far, we have taken parameters to be independent of one another, meaning that every parameter must be set in every language. However, it has long been recognised that parameters may exhibit dependency relations between one another (see e.g. Rizzi 1982). While in many cases these relations have not been investigated in wide scale crosslinguistic detail, Baker (2001:183) proposed the following tentative hierarchy:

(10)



(Baker 2001:183)

If the generalisations are supported, a hierarchical organisation of parameters better accounts for the distribution of data, and makes stricter empirical predictions. Moreover, it imposes considerable restrictions on the structure of the learning space, further reducing the difficulty of acquisition. Crucially, this parametric organisation may be attributed to UG, and so additional innate structure once again simplifies the learning task.

By contrast, a lexicocentric theory of parameters does not allow such a solution. While restricting parameters to the lexicon appears more in line with the goals of minimalism (*pace* Boeckx 2015:ch.4), this leaves little possibility for their innate organisation, despite evidence for structured relationships even between microparameters (see e.g. Gianollo et al. 2008, Rigon 2009, Longobardi 2012). Furthermore, since parameters are associated with features on lexical items, they proliferate, and the corresponding number of possible grammars proliferates exponentially. If the featural makeup of open class lexical items (or even the class of features itself) may additionally vary, then the number of parameters could in

fact be unbounded, yielding infinite possible grammars. This makes the need for a viable pathway through the learning space even more pressing. In the absence of such a pathway, the learner is left adrift in a sea of microparameters.

1.2.4 Conclusion.

Lexicocentrism provides a locus for parameters that is both minimalist and restrictive. This makes it theoretically desirable, and we have seen that it is not without empirical merit, aligning particularly well with the microparametric view of syntactic variation. Notwithstanding, we have also seen some evidence for the existence of larger parameters alongside microparameters, and it is not immediately obvious how these should be accounted for in a lexicocentric framework. Moreover, lexicocentrism provides little possibility of parametric organisation, and greatly widens the learning space, arguably making the task of language acquisition more difficult. If we wish to retain lexicocentrism, we are therefore left with two questions – where do macroparameters come from, and how is the space of possible grammars navigated? In the following section, I present an approach to variation that provides a potential solution to both these problems.

1.3 The ReCoS solution – emergent hierarchies of microparameters.

Chomsky (2005) identifies three factors that contribute to the growth of language in the individual:

(11) 1. Genetic endowment (specific to the faculty of language).
2. Experience, leading to variation.
3. Principles not specific to the faculty of language.

(Chomsky 2005:6)

Thus far, we have reviewed various classical versions of parameter theory, all of which prioritise the first factor over the other two. Conversely, the minimalist approach of lexicocentrism attributes far less to the first factor, and so previous explanations of macroparametric effects, parametric organisation, and learning pathways are lost. However, we have yet to consider the role of factors two and three. It is unlikely that linguistic experience could account for all the difficulties outlined in 1.2, with it at best explaining e.g. areal phenomena (through partially shared linguistic environments), but not widespread typological facts or acquisitional difficulties, especially given that data is not neatly presented cue by cue. This leaves the third factor, which provides considerably more scope for explanation. The essence of the ReCoS approach is therefore that the problems of 1.2 can be accounted for by domain-general learning principles.

1.3.1 Generalisation of the input and feature economy.

If domain-general principles may influence the setting of parameters, this provides a possible angle for the explanation of macroparametric effects within a lexicocentric paradigm. Consider the case of headedness, discussed in 1.2.2 above. Following Baker's (2008a) discussion, we saw that although almost the full range of possibilities appears to be realised, the crosslinguistic distribution is bimodal, with consistently head-final and head-initial varieties being more common. Hawkins (1983) describes this as a preference for cross-category harmony, which Roberts (2007) argues may be restated in the following lexicocentric terms:

(12) There is a preference for the [head-final] feature of a functional head F to generalize to other functional heads G, H, …

(adapted from Roberts 2007:194)

Such generalisation has the potential to allow swathes of heads to act in concert, yielding the skewed distribution seen. This description is nonetheless specific to this particular case, and so Roberts (2007) proposes the following more general version:

(13) *Generalization of the input:*
If acquirers assign a marked value to H, they will assign the same value to all comparable heads.

(Roberts 2007:275)

This principle may be augmented with an explicit notion of markedness, such as the following simplicity metric originating in Roberts & Roussou (2003:201), termed "Feature Economy" by Biberauer & Roberts (2012a):

(14) *Feature Economy:*
Given two structural representations R and R' for a substring of input text S, R is less marked than R' iff R contains fewer formal features than R'.

(Biberauer & Roberts 2012a:269)

Generalisation of the input and feature economy provide two opposing forces constraining the learner's behaviour, with (14) preventing the unnecessary assignment of features, and (13) making maximal use of features that are assigned. In the case of the head parameter in particular, the two least marked options are therefore no use of the head-final feature (giving consistent head-initial systems), and use of it on every head (giving consistent head-final systems). The bimodal distribution seen therefore arises as a result of (13) and (14). Moreover, since they encapsulate general principles of conservative learning, they are possible candidates for domain-general aspects of acquisition (suggested originally for (13) by Mobbs 2008, see also e.g. Roberts & Holmberg 2010, Roberts 2010c, Roberts 2012, Biberauer & Roberts 2012a, 2014b, Biberauer 2014a).

This then provides a third-factor perspective on microparametric organisation, with generalisations of features over classes of heads giving the appearance of "larger" parameters. In addition, Biberauer & Roberts (2012a) suggest that an informal taxonomy of parameters can be developed along these lines, based on the size of the class of heads involved:[4]

(15) *For a given value v_i of a parametrically variant feature F:*

a. **Macroparameters:** All heads of the relevant type share v_i.

b. **Mesoparameters:** All functional heads of a given category (e.g. all verbal heads, all nominal heads, all φ-bearing heads or all finite Cs) share v_i.

c. **Microparameters:** A small subclass of functional heads (e.g. auxiliaries, pronouns) share v_i.

d. **Nanoparameters:** One or more idiosyncratic lexical items are specified for v_i.

(Biberauer & Roberts 2012a:268)

We now have the beginnings of a solution to one of the problems identified in 1.2 – why, in the terms of Baker (2008a), macroparameters may exist in a microparametric world.[5] However, we have yet to directly address various other difficulties outlined in 1.2: the diachronic stability of macroparameters, the existence of dependencies between parametric options, and the need for a structured learning pathway.

Roberts & Holmberg (2010) present a perspective under which these difficulties may be accounted for via the same third factor principles. This is further developed in Roberts (2010c), Roberts (2012), and extended by Biberauer (2011, 2014), Branigan (2012), Biberauer & Roberts (2012a, b, 2014a, b, 2015a, b), Biberauer et al. (2013, 2014b), Sheehan (2014), Sheehan & Cyrino (2014) *inter alia*. The key suggestion is that input generalisation and feature economy not only allow the

[4] Note that the parametric terminology in (15) differs from the more general distinction between macroparameters and microparameters that is used throughout this thesis.
[5] See Baker (2008a:354, fn. 2) for a brief consideration of such an approach.

learner to assign features to multiple heads at once, but also structure their decisions more generally.[6]

Consider the assignment of a feature (f) to a set of heads (H). We have already seen two possibilities in our discussion of the head parameter, given in (16a-b):

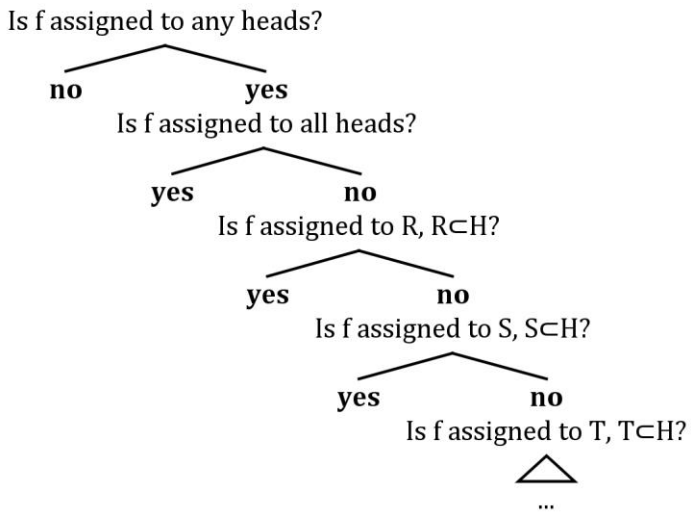
(16) a. f is not assigned to any heads

b. f is assigned to (all heads in) H

c. f is assigned to (all heads in) a proper subset of H

The first of these is maximally compliant with both feature economy and input generalisation, whereas the second maximises the latter at the cost of the former. As a result, the learner initially supposes (16a), considering more marked hypotheses only if they encounter evidence for f. In such a case, (16b) then becomes the most unmarked option, and so this is entertained. If neither (16a) nor (16b) is appropriate, the learner must move on to (16c), considering specific subsets of heads, with feature economy and input generalisation once again shaping these choices. It is therefore possible to restate (16) as a hierarchy of options presented to the learner:

(17)



[6] This idea is presented with some variation across the works cited, due to both development of the concepts involved and differences of theoretical stance. The discussion below involving examples (16) and (17) and section 1.3.2 therefore presents a fairly specific version of the proposal which is closest in its exposition to Biberauer et al. (2014b), but draws on much of the output of the ReCoS project as well as personal communication among its members.

After the first option, which distinguishes between systems with and without evidence for f,[7] each question represents a possible hypothesis of the learner – first the assignment of f to all heads, followed by its assignment to various proper subsets of H in turn. This hierarchy is therefore emergent, arising through an interaction of third-factor principles rather than domain-specific innate specification, and provides a structured learning pathway for the assignment of f. Furthermore, if we view each of the options in (17) as a parametric setting, much as in the taxonomy of (15), then (17) represents not just a learning pathway but an organisation of parameters, with macroparameters towards the top, and microparameters towards the bottom. Given options higher in the tree are less marked than those lower down, this provides a possible explanation for the diachronic stability of macroparameters (see in particular Biberauer & Roberts 2012b), while also making typological predictions. Finally, the resulting parametric organisation goes some way towards explaining the existence of dependency relations between parameters.[8]

Input generalisation and feature economy are therefore candidates for third-factor principles that combine to provide emergent hierarchies of microparameters. The putative existence of these hierarchies additionally addresses many of the difficulties with current lexicocentrism that are discussed in 1.2, while maintaining its advantages. However, we have yet to consider specific examples of such hierarchies, with (17) being only an abstraction, and so in the following subsection I review some specific proposals, and identify areas where additional specification may be required to allow the correct hierarchies to emerge.

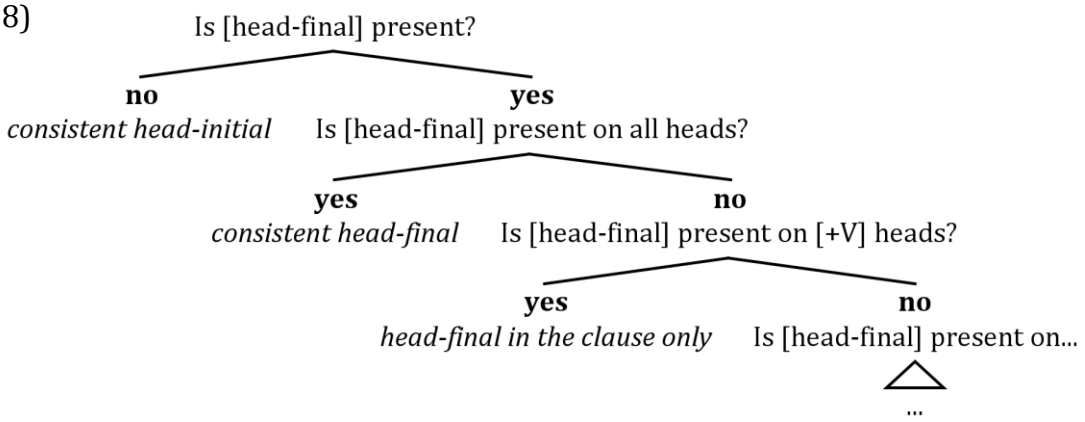
[7] Unlike the other options, this choice does not strictly represent a hypothesis of the learner, since they either have no evidence for f, in which case the hierarchy does not arise, or they do have evidence for f, in which case they begin with (16b), the hypothesis of assigning f to all heads.

[8] Michelle Sheehan (p.c.) notes that without considering typological markedness, hierarchies such as (17), where (excluding the first question) only "no" responses branch, do not in fact exhibit dependencies. While reordering these questions would make different typological predictions, it would nevertheless provide the same range of possible grammars. Such absolute dependencies may therefore only arise through certain options being ruled out due to conflicts between different innate properties of the grammar and/or domain-general principles. See e.g. Biberauer et al. (2013) and Sheehan (2014) for some discussion of how such dependencies may arise. The algorithm presented in the current work additionally allows for the emergence of dependencies through categorial structure.

1.3.2 Example hierarchies and some difficulties.

As is apparent from the discussion in 1.3.1, the abstract hierarchy in (17) can readily be applied to the case of the head parameter. We may simply replace f with a [head-final] feature, yielding the following hierarchy:

(18)



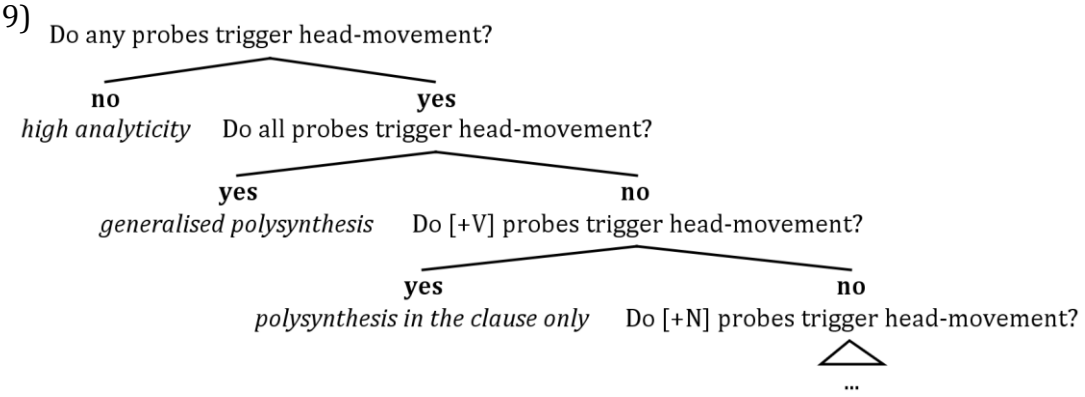
(adapted from Biberauer et al. 2014b:110)

As in (17), if there is no evidence to postulate [head-final], it remains unassigned. However, if the learner does encounter such evidence, they first entertain the hypothesis of distributing [head-final] across all heads, before going on to consider smaller subsets of heads, in this case defined by categories. This retains the advantages of the analysis in Roberts (2007), discussed in 1.3.1 above, but also outlines the kinds of learning pathways taken for gradually less consistent varieties, and predicts their comparative typological rarity.

This approach can be adapted to many other phenomena. For instance, Biberauer et al. (2014b) consider word structure, where they follow e.g. Baker (1988, 1996) and Julien (2002) in supposing that complex words are formed by head-movement. Instead of considering a [head-final] feature, we can therefore shift our perspective to whether or not specific probes trigger head-movement. If no such probes exist, then the system would exhibit no head-movement. Biberauer et al. (2014b:114) view this property as characteristic of languages such as Mandarin Chinese, drawing on Huang's (2015) discussion of the syntactic effects of high analyticity. The converse option would be all probes triggering head movement,

yielding a system comparable to Baker's (1996) description of polysynthetic languages. Smaller sets of movement-triggering probes would then yield polysynthesis only in specific domains (with Biberauer & Roberts 2012a further considering the syntactic consequences of even smaller sets). These options can therefore be combined to yield the following emergent hierarchy:

(19)



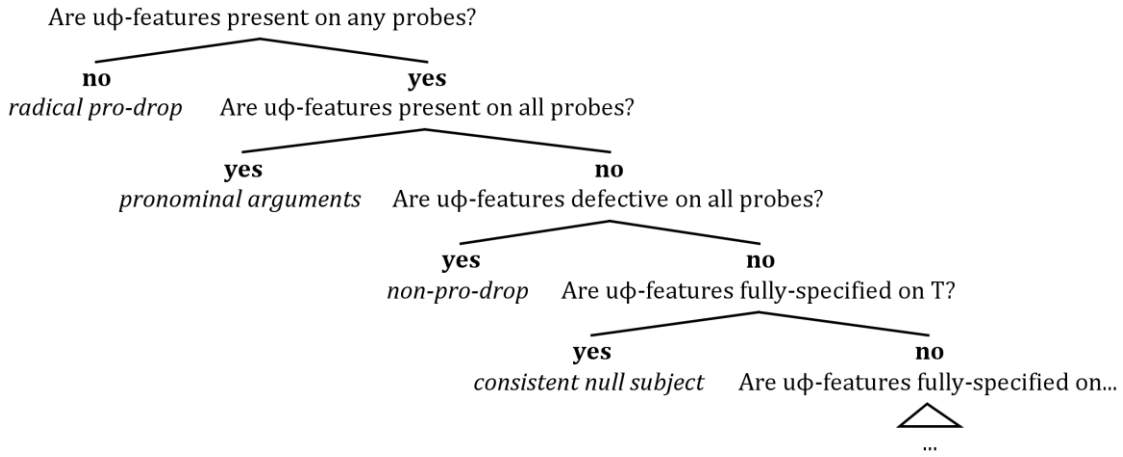
(adapted from Biberauer et al. 2014b:114)

While this hierarchy exhibits a comparable structure to those in (17) and (18), it is not as clear that the distribution of a single feature across heads is involved. Although a specific head-movement feature could be used, Biberauer et al. (2014b:114) suppose instead that such movement occurs "where the moved head has a proper subset of the features of the Probe," following Roberts (2010b). The questions in (19) may therefore involve more generalisations over multiple features, although the same kind of generalisation takes place for each question.

Additionally, Roberts & Holmberg (2010:49), Biberauer et al. (2014b:114) *inter alia* provide a potential hierarchy for the phenomenon of null arguments. In this case, crosslinguistic differences are argued to arise from the distribution of φ-features across probes, connecting a number of different analyses of null subject systems. For instance, Saito (2007) argues that "radical pro drop" systems (as illustrated in (5) for Mandarin Chinese) result from a lack of triggers for φ-agreement. Moreover, following Jelinek (1984), a class of languages with very rich agreement marking and significant word order freedom exists in which the agreement markers themselves act as arguments, here termed "pronominal argument" languages. More classical cases of null subject languages have also long

been linked to rich agreement (see (2) and its discussion above, and Roberts 2010a for a specific analysis linking non-pro-drop to φ-defectivity), and so degree of specification of φ-features on probes can be argued to connect to various null subject possibilities. These analyses can therefore be connected to form another hierarchy:

(20)



(adapted from Biberauer et al. 2014b:112[9])

As with the head-movement hierarchy in (19), the questions here do not seem to be about the distribution of a single feature, but instead the arrangement of multiple features. Furthermore, they do not all have exactly the same form, with the first two asking about presence of features, and the others asking instead about their defectivity/specification. It is therefore not immediately clear whether or not the same third factors could shape such generalisations over multiple features, and generalisations of different types. One approach, then, would be to elaborate the third factors involved and their operation in creating such questions. Alternatively, Roberts & Holmberg (2010:45-46) tentatively instead suggest that UG might make available schemata for feature assignment, such as the following proposals of Roberts & Roussou (2003:213) and Longobardi (2014:219):

[9] The hierarchy in (20) differs more from the Biberauer et al. (2014b) version than the adaptations in (18) and (19), as the third question has been rephrased from "Are uϕ-features fully-specified on some probes?" (p. 112) The alternative formulation used in (20) yields the same two possible answers, but attempts to characterise a specific distribution of features, in line with the rest of the questions in this and other hierarchies.

(21) a. Is F realised by (external) Merge? (i.e. does it correspond to an overt grammatical formative?)

b. Does F enter into an Agree relation?

c. If so, does F attract?

d. If so, does F attract a head or an XP?

e. If (c), does F attract both a head and an XP?

f. Does F combine realisation by external and internal Merge?

g. If so, does F attact a head or an XP?

(Roberts & Roussou 2003:213)

(22) a. Is F, F a feature, grammaticalized?

b. Does F, F a grammaticalized feature, Agree with X, X a category (i.e. does F probe X)?

c. Is F, F a grammaticalized feature, spread on X, X a category?

d. Is F, F a grammaticalized feature, "strong" (i.e. does F overtly attract X, probe X with an EPP feature)?

e. Does a functional category (a set of lexically co-occuring grammaticalized features) X have a phonological matrix Φ?

f. Is F, F a grammaticalized feature, checked by the minimal accessible category of type X (or is pied-piping possible)?

(Longobardi 2014:219)

When combined with third factor principles, such schemata have the potential to structure more complex and less homogeneous hierarchies, such as those seen in (19-20). This nevertheless comes at the cost of increasing the domain-specific components of UG, albeit in a fairly minimal way, and so is not adopted in all work on emergent parameter hierarchies, though see e.g. Sheehan (2014) for a hierarchy of clausal alignment that implicitly uses such a schema. Though I do not make use of schemata as involved as those of (21-22) in the current work, I suggest a somewhat simpler equivalent in 2.4 below.

Biberauer et al. (2014b:113) additionally note for (20) that while subsets of probes appear to be considered in a specific order, it is not obvious how this order arises – "[w]hy only T and not at least v becomes relevant by [the fourth question] is not clear to us at this point, but it seems empirically correct." This difficulty can also be extended to other emergent hierarchies – while input generalisation and feature economy give clear structure to the initial questions in a hierarchy, once the learner begins to consider subsets, the order of questions is not as apparent. One possibility is that subsets are considered in some logical order on the basis of the structures of and relations between the categories involved, which would require an advanced theory of categorial structure. Moreover, it seems likely that even such an approach would lead to a partial rather than total ordering of subsets, unless innate specification also plays a role in this order. For these reasons, I pursue another possibility in chapter 2, discussed in more detail below – that categories are ordered based on a combination of their formal description and the number of heads they contain.

One further difficulty remains – how, if at all, do the hierarchies connect, and do they interact with one another? Roberts (2010c, 2012) presents five tentative hierarchies designed to cover most broad typological properties, but if hierarchies are connected specifically to features, then we can suppose many more exist. It is unclear whether these hierarchies are independent of one another, or whether they connect in some way, forming more complex networks of options. Furthermore, if they are independent, then are all hierarchies set simultaneously, or is the process more sequential? Such questions remain very much open, but the explicit approach taken below resolves them through sequential acquisition of categories and features, with an independent hierarchy being constructed for each new feature.

We have thus far reviewed three examples of emergent hierachies, with further cases being proposed by Holmberg & Roberts (2010), Roberts (2010c, 2012), Biberauer & Roberts (2012a), Branigan (2012), Biberauer et al. (2013, 2014b), Ledgeway (2013, to appear), Schifano (2015), Sheehan (2014), Sheehan & Cyrino

(2014) *inter alia*. In general then, these hierarchies directly address many of the problems identified in 1.2, while remaining consistent with lexicocentrism. In particular, they make use of domain-general principles of conservative learning to provide a structured learning pathway that accounts for macroparametric effects. We have further seen the applicability of this approach in various distinct areas of the grammar. Nevertheless, some problems arise when considering the general properties of hierachies, each of which can be resolved in a variety of ways. In the following section I summarise these difficulties before considering a more serious architectural difficulty and its resolution, which leads into the algorithm developed in chapter 2.

1.3.3 Avoiding superset traps.

In our overview of emergent hierarchies above, we encountered the following open questions, each of which must be resolved by any fully-explicit account of hierarchy generation:

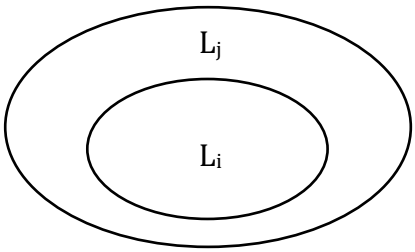
(23) a. How, if at all, do distinct hierachies interact/connect with one another?
b. How are subsets of heads ordered for consideration by the learner?
c. Do hierarchies operate on single or multiple features?
d. Can the form of questions vary in different positions of the hierarchy, and if so, what determines this questioning structure?

Each of these has a number of possible answers, and the previous subsection reviewed some suggestions, as well as hinting at the specific choices that will be implemented below. However, there remains one further architectural diffculty with the approach to emergent hierarchies outlined above, first noted by Biberauer (2011) and Branigan (2012) – how to avoid violating the subset principle.

The subset principle originates with Berwick (1985) (though see Angluin 1978, Baker 1979 for similar observations, and Dell 1981 for a discussion of the principle

in phonology). Berwick (1985:235-236) considers two languages L_i and L_j such that $L_i \subset L_j$, which may be represented as follows:

(24)



If we additionally make the assumption that language acquisition proceeds only on the basis of positive evidence,[10] then any dataset D_i compatible with L_i is equally compatible with L_j. Moreover, there exists no positive evidence capable of falsifying a hypothesis of L_j, and so the learner cannot alter their incorrect acquisition of a superset grammar. This situation is known as a "superset trap". For this reason, it is frequently proposed that acquisitional hypotheses must be ordered to prevent such situations from arising. This is summarised by Clark & Roberts (1993) as follows:

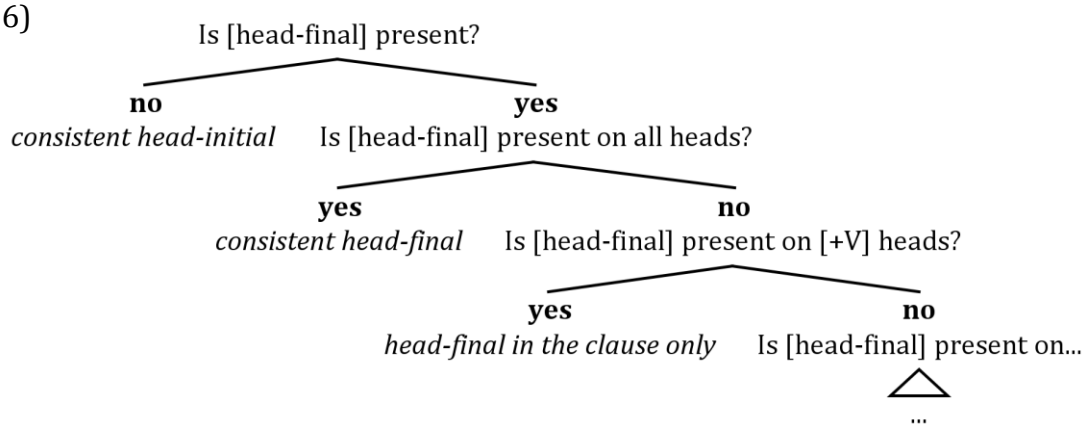
(25) The learner must guess the smallest possible language compatible with the input at each stage of the learning procedure.

(Clark & Roberts 1993:304-305)

As Biberauer (2011) and Branigan (2012) note, this principle appears to be in conflict with the hierarchical approach outlined above, where acquisition proceeds from the general to the specific. Nevertheless, for many hierarchies, this conflict does not emerge. Consider, for instance, the following potential headedness hierarchy:

[10] In support of this assumption, see e.g. Brown & Hanlon (1970), Newport et al. (1977), Marcus (1993). However, Clark & Lappin (2011) take a somewhat different approach, making use of indirect negative evidence.

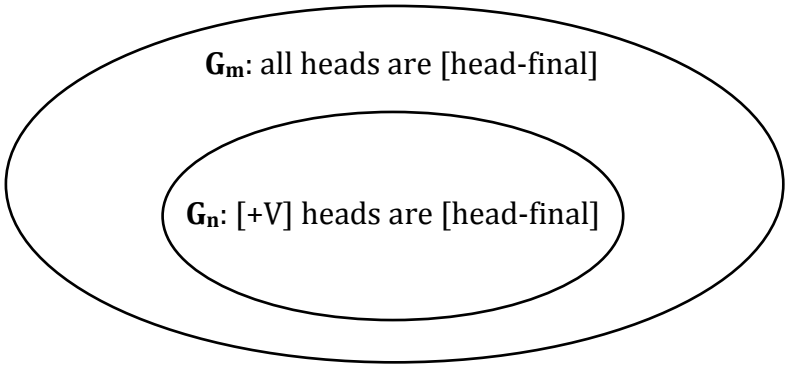
(26)



(repeated from (18))

As discussed above, the consistent head-final grammar exhibits a [head-final] feature on all heads, whereas in the clausally head-final grammar, this feature is only on the [+V] subset of heads. The heads in these grammars therefore exhibit a superset-subset relation with respect to the [head-final] feature:

(27)



This appears superficially similar to (24), and so we might suppose that learners acquiring G_n may become stuck in a superset trap of G_m. However, since the primary linguistic data available to the learner is grammatical sentences, the relation in (24) is crucially between languages generated by grammars, and not the heads they contain. This yields a rather different relation, as is demonstrated in (28-30) below. While G_m generates only sentences where all of VP, NP, and PP are head-final, demonstrated in (28), G_n generates sentences with head-final VP but head-initial NP and PP, shown in (29):

(28) a. I [$_{VP}$ [students] met] final VP

b. I [$_{VP}$ [$_{NP}$ [$_{PP}$ [literature] of] students] met] final VP, NP, PP

c. * I [$_{VP}$ [$_{NP}$ students [$_{PP}$ of [literature]]] met] final VP; initial NP, PP

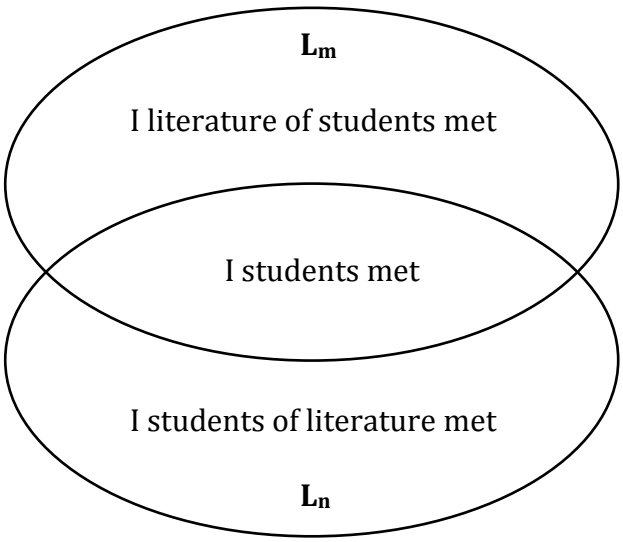
(29) a. I [$_{VP}$ [students] met] final VP

b. * I [$_{VP}$ [$_{NP}$ [$_{PP}$ [literature] of] students] met] final VP, NP, PP

c. I [$_{VP}$ [$_{NP}$ students [$_{PP}$ of [literature]]] met] final VP; initial NP, PP

Thus the (c) sentence is ungrammatical for G_m, whereas the (b) sentence is ungrammatical for G_n. However, since the headedness of non-[+V] phrases does not affect the sentence, this is generated by both Gs. L_m and L_n, the languages generated by G_m and G_n respectively, are therefore not in a superset-subset relation, but in fact intersect:

(30)



If the target grammar is G_n, this intersective relation means that an incorrect hypothesis of G_m can be readily disconfirmed by positive evidence such as (29c), since this sentence is not in L_m. For this reason, superset traps are not possible, and so the subset principle does not need to apply. As observed by e.g. MacLaughlin (1995), LaFond (2001), Biberauer & Roberts (2009), the majority of parametric differences proposed in the literature in fact exhibit this intersective relation, and so the general applicability of the subset principle becomes less clear.

We might therefore conclude that the incompatibility of the subset principle with the hierarchies under discussion is simply apparent. However, Biberauer & Roberts (2009) note that one class of cases remains where superset-subset relations may emerge: those involving formal optionality. One potential example of such optionality can be seen in Perenakan Javanese:

(31) a. Tono pernah gelem isa ngomong Inggris
Tono PRF want can speak English
'Tono has wanted to be able to speak English.'

b. Pernah Tono gelem isa ngomong Inggris?
PRF Tono want can speak English
'Has Tono ever wanted to be able to speak English?'

c. Pernah gelem isa Tono ngomong Inggris?
PRF want can Tono speak English
'Has Tono ever wanted to be able to speak English?'

(Perenakan Javanese, Branigan 2012:2)

Though there is an interpretational difference between (31a) and (31b-c), these latter two examples appear equivalent, yet allow two distinct syntactic structures. Cole et al. (2008) and Branigan (2012) argue that structures such as (31c) result from multiple head-movement to C. Crucially, though, this multiple head-movement is optional, with only the highest auxiliary needing to move to derive a question, and so the syntax allows both (31b) and (31c) in free variation. Branigan (2012) further argues that Algonquian languages allow such multiple head-movement to every probe, with e.g. multiple head-movement to v appearing as apparent noun incorporation, as shown for Innu-aimûn in (32):

(32) a. pâkunamu 's/he skins it'

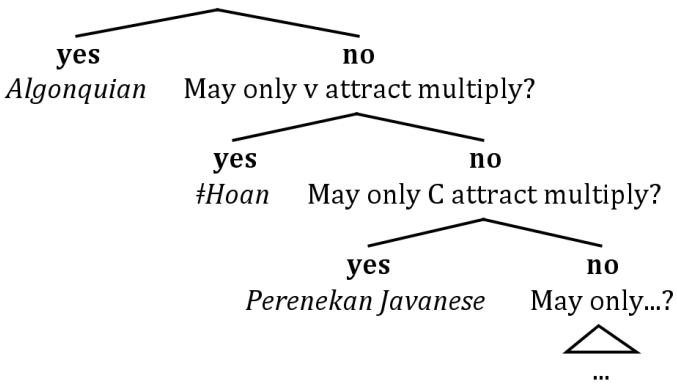
b. pâkuna-pish-ueu 's/he skins a lynx'

c. pâkun-âtshesh-ueu 's/he skins a fox'

(Innu-aimûn, Branigan 2012:15)

By contrast, Perenakan Javanese does not allow multiple head-movement to this probe, and so on the basis of this and many comparable observations, Branigan (2012) proposes the emergent hierarchy below:

(33) May all functional categories attract multiply?



(adapted from Branigan 2012:27)

Given this hierarchy, we may consider the difference in input for Algonquian and Perenakan Javanese learners. As in the discussion of head-finality above, we can once again represent this data with an English-like simplification, terming Algonquian-type grammars G_A, and Pernekan Javanese-type grammars G_P. Consequently G_A generates sentences such as the following (34):

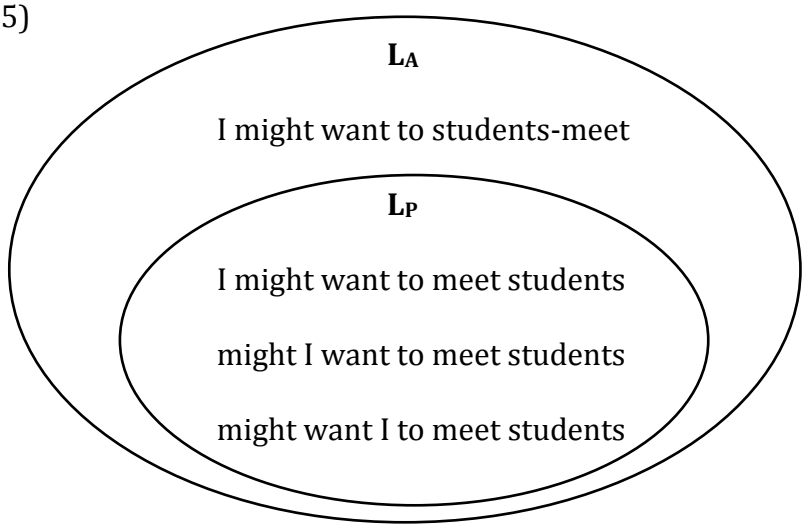
(33)	a. I might want to meet students	no head-movement
	b. might I want to meet students	head-movement to C
	c. might want I to meet students	head-movement to C
	d. I might want to students-meet	head-movement to v

Of these options (33a-c) are also generated by G_P, since these are all compatible with multiple head-movement to C. However (33d) is ungrammatical, since it is only compatible with multiple head-movement to v, which is not permitted in this variety. The range of options generated by G_P can therefore be summarised in (34):

(34)	a. I might want to meet students	no head-movement
	b. might I want to meet students	head-movement to C
	c. might want I to meet students	head-movement to C
	d. * I might want to students-meet	head-movement to v

All other things being equal, the relation between L_A and L_P (the languages generated by G_A and G_P respectively) can therefore be represented as follows:

(35)



L_P is therefore a proper subset of L_A, and so the relation between these varieties is equivalent to that in (24) above. A learner acquiring G_P will therefore be susceptible to the superset trap of assuming, on the basis of examples such as (34a-c), that *all* functional categories may attract multiply, rather than just C. Such an assumption would lead to a hypothesis of the superset grammar G_A, which would be irrefutable on the basis of positive evidence alone.

It is for such reasons that Biberauer & Roberts (2009) argue that formal optionality in grammars may lead to superset-subset relations, and from there to potential superset traps. However, they additionally argue that a key factor in such cases is the "robustness" of the linguistic data involved. In particular, their suggestion is that a hypothesis of formal optionality is entertained only when there is very robust evidence. In support of this hypothesis, they present multiple cases in the history of English where a decrease in the robustness of optionality appears to have resulted in reanalysis, and so a shift to the subset grammar. This amounts to a claim that, following Clark & Roberts (1993), the use of the subset principle is an aspect of the learner's acquisitional conservativity. Several difficulties remain, however, including the exact (presumably statistical) nature of "robustness" involved, and the implementation of the principle itself.[11] Moreover, it is unclear

[11] In particular, it is unclear which mechanism the learner should use to determine the "smallest" language consistent with the data encountered. For instance, this could be established by extensional comparison of the sentences generated by grammars, intensional comparison of the grammars themselves, application of an evaluation metric, etc., with each option having associated

whether this kind of conservativity applies in all cases, since some potential counterexamples remain. For instance, Déprez & Pierce (1993) claim that learners of English, French, German, and Swedish initially hypothesise optionalities of subject raising and/or verb movement before retreating to less optional grammars.

Such difficulties aside, the above discussion shows that a clear conflict arises between emergent hierarchies and the subset principle. Emergent hierarchies were proposed in 1.3.1 as resulting from input generalisation and feature economy, two principles of conservative learning. Furthermore, the top-down pathway that these principles create appears to have typological and diachronic support, reviewed in 1.2.2 above. The subset principle may also be thought of as a principle of conservative learning, yet it is one that appears to occasionally be in conflict with the results of input generalisation and feature economy. This is a difficulty identified by both Biberauer (2011) and Branigan (2012), and both suggest a similar solution.

In essence, the problem is how macroparameters involving optionality (such as the universal multiple attraction option in (33)) can be set positively without false positives occurring for more microparametric varieties. Branigan's (2012) suggestion is that such macroparameters may in fact be set at an earlier stage of maturational development, before all categorial distinctions between heads are made. As such, it is "the same type of parameter as the various individual microparameters, but one which is operating in a less richly-specified state of grammar." (p.30) Similarly, Biberauer (2011) suggests that categorial distinctions may not all exist when generalisations occur, and so what appear to be supercategories in adult grammars may in fact be the smallest categories available at the time. Both these hypotheses amount to a claim that categorial divisions must proceed alongside feature distribution, with the relative order of these processes varying in certain macro- and microparametric cases.

difficulties. See Biberauer & Roberts (2009:59, fn.2) and especially Fodor & Sakas (2005) for discussion.

Such perspectives arguably do not completely remove the possibility of superset traps occurring (since the logical possibility of hierarchies such as (33) always remains), but instead argue that in such problematic cases, the acquisitional pathway is structured so as to sidestep these difficulties. This may result from the differing distribution of data in the relevant varieties, some measure of robustness in the sense of Biberauer & Roberts (2009), more complex innate restrictions, or any combination of these. Overall, the general extent of the subset principle's application itself remains unclear, and so I do not consider it in further detail here, although it is briefly mentioned in chapter 2, footnote 1. Crucially, though, the distribution of features and the creation of categorial distinctions must be carried out in parallel to allow superset traps to be evaded in the manner outlined above. In the present work I remain agnostic about the factors that condition this evasion, but develop a framework which has its foundations in this parallel acquisition.

1.4 Conclusion.

This chapter introduced the lexicocentric approach to variation taken throughout the thesis, noting that it provides a minimalist locus for parameters, and is consistent with the wide range of microparametric differences that are being uncovered by current research. Nevertheless, this variation appears more synchronically and diachronically structured than lexicocentrism might have us assume, and the minimalist advantages of relegating parameters to the lexicon come at a high acquisitional cost. To address these problems, we considered the ReCoS approach, which posits that the learner uses domain-general principles of acquisition to organise microparameters into emergent hierarchies, thus structuring both typological variation and the learning pathway itself.

This approach is not without its own difficulties, and in particular we reviewed a number of open questions about the form and determination of these hierarchies before going on to consider one additional problem in detail: the possibility of superset traps. We saw that the potential for these traps arises in hierarchies pertaining to phenomena involving formal optionality, especially where this optionality is not robustly attested. Ultimately, it was argued that such traps can potentially be avoided in acquisitional systems where categorial division proceeds alongside the distribution of features. In the following section I propose a system of exactly this type, with this structural choice providing answers to many of the questions arising in this chapter.

2. An Algorithm for Lexicocentric Parameter Acquisition.

2.1 Introduction.

The previous chapter outlined how the third factor principles of feature economy and input generalisation combine to give rise to emergent hierarchies of microparameters. However, while these principles determine the general structure of hierarchies, they leave many aspects of their formation ambiguous. For this reason, in this chapter I develop a considerably more specified third factor algorithm that tackles the problems of the previous subsections by providing an explicit learning pathway for categorisation and feature assignment. A consequence of this explicitness is an algorithm that is not as simple as the general principles of conservative learning proposed in the previous section. Nevertheless, it is based on straightforward considerations of the encoding of properties, and since it is hypothesised to be domain-general, the need for minimality is less pressing. This claim of generality is corroborated by the potential applicability of the algorithm in a number of different domains. Syntax nevertheless differs from these domains in certain respects, and so the chapter ends with a consideration of how these differences should be accommodated.

Section 2.2 develops the algorithm itself, beginning with an abstract characterisation of the linguistic input, before presenting and successively refining candidate algorithms by applying them to toy syntactic examples. The resulting procedure is then assessed for the phonological, phonotactic, and conceptual domains in section 2.3. This is followed by a consideration of the unique properties of syntax in section 2.4, leading to an algorithmic basis for valued/unvalued features, movement triggers, and c-selection. Section 2.5 concludes, summarising the domain-specific assumptions that remain.

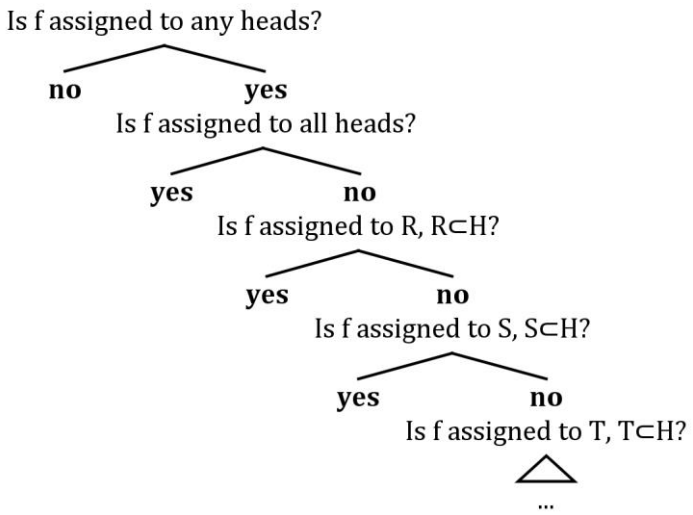
2.2 An algorithmic formalisation of the ReCoS approach.

Chapter 1 came to the conclusion that a formalisation of the ReCoS approach should not only systematically construct hierarchies for feature assignment, but also create the categories to which these features are assigned. This section begins with the latter of these tasks, incorporating the former once a fairly complex algorithm has been developed. This resulting procedure defines a putatively domain-general process for lexicocentric parameter acquisition that provides explicit answers to many of the questions arising above. However, before any such considerations, it is first necessary to determine a concrete form of input for the algorithm, which is the objective of the following two subsections.

2.2.1 Characterisation of the linguistic input.

It is difficult to develop any algorithm without knowledge of the data on which it should operate. Here, this data is essentially the linguistic input, although it is necesssary to characterise it in a manner that is appropriate to the domain of enquiry. To this end, let us reconsider the general shape of an emergent hierarchy:

(1)



(repeated from (ch.1:17))

The primary object that this hierarchy operates with is a syntactic head, with features being distributed across these heads. Furthermore, heads are arranged into specific subsets (R, S, T, etc.) which presumably correspond to linguistic categories of some sort. However, in section 1.3.3, it was argued that the

acquisition of such categories should proceed alongside the distribution of features. The algorithm must therefore begin with a number of linguistic heads, and in the course of its operation group them into categories and assign features on the basis of the properties of these heads. As such, one simple model of a linguistic head would be a set of properties, as in (2a), with a toy example shown in (2b):

(2) a. H_1: $\{p_i, p_j, p_k, p_l, \ldots\}$

b. *loves*: {verb, transitive, case-assigner}

Since sets are unordered, no particular priority is given to any one property over another, and furthermore properties are not distinguished on the basis of their ultimate encoding in the linguistic system (e.g. as a feature, category, etc.). It is additionally worth noting here that this definition of a head does not necessarily entail that the learner knows every property of every head when the algorithm is first applied. Instead, this is a statement of all the properties that are discoverable of a head, with it being entirely possible for the learner to identify each of these at a different stage of the algorithm's operation.

Of course, for a process such as (1) to apply, the learner must have access not to a single head, but to many, and so we additional require a structure for the arrangement of heads. Here, again, we desire an arrangement where no head is prioritised over any other, and so one choice would be to place heads themselves in a set. However, it is possible that two heads distinct in one domain (e.g. their phonological realisation, and/or their semantic denotation) may have the same set of syntactic properties. Since heads have been defined as sets of properties, these heads would have an identical representation in the syntactic domain, and so would be realised as the same element of a set. To avoid this complication, I represent the range of heads available to the learner as a multiset, indicated by double set brackets. This is shown in (3), with part (a) once again showing a general characterisation, and part (b) a toy example.

(3) a. H_1: {{ {p_i, p_j, p_k, …},
H_2: {p_l, p_m, p_n, …},
H_3: {p_o, p_p, p_q, …}, … }}

b. *loves*: {{ {verb, transitive, case-assigner},
sees: {verb, transitive, case-assigner},
sneezes: {verb, case-assigner},
book: {noun, takes determiner} }}

This depiction of the linguistic input may appear strange, since it is significantly more analysed than the stream of aural or visual information that is, in reality, presented to the learner. However, many treatments of comparative syntax operate on such higher-level concepts, often without considering the acquisition of these concepts themselves. This is true of emergent hierarchies, as well as many of the other proposals discussed in chapter 1. In some cases this is due to an assumption of significant innate structure, meaning far less needs to be extracted from the input. However, given the minimalist basis of this work, we should seek to reduce these innate postulations where possible, as discussed in section 1.2.

Consequently it seems likely that at least some aspects of representations such as (3a-b) should be extracted from the input via a complex and at least partially statistical acquisition process.[1] For instance, the segmentation of heads may involve transitional probabilities (see e.g. Saffran et al. 1996, Gómez & Gerken 1999, though see Johnson & Tyler 2010), although some innate restrictions are likely also required (Gambell & Yang 2005). This could additionally be combined with a more directed chunking procedure (e.g. Fasanella & Fortuny 2013). Moreover, identification of properties relevant to category-determination may be based on distributional evidence (e.g. Gagliardi & Lidz 2014), but is also likely subject to statistical tolerances similar to those proposed by Yang (2005), Legate & Yang (2012). However, even when all this information is extracted, the learner must still go from (3) to a structured system of categories and features.

[1] See Hale & Reiss (2008:ch.2) for an alternative approach that rejects statistical acquisition of phonological features, and consequently (via the subset principle) reaches the conclusion that all components of these features must be innate. Mielke (2008) takes the opposite approach, arguing for emergent phonological features.

Essentially, the position outlined here is that acquisition involves two processes: the extraction of heads and their properties, and the assembly of these heads and properties into a linguistic system. The algorithm proposed in this thesis is an attempt to account for the latter of these processes, and so it takes an already fairly structured object as its input. It may be that subsequent research could integrate these two processes, making them dependent on one another (see Fasanella & Fortuny 2013 for one argument along these lines), but for simplicity I separate them here.

2.2.2 Ordering properties by prominence.

In 1.3.3, it was argued that a desirable model of acquisition would allow some features to be distributed before categorial divisions, and vice versa. This implies that the process must be at least partially sequential, encoding different properties in turn. There is some acquisitional evidence to support this – for instance, it is commonly recognised that the category of nouns is learned before the category of verbs (e.g. Gentner 1982). Additionally, Harley & Ritter (2002) review a range of literature on the sequential acquisition of pronouns, and argue that several uniform patterns exist, such as the emergence of first person before second person, and singular before plural. One straightforward way to implement this sequentiality would therefore be to examine each property in turn. This requires the addition of one further ingredient to the input: a total order of properties.

We can therefore represent the complete input to the acquisition algorithm as follows:

(4) a. $\{\{ \{p_i, p_j, p_k, \ldots\}, \{p_l, p_m, p_n, \ldots\}, \{p_o, p_p, p_q, \ldots\}, \ldots \}\}$
$\langle p_i, p_j, p_k, p_l, p_m, p_n, p_o, p_q, \ldots \rangle$

b. {{ {verb, transitive, case-assigner}, {verb, transitive, case-assigner}, {verb, case-assigner}, {noun, takes determiner} }}
<noun, verb, case-assigner, transitive, takes determiner>

The multisets of sets of properties in (4) are each augmented with a total order of properties, which provides a sequence for the acquisition pathway to follow.

Once again, this representation does not necessarily imply that the learner knows the entirety of this order before the algorithm is applied, or that the order is completely innately determined. Instead, the existence of an order is a direct consequence of the assumption of sequentiality: since properties are treated sequentially, there must be some sequence of properties that emerges, and this is the order given to the algorithm. This order likely emerges through a combination of factors, including the frequency and robustness of the property in the data, domain-general statistical factors, and innate specification. I therefore describe this order as an order of prominence, where "prominence" encapsulates the combination of these factors that contributes to one particular property being examined before another.

A more sophisticated treatment of this notion would provide a means to extract an order of prominence from the linguistic data itself. However, this would not only require a model of all the factors producing the multiset representation, but also an advanced understanding of the acquisitional trajectory and the factors that shape it. For this reason, such a treatment seems to be not simply beyond the scope of this thesis, but also beyond the current knowledge of the field. I therefore state the order of prominence unambiguously in the input to the algorithm with the hope that its examination in different cases (and with different algorithms) might ultimately lead to a deeper understanding of how, in fact, this order arises.

2.2.3 A privative categorisation algorithm.

Having fully defined the input, we are now in a position to begin constructing a lexicocentric algorithm for categorisation and feature assignment. As noted above, I begin by concentrating on the first of these tasks. For this purpose, I begin with the toy input in (5), which consists of 5 heads:[2]

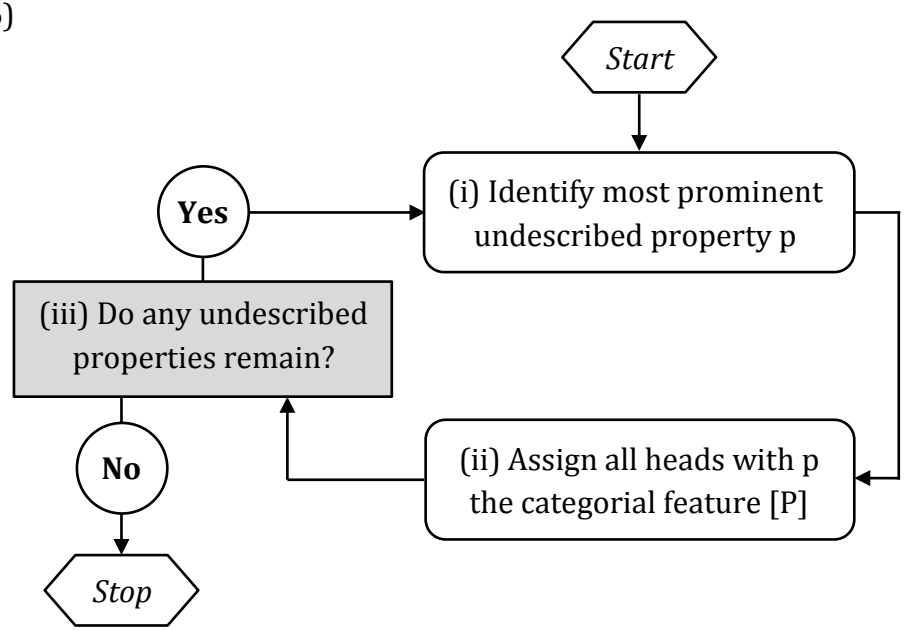
[2] The properties assigned to the adverb *quickly* and the preposition *of* are inspired by Chomsky's (1981) category system where As are [+N, +V], and Ps are [-N, -V]. This assumption is made for expositional convenience rather than theoretical validity.

(5) *loves*: {{ {verb, transitive},
sneezes: {verb},
book: {noun},
quickly: {noun, verb},
of: ∅ }}
<noun, verb, transitive>

This input has exactly the same form as those in (4), with the first part defining a multiset of sets of properties, each of which corresponds to a head, and the second part giving a prominence order for these properties.

Perhaps the simplest algorithm to convert this information into categorial features[3] is as follows:

(6)



This algorithm takes each property in order of prominence, and creates a privative categorial feature for that property, which is assigned to the heads that have it. In the case of an input of (5), the following process occurs:

[3] I represent categorial features in capitals and within square brackets.

(7) *Start*

(i) Identify most prominent undescribed property p
p = noun

(ii) Assign all heads with 'noun' the categorial feature [NOUN]
Assign [NOUN] to *book, quickly*

(iii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = verb

(ii) Assign all heads with 'verb' the categorial feature [VERB]
Assign [VERB] to *loves, sneezes, quickly*

(iii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = transitive

(ii) Assign all heads with 'transitive' the categorial feature [TRANSITIVE]
Assign [TRANSITIVE] to *loves*

(iii) Do any undescribed properties remain?
No

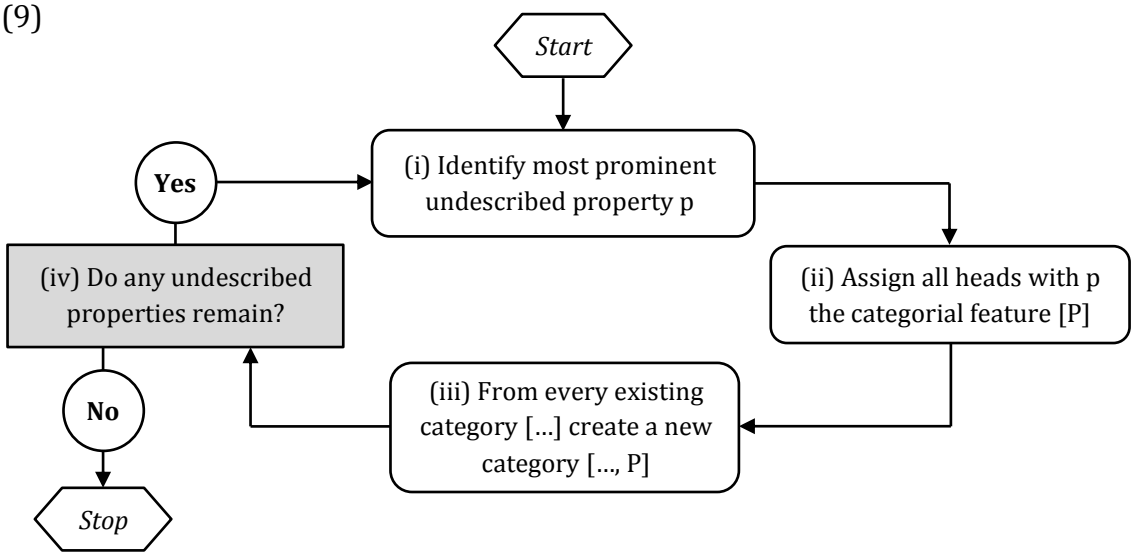
Stop

The algorithm in (6) therefore defines an iterative process that applies until all properties have been converted into categorial features. The output of (7) is as follows:

(8) *loves*: [VERB, TRANSITIVE]
sneezes: [VERB]
book: [NOUN]
quickly: [NOUN, VERB]
of: no features

Here the simplicity of the algorithm in (6) becomes apparent: it merely converts properties directly into categorial features, and so the output is very similar to the input, minus the prominence order. It is therefore far from adequate. However, with one addition to the algorithm, a slightly less trivial categorial system can be produced:

(9)



This process operates similarly to the previous system, but additionally enumerates a set of categories that may be referred to. I assume that the system begins with only one category, the category of all heads, written as [ ]. As the algorithm proceeds, and new categorial features are added to the system, more categories are created. This is demonstrated in (10), which applies the above algorithm to (5):

(10) *Start*

(i) Identify most prominent undescribed property p
p = noun

(ii) Assign all heads with 'noun' the categorial feature [NOUN]
Assign [NOUN] to *book, quickly*

(iii) From every existing category […] create a new category […, NOUN]
From [] create [NOUN]

(iv) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = verb

(ii) Assign all heads with 'verb' the categorial feature [VERB]
Assign [VERB] to *loves, sneezes, quickly*

(iii) From every existing category […] create a new category […, VERB]
From [] create [VERB]
From [NOUN] create [NOUN, VERB]

(iv) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = transitive

```
(ii)   Assign all heads with 'transitive' the categorial feature
       [TRANSITIVE]
       Assign [TRANSITIVE] to loves

(iii)  From every existing category […] create a new category
       […, TRANSITIVE]
       From [] create [TRANSITIVE]
       From [NOUN] create [NOUN, TRANSITIVE]
       From [VERB] create [VERB, TRANSITIVE]
       From [NOUN, VERB] create [NOUN, VERB, TRANSITIVE]

(iv)   Do any undescribed properties remain?
       No

       Stop
```

In addition to (8), this yields the system of categories given in (11). Since 3 categorial features are used, 8 categories result – more generally, a system of *n* categorial features produces 2^n categories.

(11)

[ ]:	*loves*, *sneezes*, *book*, *quickly*, *of*
[NOUN]:	*book*, *quickly*
[VERB]:	*loves*, *sneezes*, *quickly*
[TRANSITIVE]:	*loves*
[NOUN, VERB]:	*quickly*
[VERB, TRANSITIVE]:	*loves*
[NOUN, TRANSITIVE]:	∅
[NOUN, VERB, TRANSITIVE]:	∅

This is still a fairly simple system, but it does create some useful categories. We can, for instance, easily identify the category of transitive verbs as [TRANSITIVE] or [VERB,TRANSITIVE], and the category of adverbs as [NOUN,VERB]. However, there are two difficulties with this system. The first is that certain classes cannot be identified – for instance, intransitive verbs cannot be identified, since only [TRANSITIVE] is defined, and this is similarly true for the category of nouns, since the feature [NOUN] also includes adverbs. Furthermore, purely negatively defined categories such as prepositions cannot be identified at all, being present only in the category of all heads. The second difficulty is that there are many empty categories, which use potentially meaningless combinations of features such as [NOUN,TRANSITIVE].

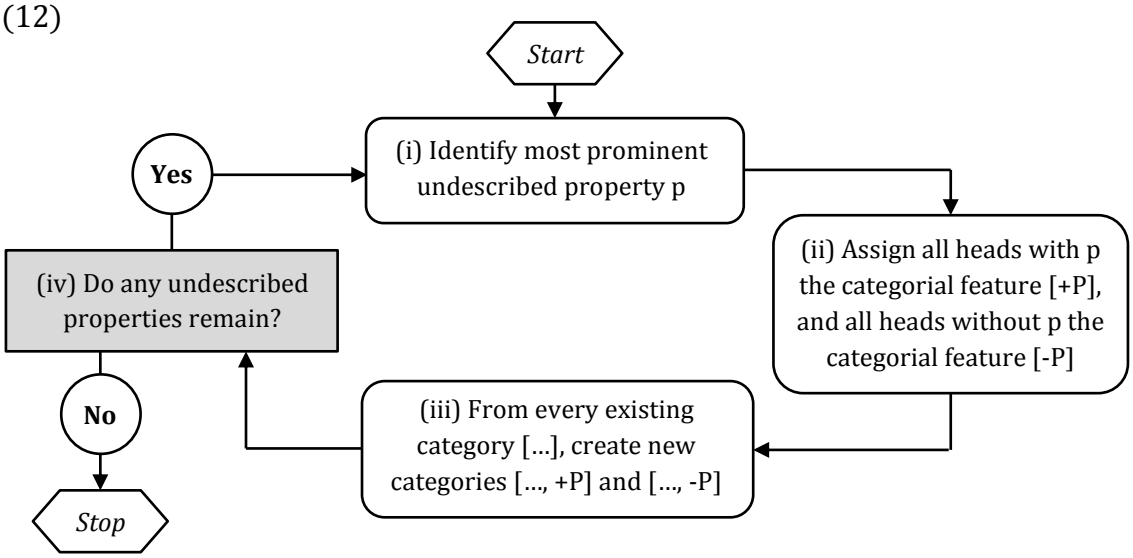
It remains the case that these properties could arguably be productively incorporated into an ontology of categorial features. For example, we might desire

a system where transitive verbs can be referred to but intransitives cannot, or we might wish to account for nominal arguments in terms of transitivity. Nevertheless, in the absence of such motivations, and to avoid such difficulties arising in unwanted cases, the system generated appears to be simultaneously too broad (in that irrelevant categories exist), and too narrow (in that many relevant classes cannot be referred to). For this reason, it is necessary to refine the algorithm.

2.2.4 A binary categorisation algorithm.

One way to address the narrowness problem identified above is to move from privative to binary features, which allows negative definitions, and presents many more categorial possibilities. Of course, this also exacerbates the broadness problem, which will be addressed below. The algorithm in (9) can be minimally altered to make use of binary categorial features:

(12)



This can once again be applied to (5):

(13) *Start*

(i) Identify most prominent undescribed property p
p = noun

(ii) Assign all heads with 'noun' the categorial feature [+NOUN], and all heads without 'noun' the categorial feature [-NOUN]
Assign [+NOUN] to *book, quickly*; assign [-NOUN] to *loves, sneezes, of*

(iii) From every existing category […], create new categories […, +NOUN] and […, -NOUN]
From [] create [+NOUN] & [-NOUN]

(iv) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = verb

(ii) Assign all heads with 'verb' the categorial feature [+VERB], and all heads without 'verb' the categorial feature [-VERB]
Assign [+VERB] to *loves*, *sneezes*, *quickly*; assign [-VERB] to *book*, *of*

(iii) From every existing category […], create new categories […, +VERB] and […, -VERB]
From [] create [+VERB] & [-VERB]
From [+NOUN] create [+NOUN, +VERB] & [+NOUN, -VERB]
From [-NOUN] create [-NOUN, +VERB] & [-NOUN, -VERB]

(iv) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = transitive

(ii) Assign all heads with 'transitive' the categorial feature [+TRANSITIVE], and all heads without 'transitive' the categorial feature [-TRANSITIVE]
Assign [+TRANSITIVE] to *loves*; assign [-TRANSITIVE] to *sneezes*, *book*, *of*, *quickly*

(iii) From every existing category […], create new categories […, +TRANSITIVE] and […, -TRANSITIVE]
From [] create [+TRANSITIVE] and [-TRANSITIVE]
From [+NOUN] create [+NOUN, +TRANSITIVE] & [+NOUN, -TRANSITIVE]
From [-NOUN] create [-NOUN, +TRANSITIVE] & [-NOUN, -TRANSITIVE]
From [+VERB] create [+VERB, +TRANSITIVE] & [+VERB, -TRANSITIVE]
From [-VERB] create [-VERB, +TRANSITIVE] & [-VERB, -TRANSITIVE]
From [+NOUN, +VERB] create [+NOUN, +VERB, +TRANSITIVE]
& [+NOUN, +VERB, -TRANSITIVE]
From [+NOUN, -VERB] create [+NOUN, -VERB, +TRANSITIVE]
& [+NOUN, -VERB, -TRANSITIVE]
From [-NOUN, +VERB] create [-NOUN, +VERB, +TRANSITIVE]
& [-NOUN, +VERB, -TRANSITIVE]
From [-NOUN, -VERB] create [-NOUN, -VERB, +TRANSITIVE]
& [-NOUN, -VERB, -TRANSITIVE]

(iv) Do any undescribed properties remain?
No

Stop

This results in (14), and the system of categories in (15):

(14) *loves*: [-NOUN, +VERB, +TRANSITIVE]
sneezes: [-NOUN, +VERB, -TRANSITIVE]
book: [+NOUN, -VERB, -TRANSITIVE]
quickly: [+NOUN, +VERB, -TRANSITIVE]
of: [-NOUN, -VERB, -TRANSITIVE]

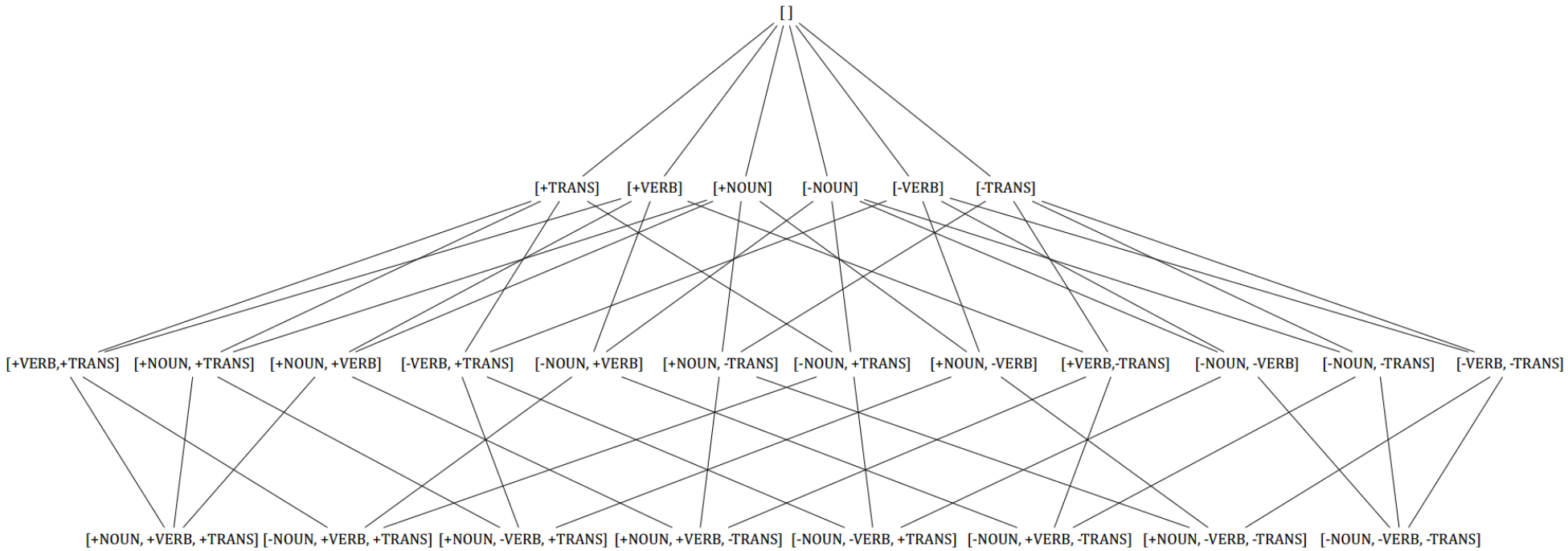
(15)

[ ]:	*loves*, *sneezes*, *book*, *quickly*, *of*
[+NOUN]:	*book*, *quickly*
[-NOUN]:	*loves*, *sneezes*, *of*
[+VERB]:	*loves*, *sneezes*
[-VERB]:	*book*, *of*
[+TRANSITIVE]:	*loves*
[-TRANSITIVE]:	*sneezes*, *book*, *quickly*, *of*
[+NOUN, +VERB]:	*quickly*
[+NOUN, -VERB]:	*book*
[-NOUN, +VERB]:	*loves, sneezes*
[-NOUN, -VERB]:	*of*
[+NOUN, +TRANSITIVE]:	∅
[+NOUN, -TRANSITIVE]:	*book*, *quickly*
[-NOUN, +TRANSITIVE]:	*loves*
[-NOUN, -TRANSITIVE]:	*sneezes*, *of*
[+VERB, +TRANSITIVE]:	*loves*
[+VERB, -TRANSITIVE]:	*sneezes*, *quickly*
[-VERB, +TRANSITIVE]:	∅
[-VERB, -TRANSITIVE]:	*book*, *of*
[+NOUN, +VERB, +TRANSITIVE]:	∅
[+NOUN, +VERB, -TRANSITIVE]:	*quickly*
[+NOUN, -VERB, +TRANSITIVE]:	∅
[-NOUN, +VERB, +TRANSITIVE]:	*loves*
[+NOUN, -VERB, -TRANSITIVE]:	*book*
[-NOUN, +VERB, -TRANSITIVE]:	*sneezes*
[-NOUN, -VERB, +TRANSITIVE]:	∅
[-NOUN, -VERB, -TRANSITIVE]:	*of*

In this system, a great many more categories may be referred to than in the privative case – 27 as opposed to 8 (or in the general case, 3^n). As a result, many categories that were previously unavailable may now be identified. For instance, intransitive verbs are [+VERB,-TRANSITIVE], nouns are [+NOUN,-VERB], and prepositions are [-NOUN,-VERB]. This resolves the narrowness problem – a vast

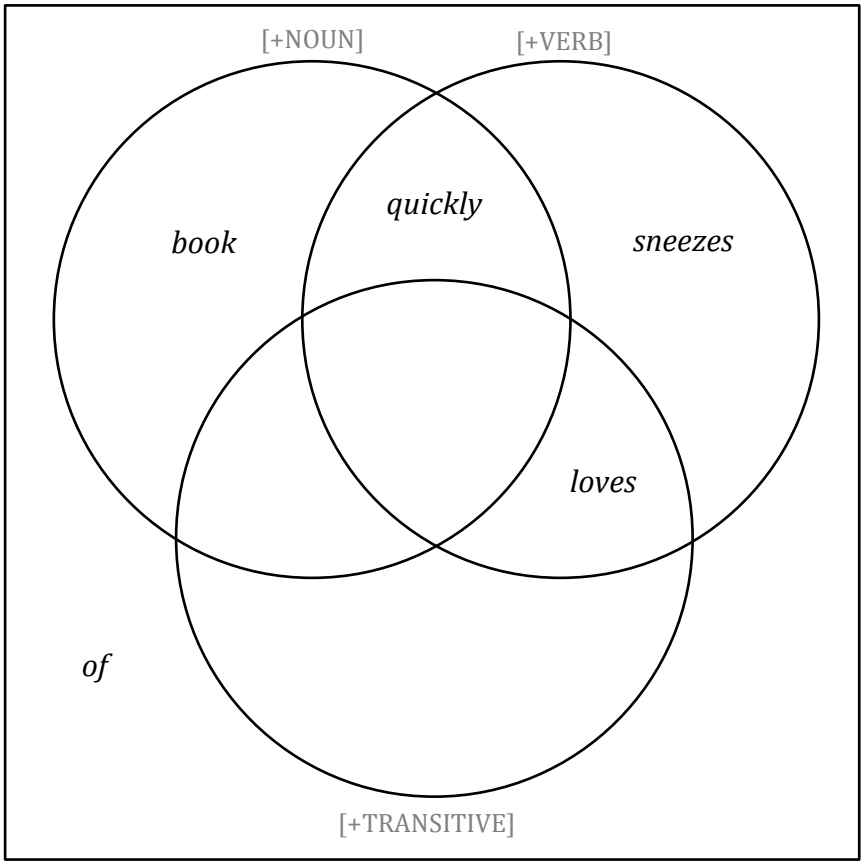
range of categories now be referred to – at the cost of worsening the broadness problem. Many categories appear to be empty and/or unnecessary. For instance, several categories making use of [+TRANSITIVE] are empty, and some nonempty categories such as [+VERB,+TRANSITIVE] define exactly the same set of heads as [-NOUN,+VERB,+TRANSITIVE]. Furthermore, each new categorial feature triples the number of categories, and so grammars are likely to quickly explode in their categorial complexity. The complex relations seen between all the categories in this three feature case can be expressed in terms of the following Haase diagram, where lines represent inclusion:

(16)


[ ]
[+TRANS]
[+VERB]
[+NOUN]
[-NOUN]
[-VERB]
[-TRANS]
[+VERB,+TRANS]
[+NOUN, +TRANS]
[+NOUN, +VERB]
[-VERB, +TRANS]
[-NOUN, +VERB]
[+NOUN, -TRANS]
[-NOUN, +TRANS]
[+NOUN, -VERB]
[+VERB,-TRANS]
[-NOUN, -VERB]
[-NOUN, -TRANS]
[-VERB, -TRANS]
[+NOUN, +VERB, +TRANS]
[-NOUN, +VERB, +TRANS]
[+NOUN, -VERB, +TRANS]
[+NOUN, +VERB, -TRANS]
[-NOUN, -VERB, +TRANS]
[-NOUN, +VERB, -TRANS]
[+NOUN, -VERB, -TRANS]
[-NOUN, -VERB, -TRANS]

This system can also be given the Venn diagram representation in (17), where each category picks out a different combination of intersections.

(17)



We are therefore motivated from two related perspectives to attenuate categorial complexity where possible: avoiding the postulation of categories that appear to be irrelevant to the system (solving the broadness problem), and reducing the exponential increase in categories that occurs with each new property considered. For this reason, I now consider an algorithm in which featural distinctions may be made relevant only to specific categories.

2.2.5 Accounting for dependent categories.

We observed above that many of the empty and/or unnecessary categories in (15) were related to the feature [+TRANSITIVE], which is shown even more clearly in the Venn diagram in (17). One way to prevent the creation of empty categories would be to check whether a given category actually supports a [±P] distinction before division. If it does not contain at least one head with [+P] and one head with

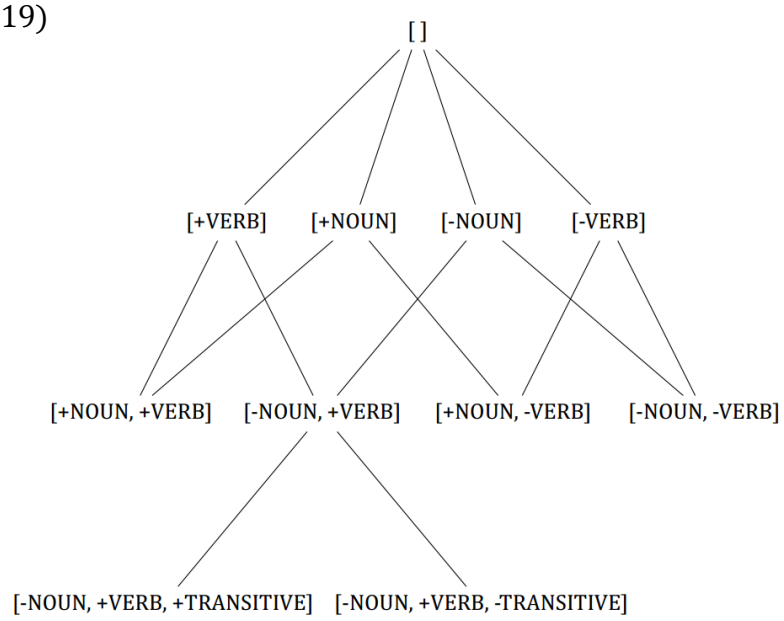
[-P], then dividing it into [±P] will create a category whose contents is identical to the original category, and a category with no members. As a result, division need not be carried out when a [±P] distinction is not supported.

This is a helpful restriction, which will be implemented below, but it does not prevent the creation of categories such as [+VERB,+TRANSITIVE], which defines the same heads [-NOUN,+VERB,+TRANSITIVE]. This difficulty results from the property of transitivity being dependent only on heads that are [-NOUN,+VERB]. Ideally, the algorithm should be able to apply the [±TRANSITIVE] distinction to this category only, as in the system of (18), additionally shown with Haase (19) and Venn (20) diagram representations:

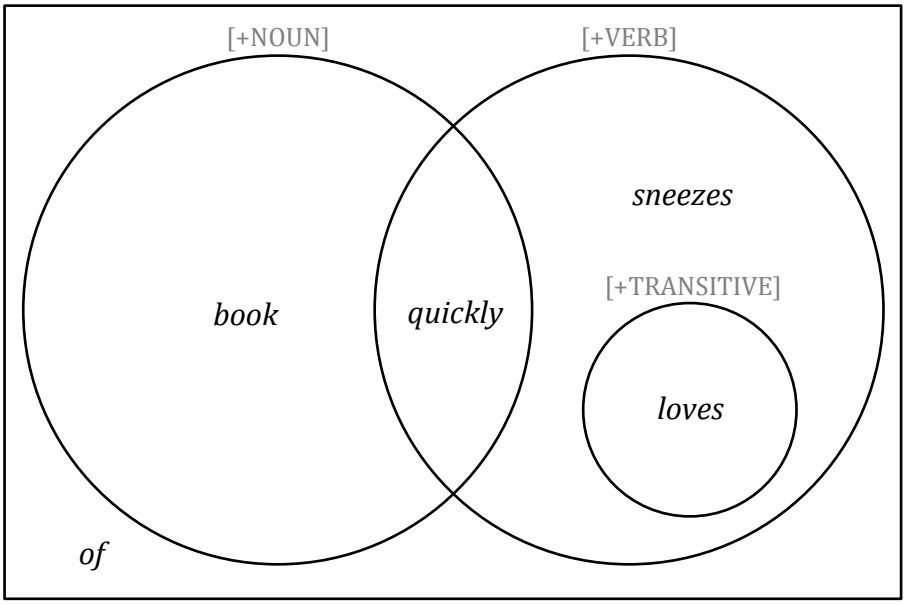
(18)

[ ]:	*loves*, *sneezes*, *book*, *quickly*, *of*
[+NOUN]:	*book*, *quickly*
[-NOUN]:	*loves*, *sneezes*, *of*
[+VERB]:	*loves*, *sneezes*
[-VERB]:	*book*, *of*
[+NOUN, +VERB]:	*quickly*
[+NOUN, -VERB]:	*book*
[-NOUN, +VERB]:	*loves, sneezes*
[-NOUN, -VERB]:	*of*
[-NOUN, +VERB, +TRANSITIVE]:	*loves*
[-NOUN, +VERB, -TRANSITIVE]:	*sneezes*

(19)



(20)



This system retains the advantages of (14-17), since all relevant distinctions can still be made – e.g. adverbs are [+NOUN,+VERB], prepositions are [-NOUN,-VERB] and intransitive verbs are [-NOUN,+VERB,-TRANSITIVE]. However, it is also considerably simplified, with 11 rather than 27 categories, since transitivity is no longer a top-level distinction, applying only to [-NOUN,+VERB]. Such a system therefore addresses both the broadness and the narrowness problem, while also reducing complexity where possible.

Notwithstanding, adapting the algorithm to produce such systems is not as straightforward as the previous alterations. For each property, it is necessary to identify the "smallest" existing category in which the distinction is made. In the case of the example above, [-NOUN,+VERB] is "smallest" in this sense, since the [±TRANSITIVE] distinction is confined to this category. By contrast, the [±NOUN] and [±VERB] distinctions are made across all heads, and so these are confined instead to the category [ ]. However, defining "smallest" is not always so clear, as it may not be obvious which category of several meets this notion. We therefore need a method of ordering categories by this notion of "size."

One possibility is that categories could be ordered by their description length, where this is defined as the number of categorial features used to describe a category. Thus [ ], with a length of 0, would be ordered before [+NOUN], and this in turn would be ordered before [+NOUN,+VERB], and so on. This provides the beginnings of a scale of "size," since more specified categories are "smaller" than their less specified equivalents. However, it does not provide a total ordering, since many categories may have descriptions of equal length, making it unlikely for there to be unique "smallest" category. We therefore need a further method of ordering among categories of the same description length, and one possibility here is by the number of heads that each category contains. Ordering first by description length (l) and then by number of heads (h) yields the following order for the above example:

(21)	[ ]	l = 0, h = 5
	[-NOUN]	l = 1, h = 3
	[+NOUN], [+VERB], [-VERB]	l = 1, h = 2
	[-NOUN, +VERB]	l = 2, h = 2
	[+NOUN, +VERB], [+NOUN, -VERB], [-NOUN, -VERB]	l = 2, h = 1
	[-NOUN, +VERB, +TRANSITIVE], [-NOUN, +VERB, -TRANSITIVE]	l = 3, h = 1

Subordering by number of heads results in a system that attempts to confine categorial distinctions to as few heads as possible, which seems plausible as an economic measure. However, this still does not provide a total ordering. At this point, there are few other considerations that could be used to order categories.

However, a number of fairly arbitrary orderings can be defined that make reference to the prominence order and the type of features involved. The version that I propose here is to order categories first by the position their features take in the prominence order, and second by whether the features involved are + or -. There are nevertheless a number of possibilities even given these restrictions. In particular, I propose mapping the featural description of a category to a ternary description (d) where digit place refers to position in the prominence order, and digit type the type of categorial feature involved (2 for [+X], 1 for [-X], and 0 for absence). As a result, in the current example [ ] has a description of 000, [+NOUN] of 200, [+NOUN,-VERB] of 210, and so on. This then allows for a total ordering of categories by "size":

(22)

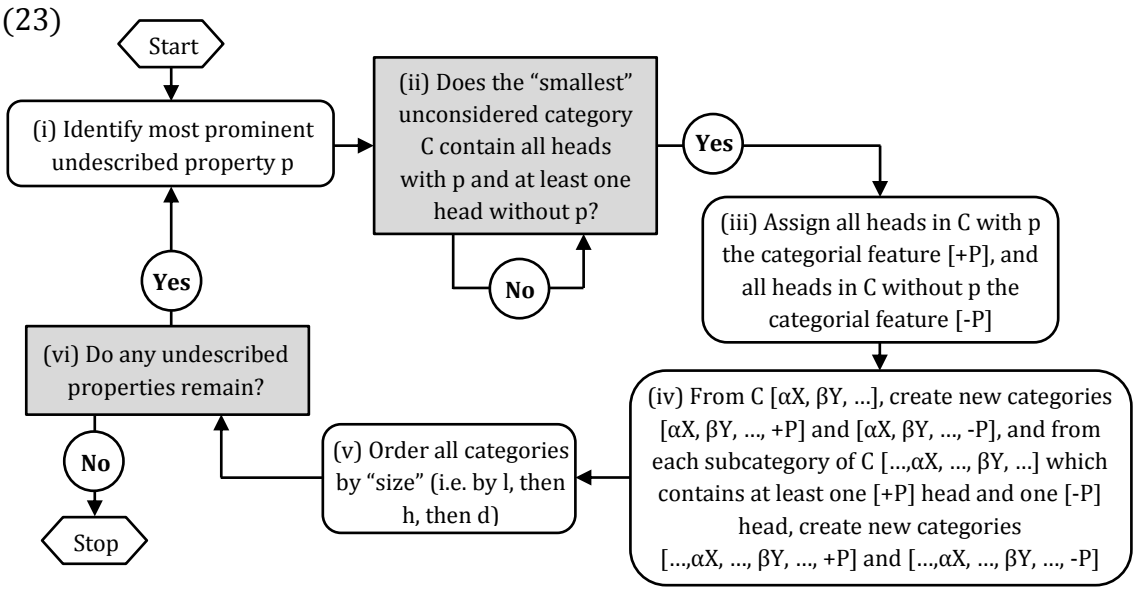
[ ]	l = 0, h = 5, d = 000
[-NOUN]	l = 1, h = 3, d = 100
[+NOUN]	l = 1, h = 2, d = 200
[+VERB]	l = 1, h = 2, d = 020
[-VERB]	l = 1, h = 2, d = 010
[-NOUN, +VERB]	l = 2, h = 2, d = 120
[+NOUN, +VERB]	l = 2, h = 1, d = 220
[+NOUN, -VERB]	l = 2, h = 1, d = 210
[-NOUN, -VERB]	l = 2, h = 1, d = 110
[-NOUN, +VERB, +TRANSITIVE]	l = 3, h = 1, d = 122
[-NOUN, +VERB, -TRANSITIVE]	l = 3, h = 1, d = 121

Ordering by these ternary descriptions therefore pemits categories of equivalent lengths to be compared by the prominence and type of the categories involved. However, this measure is only relevant for categories of the same description length, since if comparisons are made across description lengths, then e.g. [ ] comes out as the "smallest" category, despite it being best viewed as the "largest." Ordering first by description length, then by number of heads, then finally by ternary description ensures that categories are ordered first by less arbitrary measures, with the most arbitrary ordering being used only when more sensible measures do not make a distinction. This provides a formal definition of "size" yielding a total order that is partially based in plausible considerations. There are nevertheless many other procedures that could be employed, and ultimately this

question is an empirical one. Nevertheless, the ordering described here is used for concreteness.

Having defined a process for totally ordering categories by "size," the algorithm can finally be updated to create dependent categories where possible:

(23)



The key additions to this algorithm are steps (ii) and (v), with (iv) additionally being significantly altered from its previous form. Of these, step (v) is fairly straightforward, ordering all categories by the notion of "size" defined above immediately after new categories are created. Step (ii) is somewhat more complex, since it is reflexive when a "no" answer is received. This step checks each category, starting with the smallest, and determines whether that category contains all the heads with p, and at least one head without p. If it does not, then a "no" answer is received, and this step applies again with the next smallest category. As a result, this step continues until it identifies the "smallest" category C on which the [±P] distinction can be dependent. When this category is identified, step (iii) assigns [+P] and [-P] as before, although its scope is restricted to heads within C. The first part of step (iv) then divides C into [±P] variants, as in the previous version of the algorithm. However, if C contains any subcategories where the [±P] division is also made, these too should be divided, and so the second part of (iv) identifies these and creates the relevant division. The overall result is an algorithm that proceeds

as before, but now avoids categorial divisions where a [±P] distinction isn't made, and more importantly is capable of making categories that are dependent on others when necessary.

The operation of this algorithm can be seen below in its application to the current example:

(24) *Start*

(i) Identify most prominent undescribed property p
p = noun

(ii) Does [] contain all heads with 'noun' and at least one head without 'noun'?
Yes

(iii) Assign all heads in [] with 'noun' the categorial feature [+NOUN], and all heads in [] without 'noun' the categorial feature [-NOUN]
Assign [+NOUN] to *book*, *quickly*; assign [-NOUN] to *loves*, *sneezes*, *of*

(iv) From [], create new categories [+NOUN] and [-NOUN], and from each subcategory of [] […] which contains at least one [+NOUN] head and one [-NOUN] head, create new categories […, +NOUN] and […, -NOUN]
From [] create [+NOUN] & [-NOUN]

(v) Order all categories by "size" (i.e. by l, then h, then d)
[] l = 0, h = 5, d = 0
[-NOUN] l = 1, h = 3, d = 1
[+NOUN] l = 1, h = 2, d = 2

(vi) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = verb

(ii) Does [+NOUN] contain all heads with 'verb' and at least one head without 'verb'?
No

(ii) Does [-NOUN] contain all heads with 'verb' and at least one head without 'verb'?
No

(ii) Does [] contain all heads with 'verb' and at least one head without 'verb'?
Yes

(iii) Assign all heads in [] with 'verb' the categorial feature [+VERB], and all heads in [] without 'verb' the categorial feature [-VERB]
Assign [+VERB] to *loves*, *sneezes*, *quickly*; assign [-VERB] to *book*, *of*

(iv) From [] create new categories [+VERB] and [-VERB], and from each subcategory of [] […] which contains at least one [+VERB] head and one [-VERB] head, create new categories […, +VERB] and […, -VERB]
From [] create [+VERB] & [-VERB]
From [-NOUN] create [-NOUN, +VERB] & [-NOUN, -VERB]
From [+NOUN] create [+NOUN, +VERB] & [+NOUN, -VERB]

(v) Order all categories by "size" (i.e. by l, then h, then d)

[]	**l = 0, h = 5, d = 00**
[-NOUN]	**l = 1, h = 3, d = 10**
[+VERB]	**l = 1, h = 3, d = 02**
[+NOUN]	**l = 1, h = 2, d = 20**
[-VERB]	**l = 1, h = 2, d = 01**
[-NOUN, +VERB]	**l = 2, h = 2, d = 12**
[+NOUN, +VERB]	**l = 2, h = 1, d = 22**
[+NOUN, -VERB]	**l = 2, h = 1, d = 21**
[-NOUN, -VERB]	**l = 2, h = 1, d = 11**

(vi) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = transitive

(ii) Does [-NOUN, -VERB] contain all heads with 'transitive' and at least one head without 'transitive'?
No

(ii) Does [+NOUN, -VERB] contain all heads with 'transitive' and at least one head without 'transitive'?
No

(ii) Does [+NOUN, +VERB] contain all heads with 'transitive' and at least one head without 'transitive'?
No

(ii) Does [-NOUN, +VERB] contain all heads with 'transitive' and at least one head without 'transitive'?
Yes

(iii) Assign all heads in [-NOUN, +VERB] with 'transitive' the categorial feature [+TRANSITIVE], and all heads in [-NOUN, +VERB] without 'transitive' the categorial feature [-TRANSITIVE]
Assign [+TRANSITIVE] to *loves*, assign [-TRANSITIVE] to *sneezes*

(iv) From [-NOUN, +VERB], create new categories [-NOUN, +VERB, +TRANSITIVE] and [-NOUN, +VERB, -TRANSITIVE], and from each subcategory of [-NOUN, +VERB] […,-NOUN, …, +VERB, …] which contains at least one [+TRANSITIVE] head and one [-TRANSITIVE] head, create new categories […, -NOUN, …, +VERB, …, +TRANSITIVE] and […, -NOUN, …, +VERB, …, -TRANSITIVE]
From [-NOUN, +VERB] create [-NOUN, +VERB, +TRANSITIVE] & [-NOUN, +VERB, -TRANSITIVE]

```
(v)   Order all categories by "size" (i.e. by l, then h, then d)
      []                          l = 0, h = 5, d = 000
      [-NOUN]                     l = 1, h = 3, d = 100
      [+VERB]                     l = 1, h = 3, d = 020
      [+NOUN]                     l = 1, h = 2, d = 200
      [-VERB]                     l = 1, h = 2, d = 010
      [-NOUN, +VERB]              l = 2, h = 2, d = 120
      [+NOUN, +VERB]              l = 2, h = 1, d = 220
      [+NOUN, -VERB]              l = 2, h = 1, d = 210
      [-NOUN, -VERB]              l = 2, h = 1, d = 110
      [-NOUN, +VERB, +TRANSITIVE] l = 3, h = 1, d = 122
      [-NOUN, +VERB, -TRANSITIVE] l = 3, h = 1, d = 121
(vi)  Do any undescribed properties remain?
      No
      Stop
```

This results in exactly the system described in (18-20), with the following lexical specifications:

(25) *loves*: [-NOUN, +VERB, +TRANSITIVE]
sneezes: [-NOUN, +VERB, -TRANSITIVE]
book: [+NOUN, -VERB]
quickly: [+NOUN, +VERB]
of: [-NOUN, -VERB]

Thus (23) is a categorisation algorithm that addresses both the broadness problem and the narrowness problem, creating a simple binary category system that is consistent with the input. This can be further demonstrated if we simplify the input by removing *quickly*, giving the following:

(26) *loves*: {{ {verb, transitive},
sneezes: {verb},
book: {noun},
of: ∅ }}
<noun, verb, transitive>

The removal of heads that are both nominal and verbal means that there is no longer a need for 'noun' and 'verb' to both define top-level categories. This difference allows the algorithm to simplify the categorial system produced:

(27) *Start*

(i) Identify most prominent undescribed property p
p = noun

(ii) Does [] contain all heads with 'noun' and at least one head without 'noun'?
yes

(iii) Assign all heads in [] with 'noun' the categorial feature [+NOUN], and all heads in [] without 'noun' the categorial feature [-NOUN]
Assign [+NOUN] to *book*; assign [-NOUN] to *loves, sneezes, of*

(iv) From [], create new categories [+NOUN] and [-NOUN], and from each subcategory of [] […] which contains at least one [+NOUN] head and one [-NOUN] head, create new categories […, +NOUN] and […, -NOUN]
From [] create [+NOUN] & [-NOUN]

(v) Order all categories by "size" (i.e. by l, then h, then d)
[] l = 0, h = 4, d = 0
[-NOUN] l = 1, h = 3, d = 1
[+NOUN] l = 1, h = 1, d = 2

(vi) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = verb

(ii) Does [+NOUN] contain all heads with 'verb' and at least one head without 'verb'?
No

(ii) Does [-NOUN] contain all heads with 'verb' and at least one head without 'verb'?
Yes

(iii) Assign all heads in [-NOUN] with 'verb' the categorial feature [+VERB], and all heads in [-NOUN] without 'verb' the categorial feature [-VERB]
Assign [+VERB] to *loves, sneezes*; assign [-VERB] to *of*

(iv) From [-NOUN], create new categories [-NOUN, +VERB] and [-NOUN, -VERB], and from each subcategory of [-NOUN] […, -NOUN, …] which contains at least one [+VERB] head and one [-VERB] head, create new categories […, -NOUN, …, +VERB] and […, -NOUN, …, -VERB]
From [-NOUN] create [-NOUN, +VERB] & [-NOUN, -VERB]

(v) Order all categories by "size" (i.e. by l, then h, then d)
[] l = 0, h = 4, d = 00
[-NOUN] l = 1, h = 3, d = 10
[+NOUN] l = 1, h = 1, d = 20
[-NOUN, +VERB] l = 2, h = 2, d = 12
[-NOUN, -VERB] l = 2, h = 1, d = 11

(vi) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = transitive

(ii) Does [-NOUN, -VERB] contain all heads with ‘transitive’ and at least one head without ‘transitive’?
No

(ii) Does [-NOUN, +VERB] contain all heads with ‘transitive’ and at least one head without ‘transitive’?
Yes

(iii) Assign all heads in [-NOUN, +VERB] with ‘transitive’ the categorial feature [+TRANSITIVE], and all heads in [-NOUN, +VERB] without ‘transitive’ the categorial feature [-TRANSITIVE]
Assign [+TRANSITIVE] to *loves*; assign [-TRANSITIVE] to *sneezes*

(iv) From [-NOUN, +VERB], create new categories [-NOUN, +VERB, +TRANSITIVE] and [-NOUN, +VERB, -TRANSITIVE], and from each subcategory of [-NOUN, +VERB] […, -NOUN, …, +VERB, …] which contains at least one [+TRANSITIVE] head and one [-TRANSITIVE] head, create new categories
[…, -NOUN, …, +VERB, …, +TRANSITIVE] and
[…, -NOUN, …, +VERB, …, -TRANSITIVE]
From [-NOUN, +VERB] create [-NOUN, +VERB, +TRANSITIVE] & [-NOUN, +VERB, -TRANSITIVE]

(v) Order all categories by “size” (i.e. by l, then h, then d) and remove empty categories

[]	**l = 0, h = 4, d = 000**
[-NOUN]	**l = 1, h = 3, d = 100**
[+NOUN]	**l = 1, h = 1, d = 200**
[-NOUN, +VERB]	**l = 2, h = 2, d = 120**
[-NOUN, -VERB]	**l = 2, h = 1, d = 110**
[-NOUN, +VERB, +TRANSITIVE]	**l = 3, h = 1, d = 122**
[-NOUN, +VERB, -TRANSITIVE]	**l = 3, h = 1, d = 121**

(vi) Do any undescribed properties remain?
No

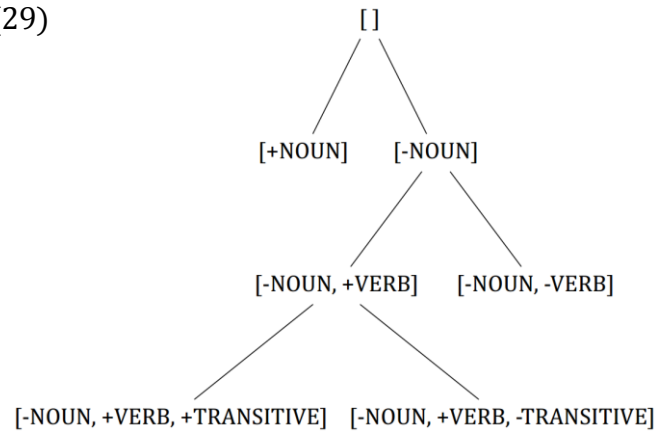
Stop

This results in (28):

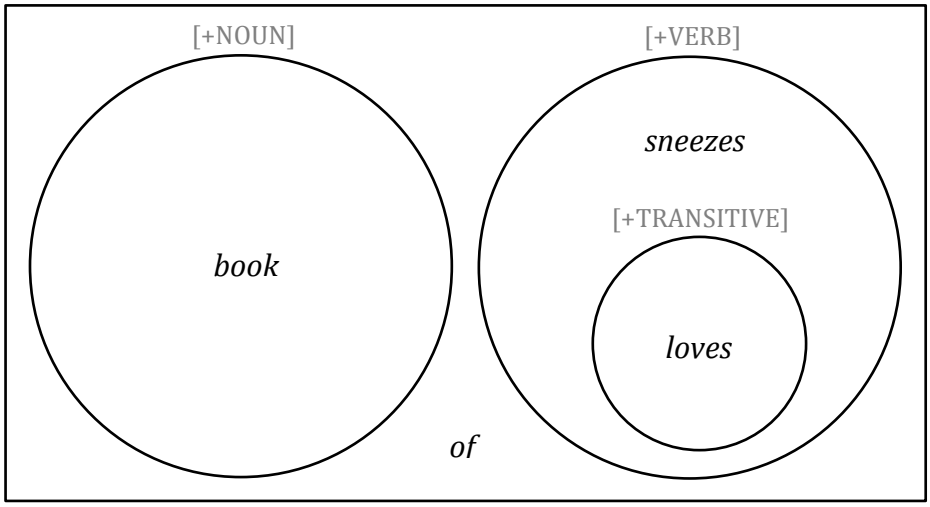
(28) *loves*: [-NOUN, +VERB, +TRANSITIVE]
sneezes: [-NOUN, +VERB, -TRANSITIVE]
book: [+NOUN]
of: [-NOUN, -VERB]

Moreover, the categorial system is considerably simplified (from 11 to 7 categories), since the removal of *quickly* has led to the [±VERB] distinction being dependent on [-NOUN]. This can be seen in (29) and (30):

(29)



(30)



All relevant categories may nevertheless still be referred to – for instance, prepositions are [-NOUN,-VERB], intransitive verbs are [-NOUN,+VERB,-TRANSITIVE], etc.

The algorithm in (23) therefore takes a multiset of sets of properties and a prominence order, and from this creates a minimal binary category system. However, this formalisation originally began with an aim to develop a process capable of parallel acquisition of features and categories. For this reason I now turn to the assignment of features to categories, leading to one final component being added to the algorithm.

2.2.6 Assignment of features to categories.

Thus far we have only considered examples of inputs where each property defines new distinctions in the categorial system. However, this need not always be true, as in the case of the following input:

(31) *loves*: {{ {verb, transitive},
sneezes: {verb},
book: {noun},
quickly: {verb, noun},
of: {pied-piping} }}
<noun, verb, transitive, pied-piping>

This input is the same as that of (5), but the property 'pied-piping' has been added to *of*. This encodes an expositional simplification of the fact that in some varieties prepositions may pied-pipe along with a moved DP. Since this property is last in the prominence order, application of the algorithm in (23) first proceeds exactly as in (24). By this point, the category of prepositions can already be identified as [-NOUN,-VERB]. However, the property of 'pied-piping' also applies to this category. This is encoded by the current algorithm as follows:

(32) (i) Identify most prominent undescribed property p
p = pied-piping

(ii) Does [-NOUN, +VERB, -TRANSITIVE] contain all heads with 'pied-piping', and at least one head without 'pied-piping'?
No

(ii) Does [-NOUN, +VERB, +TRANSITIVE] contain all heads with 'pied-piping', and at least one head without 'pied-piping'?
No

(ii) Does [-NOUN, -VERB] contain all heads with 'pied-piping', and at least one head without 'pied-piping'?
No

(ii) Does [+NOUN, -VERB] contain all heads with 'pied-piping', and at least one head without 'pied-piping'?
No

(ii) Does [+NOUN, +VERB] contain all heads with 'pied-piping', and at least one head without 'pied-piping'?
No

(ii) Does [-NOUN, +VERB] contain all heads with 'pied-piping', and at least one head without 'pied-piping'?
No

```
(ii)   Does [+NOUN] contain all heads with 'pied-piping', and at least
       one head without 'pied-piping'?
       No

(ii)   Does [-NOUN] contain all heads with 'pied-piping', and at least
       one head without 'pied-piping'?
       Yes

(iii)  Assign all heads in [-NOUN] with 'pied-piping' the categorial
       feature [+PIED-PIPING], and all heads in [-NOUN] without
       'pied-piping' the categorial feature [-PIED-PIPING]
       Assign [+PIED-PIPING] to of; assign [-PIED-PIPING] to loves,
       sneezes

(iv)   From [-NOUN], create new categories [-NOUN, +PIED-PIPING] and
       [-NOUN, -PIED-PIPING], and from each subcategory of [-NOUN]
       […, -NOUN, …] which contains at least one [+PIED-PIPING] head and
       one [-PIED-PIPING] head, create new categories
       […, -NOUN, …, +PIED-PIPING] and
       […, -NOUN, …, +VERB, …, -PIED-PIPING]
       From [-NOUN] create [-NOUN, +PIED-PIPING] & [-NOUN, -PIED-PIPING]

(v)    Order all categories by "size" (i.e. by l, then h, then d)
       []                              l = 0, h = 5, d = 0000
       [-NOUN]                         l = 1, h = 3, d = 1000
       [+VERB]                         l = 1, h = 3, d = 0200
       [+NOUN]                         l = 1, h = 2, d = 2000
       [-VERB]                         l = 1, h = 2, d = 0100
       [-NOUN, +VERB]                  l = 2, h = 2, d = 1200
       [-NOUN, -PIED-PIPING]           l = 2, h = 2, d = 1101
       [+NOUN, +VERB]                  l = 2, h = 1, d = 2200
       [-NOUN, +PIED-PIPING]           l = 2, h = 1, d = 1102
       [+NOUN, -VERB]                  l = 2, h = 1, d = 1200
       [-NOUN, -VERB]                  l = 2, h = 1, d = 1100
       [-NOUN, +VERB, +TRANSITIVE]     l = 3, h = 1, d = 1220
       [-NOUN, +VERB, -TRANSITIVE]     l = 3, h = 1, d = 1210

(vi)   Do any undescribed properties remain?
       No

       Stop
```

This assigns the following specifications to the heads involved:

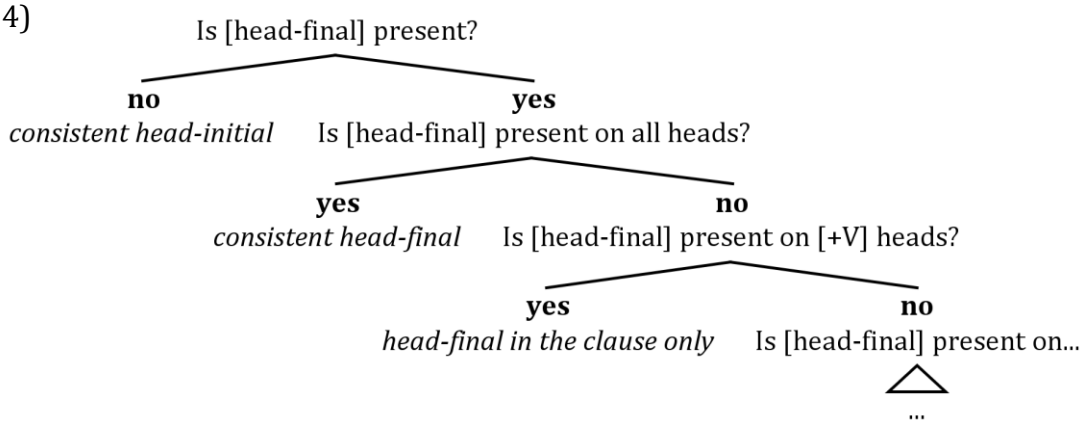
(33) *loves*: [-NOUN, +VERB, +TRANSITIVE, -PIED-PIPING]
sneezes: [-NOUN, +VERB, -TRANSITIVE, -PIED-PIPING]
book: [+NOUN, -VERB]
quickly: [+NOUN, +VERB]
of: [-NOUN, -VERB, +PIED-PIPING]

As a result, prepositions are successfully identified as being [-NOUN,-VERB,+PIED-PIPING]. However, despite pied-piping simply being a property of the category [-NOUN,-VERB], a [±PIED-PIPING] distinction is created that is dependent on [-NOUN]. As a result, superfluous complexity is added to the

system, and *loves* and *sneezes* are unnecessarily marked as [-PIED-PIPING]. The 'pied-piping' property does not define new substantive distinctions in the system, and so should ideally be treated simply a property of a particular preexisting category. It is therefore necessary to develop a notion of non-categorial features.

In the discussion of emergent hieraches in 1.3, features were viewed as objects assigned to particular subsets of heads, as exemplified by the following head-finality hierarchy:

(34)

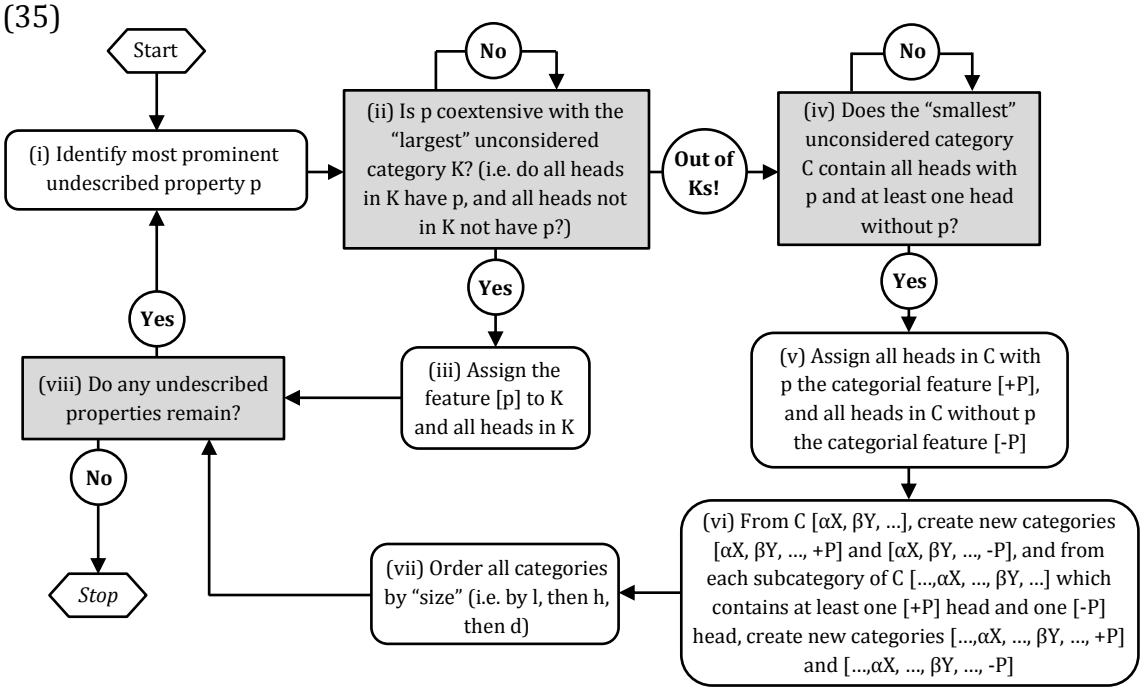


(repeated from (ch.1:18))

In most cases, these subsets were identified as particular linguistic categories, such as the [+V] category in the third question of (34). Two underspecified aspects of this approach were the exact range of categories involved, along with the ordering of these categories for consideration. However, the algorithm developed above provides potential solutions to both these problems, since it produces a specific system of categories, and totally orders these categories for "size." The typological evidence discussed in 1.2 (along with the principle of input generalisation that this inspired) suggests that more general categories are considered first, with questions getting gradually more specific. For this reason, "largest" to "smallest", the opposite order to that used for categorial features, seems most appropriate here.

With these insights, (23) can be modified to encode both categorial and non-categorial features:

(35)



Here the additions are steps (ii) and (iii). Much like step (iv), which was present in the previous version of the algorithm, step (ii) considers each category in turn, although in a different order. If a category is found to describe the distribution of the property in question, then this property is encoded as a feature of that category and all heads of that category,[4] rather than being used to create a new categorial distinction. If there are no categories that meet this description, then the algorithm moves to steps (iv-vii), which create new categories on the basis of the property as before. (35) therefore encodes two loops, with the simpler and preferred process being (i-ii*-iii-viii-i), and the more complex and dispreferred process being (i-ii*-iv*-v-vi-vii-viii-i).[5] Consequently properties are encoded as features of existing categories wherever possible, and used to make new categorial distinctions only when this fails.

This algorithm can be applied to the example input (31) to demonstrate its advantages over (23). For the first three properties, the procedure has exactly the same outcome as before, but when the property of 'pied-piping' is considered, the following occurs:

[4] I indicate such non-categorial features in lower case and with square brackets.
[5] Asterisks indicate possible iteration of a step.

(36) (i) Identify most prominent undescribed property p
p = pied-piping

(ii) Is 'pied-piping' coextensive with []?
No

(ii) Is 'pied-piping' coextensive with [-NOUN]?
No

(ii) Is 'pied-piping' coextensive with [+NOUN]?
No

(ii) Is 'pied-piping' coextensive with [-NOUN, +VERB]?
No

(ii) Is 'pied-piping' coextensive with [-NOUN, -VERB]?
Yes

(iii) Assign the feature [pied-piping] to [-NOUN, -VERB] and all heads in [-NOUN, -VERB]
Assign [pied-piping] to [-NOUN, -VERB] & *of*

(viii) Do any undescribed properties remain?
No

Stop

This yields the same category system as in (18-20), with the additional specification that the [-NOUN,-VERB] category has the feature [pied-piping], and the following specification of heads:

(37) *loves*: [-NOUN, +VERB, +TRANSITIVE]
sneezes: [-NOUN, +VERB, -TRANSITIVE]
book: [+NOUN, -VERB]
quickly: [+NOUN, +VERB]
of: [-NOUN, -VERB] [pied-piping]

The algorithm in (35) therefore constructs categories and assigns features to them in parallel, and so it satisfies the aim of this section.

For a final more detailed demonstration of its operation, we can apply it to the somewhat more complex 18 head input below:[6]

[6] This input continues to adopt some aspects of the system in Chomsky (1981), and assumes for simplicity that prepositions are not adjuncts. 'takes-det' abbreviates "takes determiner."

(38) *John*: {{ {noun, proper},
Peter: {noun, proper},
Mary: {noun, proper},
Paul: {noun, proper},
book: {noun, takes-det},
apple: {noun, takes-det},
literature: {noun, takes-det},
sees: {verb, case-assigner, transitive},
loves: {verb, case-assigner, transitive},
knows: {verb, case-assigner, transitive},
sneezes: {verb, case-assigner},
sleeps: {verb, case-assigner},
slowly: {noun, verb, adjunct},
quickly: {noun, verb, adjunct},
of: {case-assigner, pied-piping},
for: {case-assigner, pied-piping},
into: {case-assigner, pied-piping},
under: {case-assigner, pied-piping} }}

<noun, verb, case-assigner, adjunct, pied-piping, transitive, takes-det, proper>

The application of the algorithm to this input is given in (39):

(39) (i) Identify most prominent undescribed property p
p = noun

(ii) Is ‘noun’ coextensive with []?
No
Out of Ks!

(iv) Does [] contain all heads with ‘noun’ and at least one head without ‘noun’?
Yes

(v) Assign all heads in [] with ‘noun’ the categorial feature [+NOUN], and all heads in [] without ‘noun’ the categorial feature [-NOUN]
Assign [+NOUN] to *John, Peter, Mary, Paul, book, apple, literature, slowly, quickly*; assign [-NOUN] to *sees, loves, knows, sneezes, sleeps, of, for, into, under*

(vi) From [], create new categories [+NOUN] and [-NOUN], and from each subcategory of [] […] which contains at least one [+NOUN] head and one [-NOUN] head, create new categories […, +NOUN] and […, -NOUN]

From [] create [+NOUN] & [-NOUN]

(vii) Order all categories by "size" (i.e. by l, then h, then d)
[] l = 0, h = 18, d = 0
[+NOUN] l = 1, h = 9, d = 2
[-NOUN] l = 1, h = 9, d = 1

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = verb

(ii) Is 'verb' coextensive with []?
No

(ii) Is 'verb' coextensive with [+NOUN]?
No

(ii) Is 'verb' coextensive with [-NOUN]?
No
Out of Ks!

(iv) Does [-NOUN] contain all heads with 'verb' and at least one head without 'verb'?
No

(iv) Does [+NOUN] contain all heads with 'verb' and at least one head without 'verb'?
No

(iv) Does [] contain all heads with 'verb' and at least one head without 'verb'?
Yes

(v) Assign all heads in [] with 'verb' the categorial feature [+VERB], and all heads in [] without 'verb' the categorial feature [-VERB]
Assign [+VERB] to *sees*, *loves*, *knows*, *sneezes*, *sleeps*, *slowly*, *quickly*; assign [-VERB] to *John*, *Peter*, *Mary*, *Paul*, *book*, *apple*, *literature*, *of*, *for*, *into*, *under*

(vi) From [], create new categories [+VERB] and [-VERB], and from each subcategory of [] […] which contains at least one [+VERB] head and one [-VERB] head, create new categories […, +VERB] and […, -VERB]
From [] create [+VERB] & [-VERB]
From [+NOUN] create [+NOUN, +VERB] & [+NOUN, -VERB]
From [-NOUN] create [-NOUN, +VERB] & [-NOUN, -VERB]

(vii) Order all categories by "size" (i.e. by l, then h, then d)

[] l = 0, h = 18, d = 00
[-VERB] l = 1, h = 11, d = 01
[+NOUN] l = 1, h = 9, d = 20
[-NOUN] l = 1, h = 9, d = 10
[+VERB] l = 1, h = 7, d = 02
[+NOUN, -VERB] l = 2, h = 7, d = 21
[-NOUN, +VERB] l = 2, h = 5, d = 12
[-NOUN, -VERB] l = 2, h = 4, d = 11
[+NOUN, +VERB] l = 2, h = 2, d = 22

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = case-assigner

(ii) Is ‘case-assigner’ coextensive with []?
No

(ii) Is ‘case-assigner’ coextensive with [-VERB]?
No

(ii) Is ‘case-assigner’ coextensive with [+NOUN]?
No

(ii) Is ‘case-assigner’ coextensive with [-NOUN]?
Yes

(iii) Assign the feature [case-assigner] to [-NOUN] and all heads in [-NOUN]
Assign [case-assigner] to [-NOUN] & ***sees, loves, knows, sneezes, sleeps, of, for, into, under***

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = adjunct

(ii) Is ‘adjunct’ coextensive with []?
No

(ii) Is ‘adjunct’ coextensive with [-VERB]?
No

(ii) Is ‘adjunct’ coextensive with [+NOUN]?
No

(ii) Is ‘adjunct’ coextensive with [-NOUN]?
No

(ii) Is ‘adjunct’ coextensive with [+VERB]?
No

(ii) Is ‘adjunct’ coextensive with [+NOUN, -VERB]?
No

(ii) Is ‘adjunct’ coextensive with [-NOUN, +VERB]?
No

(i) Is ‘adjunct’ coextensive with [-NOUN, -VERB]?
No

(ii) Is ‘adjunct’ coextensive with [+NOUN, +VERB]?

Yes

(iii) Assign the feature [adjunct] to [+NOUN, +VERB] and all heads in [+NOUN, +VERB]
Assign [adjunct] to [+NOUN, +VERB] & ***quickly, slowly***

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = pied-piping

(ii) Is ‘pied-piping’ coextensive with []?
No

(ii) Is ‘pied-piping’ coextensive with [-VERB]?
No

(ii) Is ‘pied-piping’ coextensive with [+NOUN]?
No

(ii) Is ‘pied-piping’ coextensive with [-NOUN]?
No

(ii) Is ‘pied-piping’ coextensive with [+VERB]?
No

(ii) Is ‘pied-piping’ coextensive with [+NOUN, -VERB]?
No

(ii) Is ‘pied-piping’ coextensive with [-NOUN, +VERB]?
No

(ii) Is ‘pied-piping’ coextensive with [-NOUN, -VERB]?
Yes

(iii) Assign the feature [pied-piping] to [-NOUN, -VERB] and all heads in [-NOUN, -VERB]
Assign [pied-piping] to [+NOUN, +VERB] & *of, for, into, under*

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = transitive

(ii) Is ‘transitive’ coextensive with []?
No

(ii) Is ‘transitive’ coextensive with [-VERB]?
No

(ii) Is ‘transitive’ coextensive with [+NOUN]?
No

(ii) Is ‘transitive’ coextensive with [-NOUN]?
No

(ii) Is ‘transitive’ coextensive with [+VERB]?
No

(ii) Is ‘transitive’ coextensive with [+NOUN, -VERB]?
No

(ii) Is ‘transitive’ coextensive with [-NOUN, +VERB]?

No

(ii) Is ‘transitive’ coextensive with [-NOUN, -VERB]?
No

(ii) Is ‘transitive’ coextensive with [+NOUN, +VERB]?
No
Out of Ks!

(iv) Does [+NOUN, +VERB] contain all heads with ‘transitive’ and at least one head without ‘transitive’?
No

(iv) Does [-NOUN, -VERB] contain all heads with ‘transitive’ and at least one head without ‘transitive’?
No

(iv) Does [-NOUN, +VERB] contain all heads with ‘transitive’ and at least one head without ‘transitive’?
Yes

(v) Assign all heads in [-NOUN, +VERB] with ‘transitive’ the categorial feature [+TRANSITIVE], and all heads in [-NOUN, +VERB] without ‘transitive’ the categorial feature [-TRANSITIVE]
Assign [+TRANSITIVE] to *sees*, *loves*, *knows*; assign [-TRANSITIVE] to *sneezes*, *sleeps*

(vi) From [-NOUN, +VERB], create new categories [-NOUN, +VERB, +TRANSITIVE] and [-NOUN, +VERB, -TRANSITIVE], and from each subcategory of [-NOUN, +VERB] […, -NOUN, …, +VERB, …] which contains at least one [+TRANSITIVE] head and one [-TRANSITIVE] head, create new categories […, -NOUN, …, +VERB, …, +TRANSITIVE] and […, -NOUN, …, +VERB, …, -TRANSITIVE]
From [-NOUN, +VERB] create [-NOUN, +VERB, +TRANSITIVE] & [-NOUN, +VERB, -TRANSITIVE]

(vii) Order all categories by “size” (i.e. by l, then h, then d)

[]	**l = 0, h = 18, d = 000**
[-VERB]	**l = 1, h = 11, d = 010**
[+NOUN]	**l = 1, h = 9, d = 200**
[-NOUN]	**l = 1, h = 9, d = 100**
[+VERB]	**l = 1, h = 7, d = 020**
[+NOUN, -VERB]	**l = 2, h = 7, d = 210**
[-NOUN, +VERB]	**l = 2, h = 5, d = 120**
[-NOUN, -VERB]	**l = 2, h = 4, d = 110**
[+NOUN, +VERB]	**l = 2, h = 2, d = 220**
[-NOUN, +VERB, +TRANSITIVE]	**l = 3, h = 3, d = 122**
[-NOUN, +VERB, -TRANSITIVE]	**l = 3, h = 2, d = 121**

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = takes-det

(ii) Is ‘takes-det’ coextensive with []?
No

(ii) Is ‘takes-det’ coextensive with [-VERB]?

No

(ii) Is ‘takes-det’ coextensive with [+NOUN]?
No

(ii) Is ‘takes-det’ coextensive with [-NOUN]?
No

(ii) Is ‘takes-det’ coextensive with [+VERB]?
No

(ii) Is ‘takes-det’ coextensive with [+NOUN, -VERB]?
No

(ii) Is ‘takes-det’ coextensive with [-NOUN, +VERB]?
No

(ii) Is ‘takes-det’ coextensive with [-NOUN, -VERB]?
No

(ii) Is ‘takes-det’ coextensive with [+NOUN, +VERB]?
No

(ii) Is ‘takes-det’ coextensive with [-NOUN, +VERB, +TRANSITIVE]?
No

(ii) Is ‘takes-det’ coextensive with [-NOUN, +VERB, -TRANSITIVE]?
No
Out of Ks!

(iv) Does [-NOUN, +VERB, -TRANSITIVE] contain all heads with ‘takes-det’ and at least one head without ‘takes-det’?
No

(iv) Does [-NOUN, +VERB, +TRANSITIVE] contain all heads with ‘takes-det’ and at least one head without ‘takes-det’?
No

(iv) Does [+NOUN, +VERB] contain all heads with ‘takes-det’ and at least one head without ‘takes-det’?
No

(iv) Does [-NOUN, -VERB] contain all heads with ‘takes-det’ and at least one head without ‘takes-det’?
No

(iv) Does [-NOUN, +VERB] contain all heads with ‘takes-det’ and at least one head without ‘takes-det’?
No

(iv) Does [+NOUN, -VERB] contain all heads with ‘takes-det’ and at least one head without ‘takes-det’?
Yes

(v) Assign all heads in [+NOUN, -VERB] with ‘takes-det’ the categorial feature [+TAKES-DET], and all heads in [+NOUN, -VERB] without ‘takes-det’ the categorial feature [-TAKES-DET]
Assign [+TAKES-DET] to *book*, *literature*, *apple*; assign [-TAKES-DET] to *John*, *Peter*, *Mary*, *Paul*

(vi) From [+NOUN, -VERB], create new categories [-NOUN, +VERB, +TAKES-DET] and [-NOUN, +VERB, -TAKES-DET], and from each subcategory of [+NOUN, -VERB] […, +NOUN, …, -VERB, …] which contains at least one [+TAKES-DET] head and one [-TAKES-DET] head, create new categories […, +NOUN, …, -VERB, …, +TAKES-DET] and […, +NOUN, …, -VERB, …, -TAKES-DET]

From [+NOUN, -VERB] create [+NOUN, -VERB, +TAKES-DET] & [+NOUN, -VERB, -TAKES-DET]

(vii) Order all categories by "size" (i.e. by l, then h, then d)

[]	**l = 0, h = 18, d = 0000**
[-VERB]	**l = 1, h = 11, d = 0100**
[+NOUN]	**l = 1, h = 9, d = 2000**
[-NOUN]	**l = 1, h = 9, d = 1000**
[+VERB]	**l = 1, h = 7, d = 0200**
[+NOUN, -VERB]	**l = 2, h = 7, d = 2100**
[-NOUN, +VERB]	**l = 2, h = 5, d = 1200**
[-NOUN, -VERB]	**l = 2, h = 4, d = 1100**
[+NOUN, +VERB]	**l = 2, h = 2, d = 2200**
[+NOUN, -VERB, -TAKES-DET]	**l = 3, h = 4, d = 2101**
[+NOUN, -VERB, +TAKES-DET]	**l = 3, h = 3, d = 2102**
[-NOUN, +VERB, +TRANSITIVE]	**l = 3, h = 3, d = 1220**
[-NOUN, +VERB, -TRANSITIVE]	**l = 3, h = 2, d = 1210**

(viii) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p
p = proper

(ii) Is 'proper' coextensive with []?
No

(ii) Is 'proper' coextensive with [-VERB]?
No

(ii) Is 'proper' coextensive with [+NOUN]?
No

(ii) Is 'proper' coextensive with [-NOUN]?
No

(ii) Is 'proper' coextensive with [+VERB]?
No

(ii) Is 'proper' coextensive with [+NOUN, -VERB]?
No

(ii) Is 'proper' coextensive with [-NOUN, +VERB]?
No

(ii) Is 'proper' coextensive with [-NOUN, -VERB]?
No

(ii) Is 'proper' coextensive with [+NOUN, +VERB]?
No

(ii) Is 'proper' coextensive with [+NOUN, -VERB, -TAKES-DET]?
Yes

(iii) Assign the feature [proper] to [+NOUN, -VERB, -TAKES-DET] and all heads in [+NOUN, -VERB, -TAKES-DET]

Assign [proper] to [+NOUN, -VERB, -TAKES-DET] & *John*, *Peter*, *Mary*, *Paul*

(viii) Do any undescribed properties remain?
No

Stop

This results in (40-43):

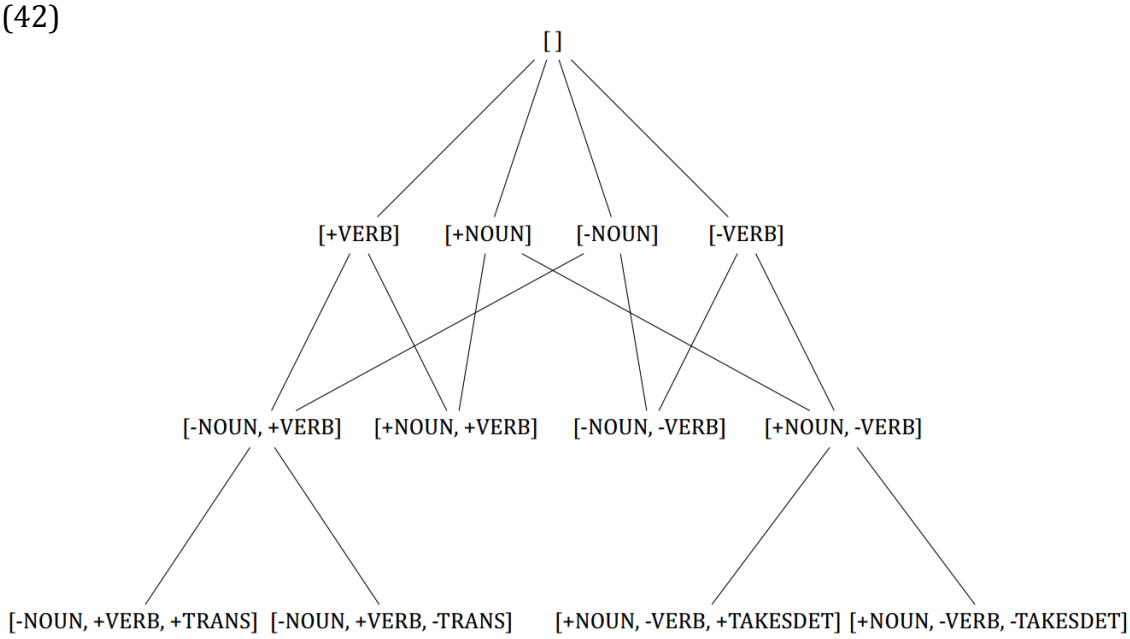
(40)

John:	[+NOUN, -VERB, -TAKES-DET] [proper]
Peter:	[+NOUN, -VERB, -TAKES-DET] [proper]
Mary:	[+NOUN, -VERB, -TAKES-DET] [proper]
Paul:	[+NOUN, -VERB, -TAKES-DET] [proper]
book	[+NOUN, -VERB, +TAKES-DET]
apple:	[+NOUN, -VERB, +TAKES-DET]
literature:	[+NOUN, -VERB, +TAKES-DET]
sees:	[-NOUN, +VERB, +TRANSITIVE] [case-assigner]
loves:	[-NOUN, +VERB, +TRANSITIVE] [case-assigner]
knows:	[-NOUN, +VERB, +TRANSITIVE] [case-assigner]
sneezes:	[-NOUN, +VERB, -TRANSITIVE] [case-assigner]
sleeps:	[-NOUN, +VERB, -TRANSITIVE] [case-assigner]
slowly:	[+NOUN, +VERB] [adjunct]
quickly:	[+NOUN, +VERB] [adjunct]
of:	[-NOUN, -VERB] [case-assigner, pied-piping]
for:	[-NOUN, -VERB] [case-assigner, pied-piping]
into:	[-NOUN, -VERB] [case-assigner, pied-piping]
under:	[-NOUN, -VERB] [case-assigner, pied-piping]

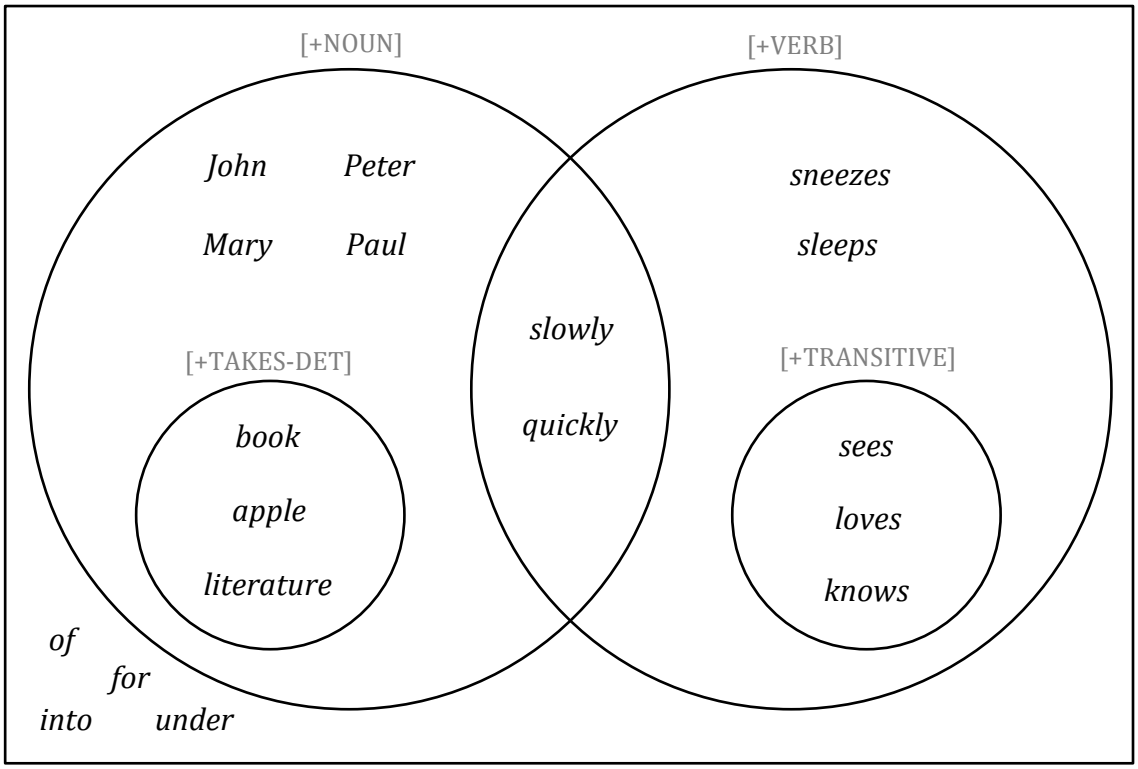
(41)

[ ]:	*John*, *Peter*, *Mary*, *Paul*, *book*, *apple*, *literature*, *sees*, *loves*, *knows*, *sneezes*, *sleeps*, *slowly*, *quickly*, *of*, *for*, *into*, *under*
[-VERB]:	*John*, *Peter*, *Mary*, *Paul*, *book*, *apple*, *literature*, *of*, *for*, *into*, *under*
[+NOUN]:	*John*, *Peter*, *Mary*, *Paul*, *book*, *apple*, *literature*, *slowly*, *quickly*
[-NOUN] [case-assigner]:	*sees*, *loves*, *knows*, *sneezes*, *sleeps*, *of*, *for*, *into*, *under*
[+VERB]:	*sees*, *loves*, *knows*, *sneezes*, *sleeps*, *slowly*, *quickly*
[+NOUN, -VERB]:	*John*, *Peter*, *Mary*, *Paul*, *book*, *apple*, *literature*
[-NOUN, +VERB]:	*sees*, *loves*, *knows*, *sneezes*, *sleeps*
[-NOUN, -VERB] [pied-piping]:	*of*, *for*, *into*, *under*
[+NOUN, +VERB] [adjunct]:	*slowly*, *quickly*
[+NOUN, -VERB, -TAKES-DET] [proper]:	*John*, *Peter*, *Mary*, *Paul*
[-NOUN, +VERB, +TRANSITIVE]:	*sees*, *loves*, *knows*
[+NOUN, -VERB, +TAKES-DET]:	*book*, *apple*, *literature*
[-NOUN, +VERB, -TRANSITIVE]:	*sneezes*, *sleeps*

(42)



(43)



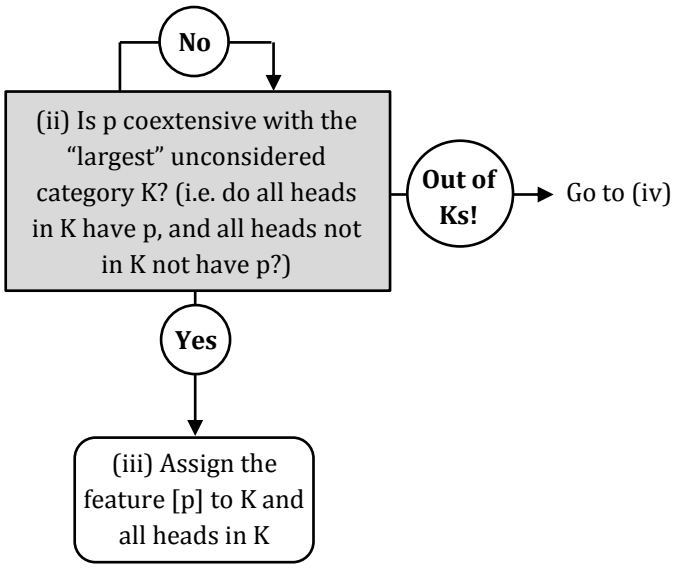
This output is once again a parsimonious description of the input, making use of both categorial distinctions and non-categorial features. Moreover, these are acquired in parallel, and so a specific feature assignment may occur either before or after a categorial division depending on the input. For this reason, superset

traps may potentially be avoided. More generally, (35) represents a formalisation of the emergent hierarchies introduced in 1.3, and in the remainder of this section I consider the relation between these two proposals.

2.2.7 Relating the algorithm back to emergent parameter hierarchies.

The process of (35) applying to an input does not look immediately comparable to the hierarchies of 1.3. This is in part because the algorithm deals with construction of categories in addition to distribution of features across them, whereas the hierarchies model only the latter of these (though see e.g. Biberauer 2014a, b for suggestions regarding category creation). However, the key steps of (35) that correspond to feature distribution are (ii) and (iii):

(44)



As discussed above, the reflexive question in (ii) allows the algorithm to move through all the current categories in turn, from "largest" to "smallest," determining if a feature should be applied to any category. The operation of this step can be seen in (45), a section of (39):

(45) (ii) Is ‘case-assigner’ coextensive with []?
No

(ii) Is ‘case-assigner’ coextensive with [-VERB]?
No

(ii) Is ‘case-assigner’ coextensive with [+NOUN]?
No

(ii) Is ‘case-assigner’ coextensive with [-NOUN]?
Yes

(iii) Assign the feature [case-assigner] to [-NOUN] and all heads in [-NOUN]

Assign [case-assigner] to [-NOUN] & ***sees, loves, knows, sneezes, sleeps, of, for, into, under***

At this point in (39), the following series of ordered categories is available:

(46)

[ ]	l = 0, h = 18, d = 00
[-VERB]	l = 1, h = 11, d = 01
[+NOUN]	l = 1, h = 9, d = 20
[-NOUN]	l = 1, h = 9, d = 10
[+VERB]	l = 1, h = 7, d = 02
[+NOUN, -VERB]	l = 2, h = 7, d = 21
[-NOUN, +VERB]	l = 2, h = 5, d = 12
[-NOUN, -VERB]	l = 2, h = 4, d = 11
[+NOUN, +VERB]	l = 2, h = 2, d = 22

Consideration of each of these categories is the equivalent of a question in a hierarchy, with the order of categories forming the hierarchical structure. This process may therefore be reexpressed as (47), which is directly comparable to the hierarchies introduced in 1.3:

(47)

Is 'case-assigner' coextensive with [ ]?

yes go to (iii)

no Is 'case-assigner' coextensive with [-VERB]?

yes go to (iii)

no Is 'case-assigner' coextensive with [+NOUN]?

yes go to (iii)

no Is 'case-assigner' coextensive with [-NOUN]?

yes go to (iii)

no Is 'case-assigner' coextensive with [+VERB]?

yes go to (iii)

no Is 'case-assigner' coextensive with [+NOUN, -VERB]?

yes go to (iii)

no Is 'case-assigner' coextensive with [-NOUN, +VERB]?

yes go to (iii)

no Is 'case-assigner' coextensive with [-NOUN, -VERB]?

yes go to (iii)

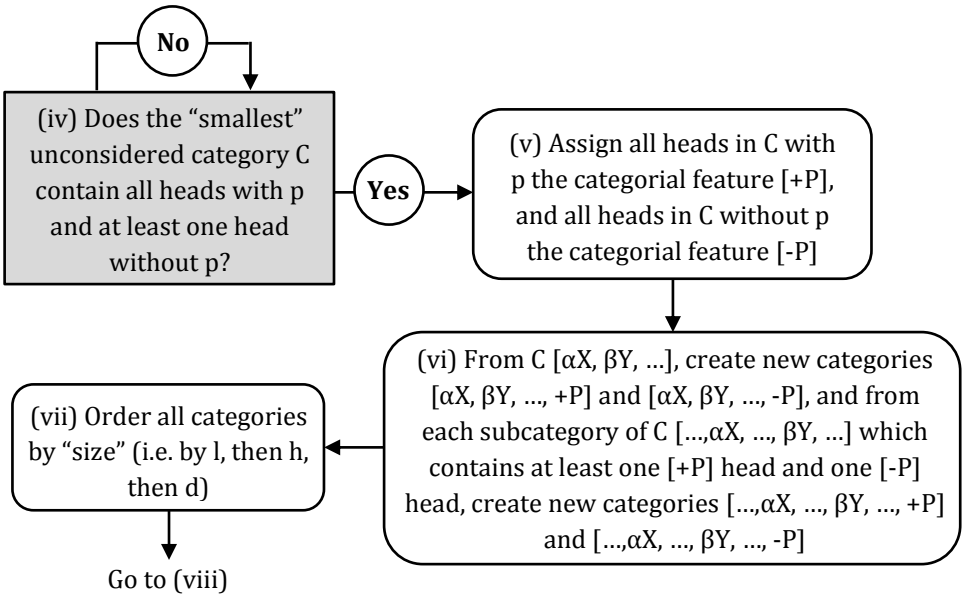
no Is 'case-assigner' coextensive with [+NOUN, +VERB]?

yes go to (iii)

no **Out of Ks** - go to (iv)

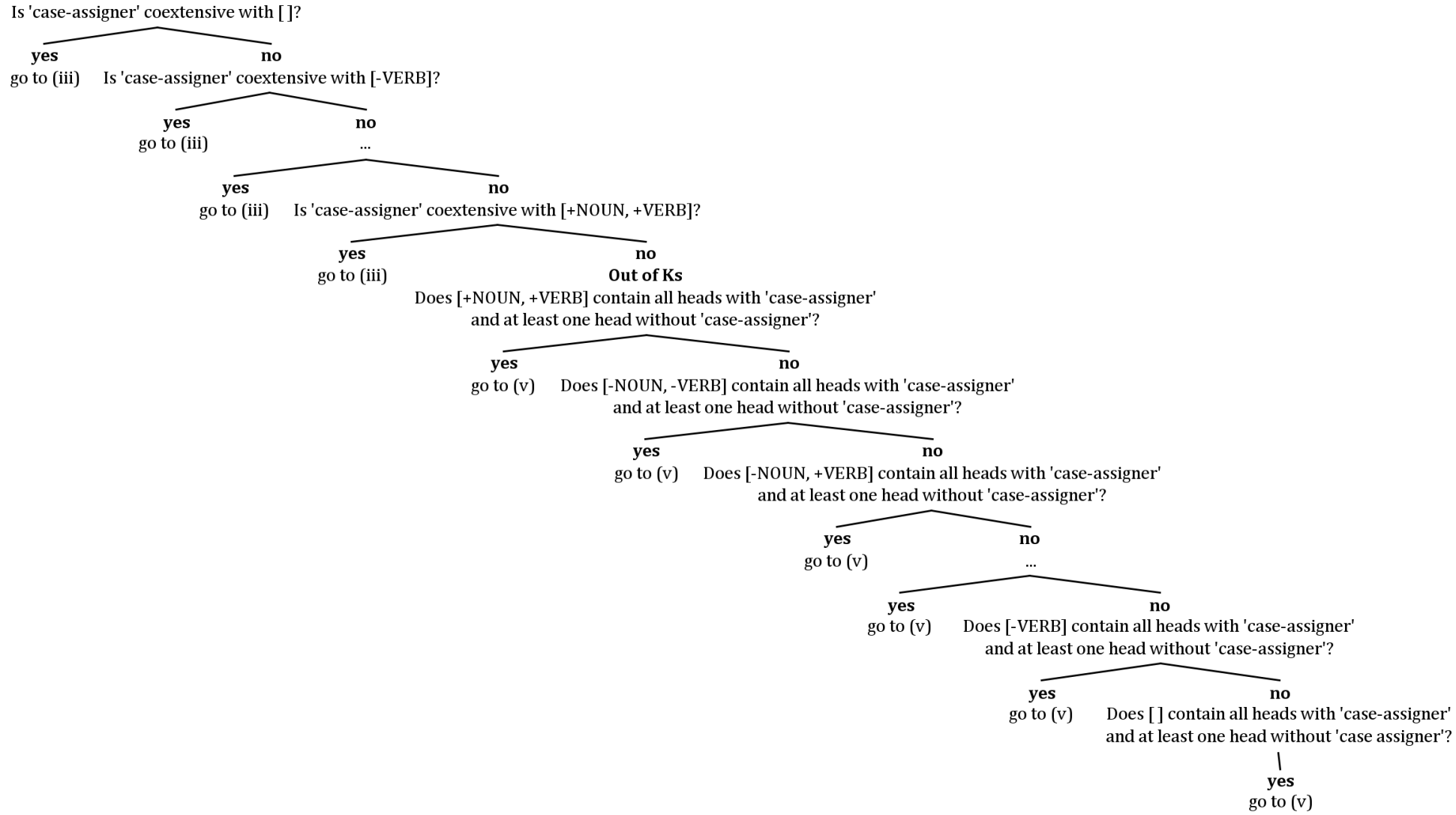
In the case of an input of (38), the learner answers "yes" to the fourth question, and so the feature [case-assigner] is assigned to [-NOUN] and all [-NOUN] heads. However, with a different input, the learner could answer "no" to every question in this hierarchy, leading them on to steps (iv-vii):

(48)



The question in (iv) once again traverses the hierarchies, but in the opposite order, and testing for a different condition. Such questions can also be added to the hierarchy in (47):

(49)


Is 'case-assigner' coextensive with [ ]?
yes
go to (iii)
no
Is 'case-assigner' coextensive with [-VERB]?
yes
go to (iii)
no
...
yes
go to (iii)
no
Is 'case-assigner' coextensive with [+NOUN, +VERB]?
yes
go to (iii)
no
Out of Ks
Does [+NOUN, +VERB] contain all heads with 'case-assigner'
and at least one head without 'case-assigner'?
yes
go to (v)
no
Does [-NOUN, -VERB] contain all heads with 'case-assigner'
and at least one head without 'case-assigner'?
yes
go to (v)
no
Does [-NOUN, +VERB] contain all heads with 'case-assigner'
and at least one head without 'case-assigner'?
yes
go to (v)
no
...
yes
go to (v)
no
Does [-VERB] contain all heads with 'case-assigner'
and at least one head without 'case-assigner'?
yes
go to (v)
no
Does [ ] contain all heads with 'case-assigner'
and at least one head without 'case assigner'?
yes
go to (v)

Steps (ii) and (iv) of the algorithm therefore combine to generate hierarchies, with the top half of these hierarchies being equivalent to the emergent hierarchies introduced above. Step (ii) essentially attempts to make maximal use of the categorial system that currently exists, trying to assign the property under consideration to the largest category possible. If this fails, step (iv) then attempts to add to this categorial system in as minimal a way as possible. Step (ii) therefore corresponds roughly to the notion of input generalisation, and step (iv) to feature economy.

Having arrived this formalisation of hierarchy generation, we can return to the open questions summarised at the start of 1.3.3, and consider how each is answered by the algorithm in (35):

(50) a. How, if at all, do distinct hierachies interact/connect with one another?
b. How are subsets of heads ordered for consideration by the learner?
c. Do hierarchies operate on single or multiple features?
d. Can the form of questions vary in different positions of the hierarchy, and if so, what determines this questioning structure?

(repeated from (ch.1:23))

The assumption of sequential acquisition that we made in 1.4.2 led fairly directly to an answer to (50a) – each hierarchy is traversed in turn, as determined by the prominence order. As discussed above, there is at least some acquisitional evidence in support of this proposal in addition to its conceptual simplicity. The ordering of subsets of heads, the subject of (50b), is considered in 1.4.5. The chosen approach of ordering less embedded categories first, then subordering by number of heads and other properties of the description aids the operation of both steps (ii) and (iv). Many other orders are of course possible, but this approach is comparable to the orders given in other hierachies, and resolves any ambiguities, while also being relevant to both categorial and non-categorial feature assignment. Perhaps the most arbitrary answer is to (50c), that each hierarchy operates on exactly one property, since this is an artifact of the input formalisation and

procedure chosen. Specific properties can nevertheless be encoded as either categorial or non-categorial features. Moreover, this ensures that the process is simple and comparable for every case, although it does mean that hierachies operating on multiple features (e.g. (ch.1:19) and (ch.1:20) of 1.3.2) must in fact represent generalisations over multiple hierachies. Finally, the discussion of steps (ii) and (iv) above demonstrates the answer to (50d): only two types of question are possible, with one being exhausted before the other, an approach that leads to the construction of a parsimonious system.

While these answers connect to form a fully-specified view of parameter hierarchies, they are by no means the only ones that could be given. For instance, an algorithm could be constructed that made generalisations over multiple features within single hierarchies, or allowed many different questions at different stages of the learning process. However, such algorithms would likely be more complex, and so should ultimately be proposed only if simpler systems are empirically lacking. Perhaps more pressingly, incorporation of further acquisitional considerations (including those of 2.2.1 and 2.2.2) may yield an algorithm whose operation is rather different. One example along these lines is the approach of Biberauer (2011, 2013, 2014a), Biberauer & Roberts (2014b, 2015a, b), where categorial divisions occur when the learner notices contrast in specific categories, rather than through the more systematic approach taken here. As a result, the decisions presented to the learner may in fact be structured as much through extraction of data from the input as through application of a procedure to the resulting information. A formalisation of this approach would therefore entail rather different answers to the questions above. Nevertheless, the choices taken in this work yield a unified, explicit perspective on emergent hierarchies, and one that allows for further falsification and refinement through the consideration of such ideas.

2.3 Application of the algorithm to non-syntactic domains.

I have argued above that the principles governing hierarchy formation are third factor constraints on language acquisition. As a result, the algorithm under consideration should not be domain-specific, but instead a general cognitive process underlying categorisation. This perspective somewhat mitigates the complexity of the algorithm, since it is likely to be a faculty that has been naturally selected over considerable evolutionary time. For this reason, Boeckx & Leivada's (2014:5) claim that an earlier version of this algorithm (Bazalgette 2013) "presupposes that the learner somehow knows how to distinguish the largest unconsidered natural class of heads, but it is not clear where this knowledge comes from or what exactly it corresponds to," is inaccurate: this knowledge corresponds to a domain-general process of which the algorithm is a tentative formal account.[7] One consequence of this view is that we should expect the algorithm to apply in non-syntactic as well as syntactic domains. For this reason, in this section I consider its application to phonological contrasts (section 2.3.1), phonotactic constraints (section 2.3.2), and conceptual structure (section 2.3.3).

2.3.1 Acquisition of phonological constrasts.

The suggestion that phonological distinctions may be made by an algorithmic process is by no means a new one. For instance, van den Broecke (1976:33-34) and Archangeli (1988:192) propose specific algorithms for contrastive specification of phonemes by pairwise comparison, albeit as an argument against this method in both cases. Dresher (2008, 2009) notes futher difficulties with such processes, but instead proposes the Successive Division Algorithm (SDA, Dresher 1998, 2003, 2008, 2009), based on the approaches of Jakobson et al. (1952), Cherry et al. (1953), Jakobson & Halle (1956), and Halle (1959). This has the following formalisation:

[7] Boeckx & Leivada (2014:5) also state that "it is not clear how the division into +F and –F takes place in terms of how much noise/exceptions to a hypothesised rule the learner tolerates." Such concerns are addressed in 2.2.1 and 2.2.2 above, which clarify the algorithm as being a non-statistical partial model of acquisition that operates on a clearly specified input.

(51) a. In the initial state, all tokens in inventory I are assumed to be variants of a single member. Set I = S, the set of all members.

b. (i) If S is found to have more than one member proceed to (c).
(ii) Otherwise, stop. If a member, M, has not been designated contrastive with respect to a feature, G, then G is *redundant* for M.

c. Select a new *n*-ary feature, F, from the set of distinctive features. F splits members of the input set, S, into *n* sets, F_1–F_n, depending on what value of F is true of each member of S.

d. (i) If all but one of F_1–F_n is empty, then loop back to (c).
(ii) Otherwise, F is *contrastive* for all members of S.

e. For each set F_i, loop back to (b), replacing S by F_i.

(Dresher 2009:17, fn. 3, emphases in the original)

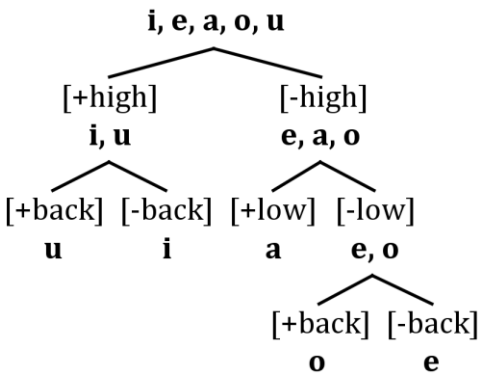
This algorithm can be demonstrated for the contrastive specification of the 5 vowel system /i, e, a, o, u/. I take these phonemes to have the following properties:

	high	**low**	**back**	**round**
i	+	-	-	-
e	-	-	-	-
a	-	+	+	-
o	-	-	+	+
u	+	-	+	+

Table 2.1: Specification of a 5 vowel system.

If we apply the SDA to these vowels, dividing in the order of [high] > [low] > [back] > [round], and assuming binary features, the following system results:

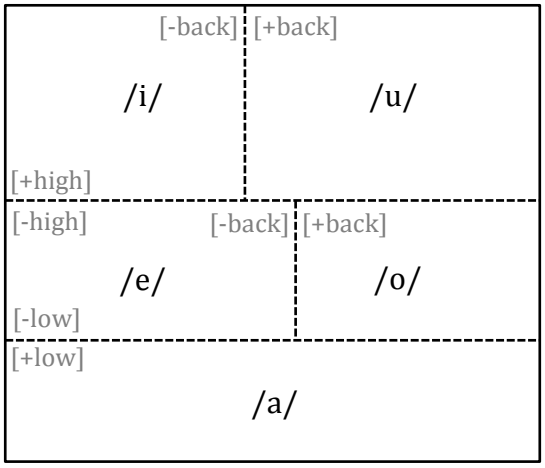
(52)



Since the algorithm aims to contrastively specify segments, division continues until each vowel can be uniquely identified, and so the [±round] distinction need not be invoked. This leads to the specifications of segments given in (53), and can be partially graphically represented by (54):

(53) /i/ [+high, -back]
/e/ [-high, -low, -back]
/a/ [-high, +low]
/o/ [-high, -low, +back]
/u/ [+high, +back]

(54)



This restriction to only those features which are contrastive is designed to be consistent with the Contrastivist Hypothesis of Hall (2007), stated as follows:

(55) The phonological component of a language L operates only on those features which are necessary to distinguish the phonemes of L from one another.

(Hall 2007:20)

This hypothesis predicts that only features that are involved in contrastive specifications should be involved in phonological processes. For instance, in the vowel system in (52), /a/ is phonetically but not phonemically [+back], and so (55) predicts that in this language it should not trigger processes such as backness harmony. Evidence is presented for this hypothesis in Hall (2007), Dresher (2008,

2009, 2011), Dresher et al. (2014) *inter alia*, though it is not fully supported by all researchers – see e.g. Nevins (2010), Kim (2013).

The SDA clearly has many features in common with the algorithm of 2.2. Both make use of distinctive features to distinguish a collection of objects by their properties, and both require an order in which these distinguishing properties should be examined. However, the process and goal of each algorithm differs somewhat. Whereas the SDA makes use of successive division to arrive at a complete contrastive specification of the input, the algorithm proposed above constructs a categorial system via a more complex process, aiming to fully represent the properties of the input in a parsimonious fashion. Many additional differences between the processes exist – for example, the SDA operates on n-ary rather than binary features, the algorithm of the previous section may take multiple identical objects in its input (and so not arrive at a complete contrastive specification), and a distinction is made between categorial and non-categorial properties. The difference in operation between these processes can be seen if we provide (35) with the following input, based on table 2.1, and making use of the same order as in the SDA examples:

(56) /i/ {{ {high},
/e/ ∅,
/a/ {low, back},
/o/ {back, round},
/u/ {high, back, round} }}
<high, low, back, round>

The following ouput results:

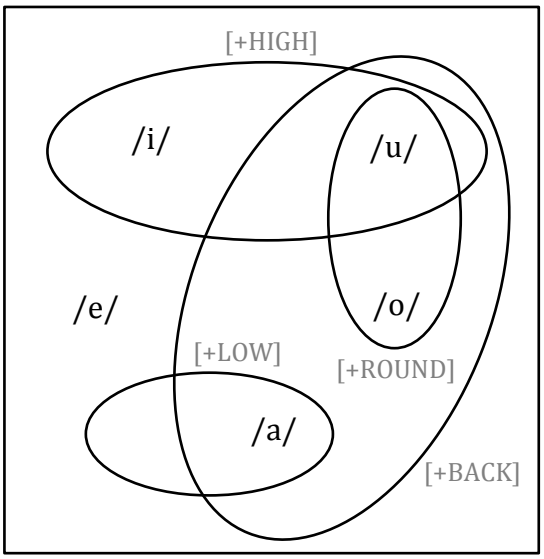
(57)

[ ]	l = 0, h = 5, d = 0000
[-HIGH]	l = 1, h = 3, d = 1000
[+BACK]	l = 1, h = 3, d = 0020
[+HIGH]	l = 1, h = 2, d = 2000
[-BACK]	l = 1, h = 2, d = 0010
[-HIGH, -LOW]	l = 2, h = 2, d = 1100
[-HIGH, +BACK]	l = 2, h = 2, d = 1020
[+BACK, +ROUND]	l = 2, h = 2, d = 0022
[+HIGH, +BACK]	l = 2, h = 1, d = 2020
[+HIGH, -BACK]	l = 2, h = 1, d = 2010
[-HIGH, +LOW]	l = 2, h = 1, d = 1200
[-HIGH, -BACK]	l = 2, h = 1, d = 1010
[+BACK, -ROUND]	l = 2, h = 1, d = 0021
[-HIGH, -LOW, +BACK]	l = 3, h = 1, d = 1120
[-HIGH, -LOW, -BACK]	l = 3, h = 1, d = 1110

(58)

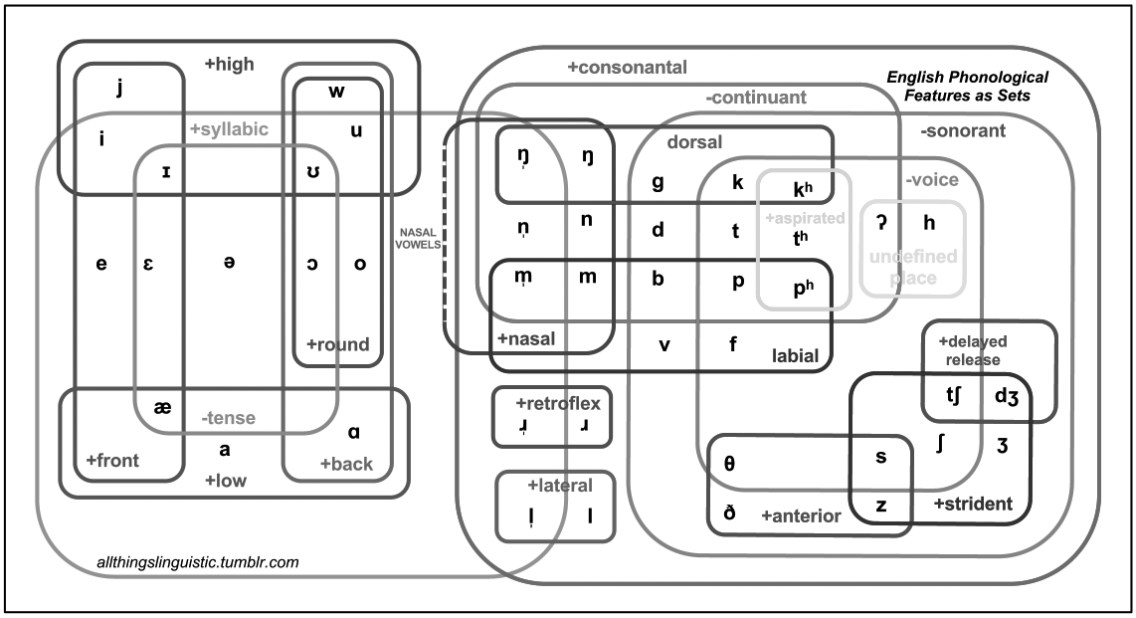
/i/	[+HIGH, -BACK]
/e/	[-HIGH, -LOW, -BACK]
/a/	[-HIGH, +LOW, +BACK, -ROUND]
/o/	[-HIGH, -LOW, +BACK, +ROUND]
/u/	[+HIGH, +BACK, +ROUND]

(59)



This system is more complex than the one that results from the SDA, but all properties are fully encoded. Entire phoneme inventories may equally be represented in this Venn diagram fashion, as shown for English phonemes and allophones by McCulloch (2013), based loosely on the features of Hayes (2008):

(60)



The algorithm in (35) can therefore yield outputs comparable to (60), dividing up the phoneme inventory somewhat differently to the SDA, but nonetheless resulting in a structured system of nested phonological categories, which may potentially even underlie aspects of feature geometry. Moreover, non-contrastive properties specific to any of these categories may also be encoded, which in this domain may relate to allophonic or phonetic detail. As a result, (35) is capable of acquiring phonological as well as syntactic features, but has several predictive differences compared to the SDA.

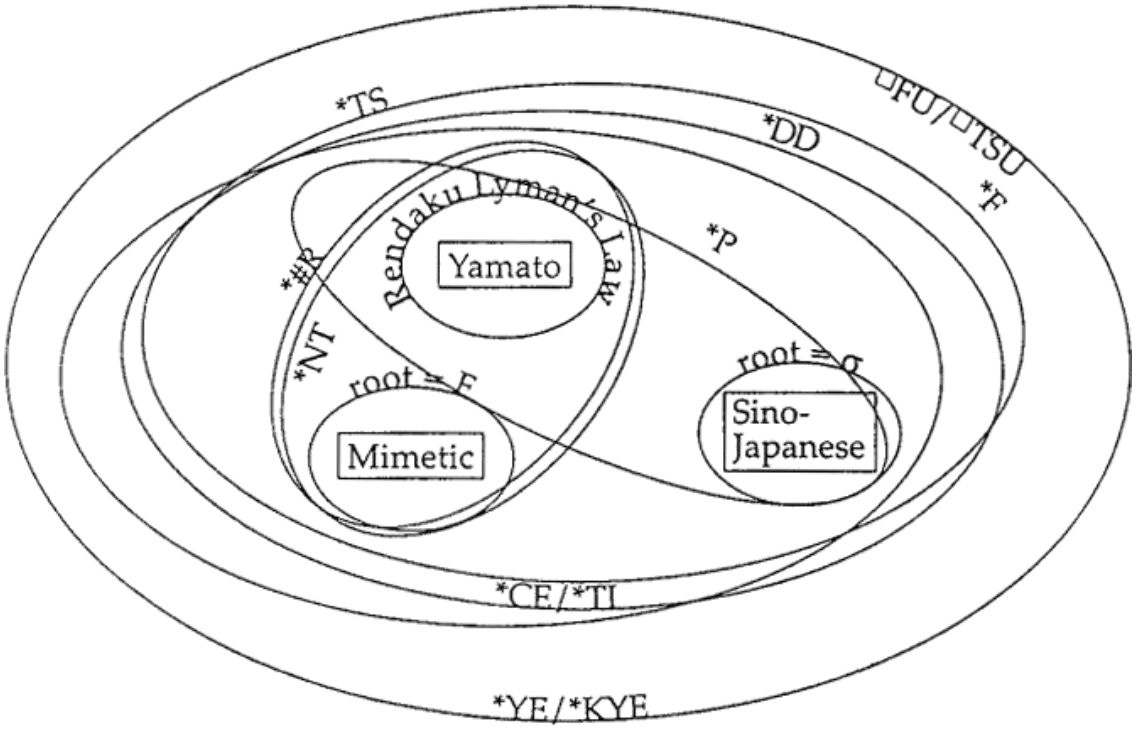
Further research is therefore necessary to determine the exact nature of the algorithms necessary in the phonological domain, with there being a number of possibilities. For instance, exactly the same domain-general process may apply in both the syntactic and the phonological domain, which could be equivalent to either a more general form of the SDA, or the more complex categorisation algorithm of 2.2. Alternatively, the SDA may be a simplified version of this complex categorisation algorithm that applies specifically in the phonology, with the full form being used only for the assignment of the phonetic properties of segments. However, it is equally possible that forms of both algorithms may apply together, with e.g. a version of the SDA producing the input to (or modifying the output of)

(35). Each of these possibilities is compatible with the existence of a domain-general categorisation algorithm relevant to the phonological as well as the syntactic system. Consequently, though the applicability of (35) to the acquisition of phonological features remains inconclusive, it seems plausible that it could play some role in this domain.

2.3.2 Acquisition of phonotactic constraint systems.

Above, we considered the categorial systems that distinguish phonological segments themselves. This subsection widens in scope, concentrating instead on the division of the lexicon itself into strata with distinct phonotactic properties. Itô & Mester (1995) examine this question in detail with respect to Japanese, considering the four classes of Yamato (native) forms, mimetic adverbs (see e.g. McCawley 1968:64), Sino-Japanese forms, and other foreign imports. Despite the greater number of strata, these distinctions are comparable to the Germanic/Latinate divide in English. As Itô & Mester (1995:818) note, "as is familiar from classical linguistic literature on the subject (see e.g. Chomsky and Halle, 1968 pp. 174, 373; McCawley1968, pp. 62-75; Postal 1968, pp. 120-139; Saciuk 1969, pp. 505-512), such classifications require explicit synchronic recognition if, and as far as, they continue to play a role in the grammar." This is very much the case, with such stratification affecting e.g. "morpheme combinatorics [as well as] organizing the lexical domains of phonological regularities, affecting both segmental alterations and structural constraints." (Itô & Mester 1995:818) In particular, they argue for a complex system of interaction between lexical strata and phonotactic constraints in Japanese, summarised by the following Venn diagram:

(61)



(Itō & Mester 1995:834)

The following table summarises Itô & Mester's (1995) description of each of these constraints and their domains of application:

Constraint	Description	Examples	Domain
□FU/□TSU	Replace [hu], [tu] with [fu], [tˢu] respectively	*[hu], *[tu]	all items
*YE/*KYE	No palatalised Cs or palatal glides before [e]	*[kʸe], *[pʸe], *[mʸe], *[dʸe] *[ye]	all items
*CE/*TI	No alveopalatal Cs before [e]; no nonpalatal coronal Cs before [i]	*[če], *[še], *[že], *[ǰe] **se**paado 'shepherd (dog)' rosan**ze**rusu 'Los Angeles' *[ti], *[di], [*si], *[zi] hana**su** 'talk' ~ hana**ši** 'talk (inf)' **či**imu 'team'	all items excluding some peripheral e.g. nii**če** 'Nietzsche', **ti**in 'teen(ager)' (Foreign); **čeʔ** (swearword)
*F/*TS	No labial fricatives [f] or coronal obstruents [tˢ] except before [u][8]	*[fa], *[fe], *[fe], *[fo] [fu]: too**fu** 'tofu,' **fu**ǰi 'Fuji' *[tˢa], *[tˢe], *[tˢe], *[tˢo] [tˢu]: **tˢu**kue 'desk,' ka**tˢu** 'win'	all items excluding some peripheral e.g. **fa**ito 'fight,' **tˢa**togaisuto 'Zeitgeist' (Foreign)
*DD	No voiced obstruent geminates	ka**tt**e 'buying,' *ka**dd**e ni**kk**ori 'smiling,' *ni**gg**ori	all items excluding some peripheral e.g. do**gg**u 'dog,' be**dd**o 'bed' (Foreign)
*NT	Postnasal obstruents must be voiced	to**mb**o 'dragonfly,' *to**mp**o ka**nd**e 'chewing,' *ka**nt**e	Yamato & Mimetic ka**ŋk**ei 'relation' (Sino-Japanese compound); sa**nt**akuroozu 'Santa Claus' (Foreign)
*#R	No word-initial [r]	*[#r] (though see Itô & Mester 1995:836, fn. 6)	Yamato & Mimetic **r**aku 'ease' (Sino-Japanese); **r**aǰio 'radio' (Foreign)
*P	No ungeminated [p]	ni**pp**on 'Japan,' *ni**p**on ka**pp**a 'river imp,' *ka**p**a	Yamato & Sino-Japanese **p**ika**p**ika 'gilttering' (Mimetic); **p**ee**p**aa 'paper' (Foreign)
root = σ	Each item must consist of one syllable	sen 'river' koo 'shine'	Sino-Japanese
root = F	Each item must consist of one bimoraic foot	pikapika 'glittering' wanwan 'woof'	Mimetic
Rendaku	Voicing on the second member of a compound	yu 'hot water' + **t**oofu 'tofu' → yu**d**oofu 'boiled tofu' de 'leave' + **k**uči 'mouth' → de**g**uči 'exit'	Yamato
Lyman's Law	Morphemes contain at most one voiced obstruent	**b**uta 'pig'; ***b**u**d**a onna 'woman' + **k**oto**b**a 'word' → onna**k**oto**b**a 'feminine speech'	Yamato

Table 2.2: Japanese phonotactic constraints described by Itô & Mester (1995).

Thus Japanese phonotactic properties are restricted by a system of constraints applying at various strata, with Yamato items being subject to the most restrictions. Unlike Yamato, Sino-Japanese, and mimetic items, Itô & Mester (1995) argue that foreign items do not form a consistent class, instead becoming gradually less peripheral as they become more established in the lexicon. As a result, some foreign items such as *niiče* 'Nietzsche' and *faito* 'fight' are very peripheral, some such as *santakuroozu* 'Santa Claus' and *raǰio* 'radio' less so, and some long-standing loans such as *tabako* 'tobacco' and *karuta* 'carta' are entirely nativised, belonging

[8] Itô & Mester (1995:825-826) state the *F/*TS constraint in a more general form that bans all occurences of [f] and [tˢ], which following the Pāṇinian theorem of optimality theory (Prince & Smolensky 1993:81-82) is argued to be violable when the more specific □FU/□TSU constraint holds. Here I state it in a simpler form for expositional simplicity, which avoids the complications of constraint interaction.

to the Yamato class. This is particularly clear with *karuta*, which undergoes Rendaku voicing in *hana-**g**aruta* 'flower card game.' Furthermore, some peripheral items do not have foreign origins, such as the swearword *čeʔ*.

The acquisition of these constraints, especially negative constraints, is clearly a complex process, since it is difficult to determine whether a form is consistent with a specific constraint due to its application, rather than accidentally. It is nevertheless possible to present a partial model of the input by supposing that each constraint applying to a specific item is available upon investigation. Continuing this reasoning, we may view each lexical item as the set of constraints that apply to it, and so this is directly comparable with the input described in 2.2.1. We can therefore produce an input to (35) for Japanese phonotactics which consists of a multiset of sets of constraints, along with an order of constraints. A toy example of such an input is given in (62), which consists of 28 items and 11 constraints. Rendaku and Lyman's law are combined into the single constraint 'rendaku,' and for simplicity it is supposed that peripheral items are either consistent with all of *CE/*TI, *F/*TS, and *DD or none of them.

(62)

kappa	‘river imp’	{{ {□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, *nt, *#r, rendaku},
nippon	‘Japan’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, *nt, *#r, rendaku},
kuči	‘mouth’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, *nt, *#r, rendaku},
buta	‘pig’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, *nt, *#r, rendaku},
karuta	‘carta’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, *nt, *#r, rendaku},
tabako	‘tobacco’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, *nt, *#r, rendaku},
pikapika	‘glittering’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *nt, *#r, root=F},
fuwafuwa	‘fluffy’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *nt, *#r, root=F},
wanwan	‘woof’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *nt, *#r, root=F},
sen	‘river’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, root=σ},
nin	‘person’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, root=σ},
koo	‘shine’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, root=σ},
ken	‘dog’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, root=σ},
raku	‘ease’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *p, root=σ},
peepaa	‘paper’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd},
rosanzerusu	‘Los Angeles’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd},
rajio	‘radio’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd},
supagetee	‘spaghetti’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd},
čiimu	‘team’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd},
sepaado	‘shepherd’	{□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd},
doggu	‘dog’	{□fu/□tsu, *ye/*kye},
beddo	‘bed’	{□fu/□tsu, *ye/*kye},
faito	‘fight’	{□fu/□tsu, *ye/*kye},
tˢaitogaisuto	‘Zeitgeist’	{□fu/□tsu, *ye/*kye},
tiin	‘teen(ager)’	{□fu/□tsu, *ye/*kye},
paatii	‘party’	{□fu/□tsu, *ye/*kye},
niiče	‘Nietzsche’	{□fu/□tsu, *ye/*kye},
čeʔ	swearword	{□fu/□tsu, *ye/*kye} }}

<□fu/□tsu, *ye/*kye, *ce/*ti, *f/*ts, *dd, *nt, *#r, *p, root=σ, root=F, rendaku>

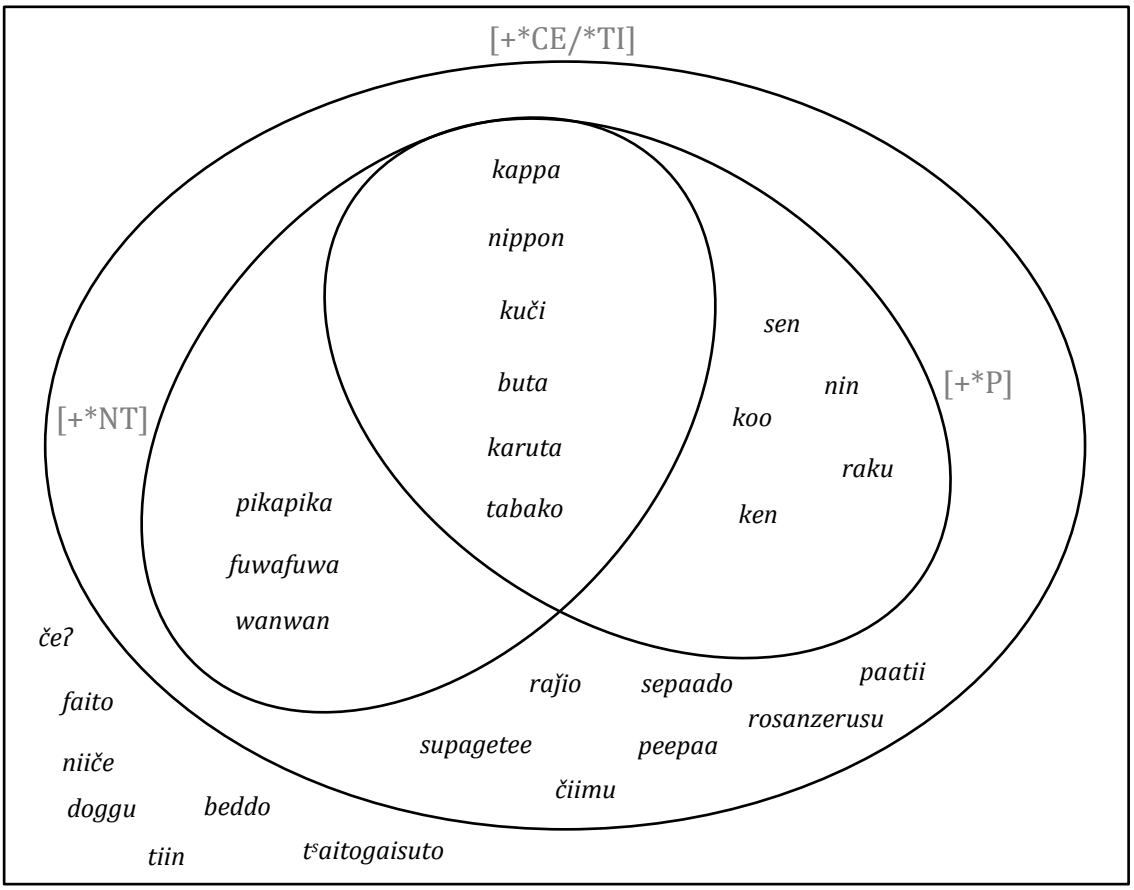
If we apply the algorithm to this input, the following categories result:

(63)

[ ] [□fu/tsu, *ye/kye]	l = 0, h = 28, d = 000
[+*CE/*TI] [*f/ts, *dd]	l = 1, h = 20, d = 200
[-*CE/*TI]	l = 1, h = 8, d = 100
[+*CE/*TI, -*NT]	l = 2, h = 11, d = 210
[+*CE/*TI, +*P]	l = 2, h = 11, d = 202
[+*CE/*TI, +*NT] [*#r]	l = 2, h = 9, d = 220
[+CE/*TI, -*P]	l = 2, h = 9, d = 201
[+*CE/*TI, +*NT, +*P] [rendaku]	l = 3, h = 6, d = 222
[+*CE/*TI, -*NT, -*P]	l = 3, h = 6, d = 211
[+*CE/*TI, -*NT, +*P] [root=σ]	l = 3, h = 5, d = 212
[+*CE/*TI, +*NT, -*P] [root=F]	l = 3, h = 3, d = 221

This can be depicted by (64), which closely reflects the structure of (61):

(64)



Moreover, five classes of items are identified, receiving the following specifications:

(65) Yamato: [+*CE/TI, +*NT, +*P] [□fu/□tsu, *ye/*kye, *f/*ts, *dd, *#r, rendaku]
Mimetic: [+*CE/TI, +*NT, -*P] [□fu/□tsu, *ye/*kye, *f/*ts, *dd, *#r, root=F]
Sino-Japanese: [+*CE/TI, -*NT, +*P] [□fu/□tsu, *ye/*kye, *f/*ts, *dd, root=σ]
Inner Periphery: [+*CE/TI, -*NT, -*P] [□fu/□tsu, *ye/*kye, *f/*ts, *dd]
Outer Periphery: [-*CE/TI] [□fu/□tsu, *ye/*kye]

The algorithm developed in the previous section is therefore capable of acquiring at least some aspects of systems of phonotactic constraints applying at different stratal levels. Many aspects of this process remain unclear, such as how such constraints are acquired, and the related question of whether acquisition of these systems builds on stratal distinctions, or creates them, with the latter option being employed above. Nevertheless, the algorithm in (35) is compatible with many of

these possibilities, and its applicability in this domain adds support to the hypothesis that it represents a domain-general cognitive process.

2.3.3 Acquisition of conceptual structure.

The non-syntactic cases that we have considered so far have nonetheless been structural, being closely related to the phonological system. However, for the hypothesis of domain-generality to be correct, we should additionally expect the algorithm to apply in domains less closely related to the core linguistic system. Nevertheless, the pervasive nature of language in cognition makes it unlikely that categorisation might apply with no linguistic correlate. For this reason, in this subsection I briefly consider the role of (35) in the creation of lexical and conceptual distinctions, which while at least partially linguistic, are more distant from the core structural properties of languages.

Application of featural analysis to lexical semantic distinctions has a long history, perhaps beginning with Lounsbury's (1956) and Goodenough's (1956) work on kinship terminology. More generally, the use of necessary and sufficient conditions in the study of concepts has come to be known as classical theory (Smith & Medin 1981), and traces back to Aristotle (Apostle 1980:19-20 via Murphy 2002:11). This approach has largely been abandoned in favour of less absolute accounts of concepts, especially prototype theory, which builds on Wittgenstein's (1953) notion of family resemblances, and is backed by considerable experimental evidence (e.g. Rosch 1975, Rosch & Mervis 1975 *inter alia*). While a small number of researchers retain a version of the classical view (e.g. Armstrong et al. 1983, Rey 1983, Sutcliffe 1993), it seems likely that human understanding of concepts is not as straightforward as the traditional view.

This conclusion appears to diminish the role of an algorithm such as (35) in this domain, since it operates on [±P] distinctions, which must be necessary and sufficient. Nevertheless, in this section I consider evidence discussed by Seuren & Jaspers (2014), who argue that "concept formation proceeds by successive, mostly binary, hierarchical divisions," (p. 621) presenting examples such as the following:

(66) a. non-null R-set
- no
- SOME
  - all
  - some

b. velocity
- stationary
- moving
  - fast
  - slow

c. organic life
- plant
- ANIMAL
  - human
  - animal

d. human
- single
- married
  - wife
  - husband

(adapted from Seuren & Jaspers 2014:621, 624)

Here the "R-set" in (66a) refers to the set of individuals being quantified over (e.g. in the statement "all Romans are mortal," this corresponds to the set of Romans). Further, the capitalised terms in (66a, c) denote superordinate forms of words, contrasting with their lowercase subordinate equivalents. Instead of taking these terms to be pragmatic variants, Seuren and Jaspers (2014:608-609) argue they are distinct but homophonous, and so for instance *ANIMAL* always ranges over both humans and animals, whereas *animal* can never denote humans.

The structures in (66) are argued to be constructed through a process termed "progressive universe restriction," where the initial universe is recursively restricted to smaller subdomains as divisions are carried out. For example, (66d) begins with the universe of humans, which is divided into *single* and *married*. This universe is then restricted to the universe of married humans, before further subdivision into *husband* and *wife*. One type of evidence for these universe restrictions is the comparative naturalness of contrasts such as "I'm not a husband but a wife" compared to "I'm not a husband but single." (adapted from Seuren & Jaspers 2014:609-610). This process has the consequence of making certain logically possible terms undefinable within the system – in the case of (66d), "**nonhusband*, meaning 'either wife or single', and **nonwife*, meaning 'either husband or single', are not lexicalizable." (Seuren & Jaspers 2014:624). When applied to (66a), this accounts for the commonly noted crosslinguistic absence of **nall* (see e.g. Horn 1989, 2004). But these gaps occur not just in the logical domain, but throughout the lexicon, and perhaps even at deeper levels of cognition, such as the interpretation of colour (Jaspers 2012).

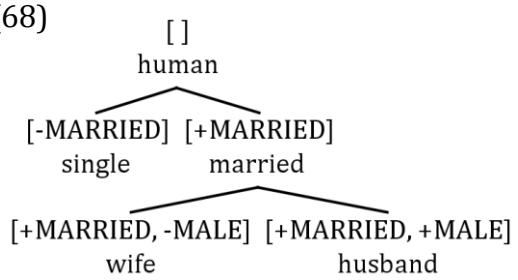
Consequently, successive hierarchical divisions arguably play an important role in the domain of conceptual structure. However, we yet to consider the relation

between these divisions and the algorithm in (35). One possibility is that a version of this algorithm is actually responsible for successive universe restriction itself. While this is not implausible, since both processes revolve around the creation of hierarchical divisions, the input would be of a very different form – a single initial universe rather than a set of heads – and so this version of the algorithm would itself need to be rather different. One more straightforward application of (35) would be the acquisition of pre-existing lexical distinctions in the adult grammar, as in the input of (67), which corresponds to the distinctions in (66d):

(67) *single*: {{ ∅,
husband: {married, male},
wife: {married} }}
<married, male>

When given to (35), this produces the system of categories in (68), whose structure is exactly equivalent to (66d):

(68)



As a result, a learner acquiring a language with the lexical items and properties in (67) would posit the categorial structure of (68), which has no categories corresponding to the unattested **nonhusband* and **nonwife*. Consequently, while this approach may not explain the origins of these lexical gaps, it provides some insight into how they might be retained.

However, there are some difficulties with the analysis in (67-68). In particular, lexical items are used to represent both heads and properties, meaning the non-terminal nodes of (68) cannot be represented as lexical items in the input, but only as categories that emerge as a result of acquisition. Perhaps, then, a better equivalent of a head in this system is not lexical items themselves, but specific

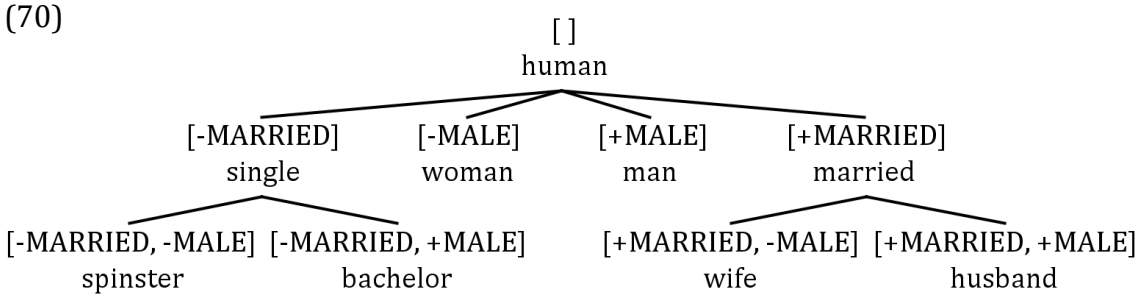
types of individuals. This would allow categories of individuals to be constructed on the basis of their properties, with these categories corresponding to specific (possible) lexical items. One possible input along these lines would be as follows, which exhausts the space of possibilities for combination of the properties "married" and "male."

(69) unmarried men: {{ {male},
unmarried women: ∅,
married men: {married, male}
married women: {married} }}

<married, male>

When (35) is applied to this input, the following results:

(70)



These nine categories each correspond to an attested lexical item, and the ordering of "married" before "male" leads to a categorial structure has direct contrast between *single/married*, *wife/husband*, and *spinster/bachelor*, since each pair consists of two immediate sisters in (70). This system combines two of the conceptual structures suggested in Seuren & Jaspers (2014), while also creating categories only for attested forms. Thus, one the basis of this tentative example, it may be that progressive universe restriction is responsible for the identification of the properties and prominence orders considered by the learner, which are in turn used by the algorithm in (35) to produce systems such as (70).

Overall then, we have considered various possible applications here for the algorithm in (35). While significant further investigation is clearly required, a more cognitively basic version of the algorithm may underlie successive universe restriction itself, or alternatively (35) may act on the results of this process, either

preserving lexical distinctions, or constructing the systems that encode them. The resulting categorial distinctions would then form one of the many components of lexical meaning, with such distinctions perhaps later being overlaid with more prototypical interpretations in many cases. It is therefore not implausible that the algorithm has at least some role to play in this domain.

2.3.4 Conclusion.

In this section, we have considered application of the algorithm in the three non-syntactic domains of phonology, phonotactics, and lexical semantics. In each of these cases, I have argued that it is possible that the algorithm in (35) plays at least some role in the acquisition of the relevant structures involved, demonstrating this with toy examples. While the details of acquisition in each of these domains requires further investigation, this applicability adds support to the claim that (35) is a process of general cognition, and thus qualifies as a third factor. We are now in a position to return to the syntactic domain and examine it in more detail, considering in particular the properties that it does not share with other domains.

2.4 C-selection, unvalued features, and the uniqueness of the syntactic domain.

The algorithm developed thus far assigns two kind of features to the heads on which it operates: binary categorial features, and unary non-categorial features. As we have seen, this has been sufficient for the acquisition of toy grammars in both syntactic and non-syntactic domains. However, for syntactic examples in particular, this feature typology is inadequately simplistic, since it does not account for the agreement, movement, and selection properties of heads. For this reason, this subsection considers each of these behaviours, presenting suggestions for how the algorithm in (35) might be modified to acquire a more complex typology of features. Moreover, since these modifications are specific to the syntactic domain, they constitute a hypothesis about those aspects of syntactic acquisition that cannot be attributed to domain-general processes.

2.4.1 Probe-Goal Agree and the EPP.

The unary features assigned by (35) attribute a property to a category and its contents. As we have seen in multiple cases above, these properties could potentially represent a large number of things, ranging from information about syntactic behaviour to semantic characteristics. Categories can therefore be further specified beyond their binary featural definition, allowing for the hierarchical modelling of feature distribution across heads. However, while this is arguably adequate for standalone properties such as [head-final] or [definite], it is harder to apply in cases where features appear to interact with others over distance.

For instance, in (71), *be* agrees in person and number with *John*, with both taking third person singular forms:

(71) [$_{TP}$ John i**s** [$_{vP}$ ~~John~~ eating an apple]]

While the algorithm we have been using so far would enable us to specify *John* as [3SG], it is far less clear how *be* should be encoded. We require a property that will

lead to *be* having the same features as *John*, but it is hard to see how this could be stated with unary features alone. By contrast, under the Probe-Goal Agree system of Chomsky (2000, 2001, 2004), this is readily explained: T bears uninterpretable, unvalued φ-features, which probe their c-command domain, and enter into an Agree relation with the interpretable, valued φ-features of *John*. Furthermore, the A-movement of *John* to Spec,TP is also attributed to an EPP movement triggering feature of T. A'-movement may similarly be accounted for, as in the analysis for *wh*-movement briefly suggested by Chomsky (2000:128), summarised in (72). Here C probes and Agrees with the interpretable Q feature on *who*, once again leading to EPP feature-driven movement:

(72) [who$_{[iQ,\ \cancel{uWh}]}$ C$_{[\cancel{uQ,\ EPP}]}$ [$_{TP}$ ~~who~~$_{[iQ,\ \cancel{uwh}]}$ is [$_{vP}$ ~~who~~ eating an apple]]]

The complexity of these behaviours and the features required to yield them therefore presents a problem for the algorithm. Even if we make some simplifying assumptions, such as following Chomsky (2001) in taking (un)interpretable to be equivalent to (un)valued (*pace* Pesetsky & Torrego 2007), and leaving aside the Activity Condition of Chomsky (2000, 2001),[9] we still need a minimum of three types of features:

(73) [vf]: valued feature
[uf]: unvalued feature
[uf^]: unvalued feature triggering movement

The properties corresponding to these features must in some way be represented in the input, and so before considering how they are acquired, it is necessary to first enrich the input description of a head beyond a simple set of properties. Of the features described in (73), [vf]s appear closest to the unary features assigned by (35), since they represent simple properties particular to a head, such as its φ-

[9] It may be possible to implement the Activity Condition in the system developed in this subsection, but it would require a clear format and understanding of the features rendering goals active, which appear to differ somewhat from the uninterpretable, unvalued features of probes. Moreover, there is some debate on the necessity of this condition, with e.g. Nevins (2005), Bošković (2007) presenting arguments against versions of the condition. Finally, it is not used in the analyses we propose in the remainder of this work, and so is not considered in any further detail.

specification. As a result, it seems reasonable to assume that their corresponding inputs are merely properties of a head:

(74) H: $\{p_i, p_j, p_k, \ldots\} \leftrightarrow$ H: $[vp_i, vp_j, vp_k, \ldots]$

However, [uf]s are more complex, representing the need for the head bearing the [uf] to enter into an Agree relation with a corresponding [vf], and so I represent these in the input as a set containing the property to be agreed with:

(75) H: $\{p_i, \{p_j\}, \{p_k\}, \ldots\} \leftrightarrow$ H: $[vp_i, up_j, up_k, \ldots]$

Finally, depending on the specification of the [uf], this Agree relation may or may not lead to movement, and so those heads bearing [uf]s where it does are specified as the ordered pair <f, m(ove)> rather than as {f} in the input:

(76) H: $\{p_i, \{p_j\}, \langle p_k, m\rangle, \ldots\} \leftrightarrow$ H: $[vp_i, up_j, up_k\text{^}, \ldots]$

We are therefore viewing the input as a multiset of sets of properties, singleton sets of properties, and ordered pairs of properties and the special property 'm(ove)':

(77) $\{\{ \{p_i, p_j, p_k, \ldots, \{p_l\}, \{p_m\}, \{p_n\}, \ldots, \langle p_o, m\rangle, \langle p_p, m\rangle, \langle p_q, m\rangle, \ldots\},$
$\{p_r, p_s, p_t, \ldots, \{p_u\}, \{p_v\}, \{p_w\}, \ldots, \langle p_x, m\rangle, \langle p_y, m\rangle, \langle p_z, m\rangle, \ldots\}, \ldots \}\}$

While this complicates the conception of the input, some such specification is necessary if the features in (73) are to be acquired. Moreover, as with the discussion of input in 2.2.1, this specification is not intended as a claim that learners must describe lexical items as such before acquisition proceeds, but instead as a statement that these properties are available upon investigation.

So far, then, we have merely stated that this information is available in the input, but we have not determined how it should be extracted and encoded as features on lexical items. One simple approach would be to merely state these more complex properties in the prominence order along with bare properties, but this would still require the algorithm to be able to distinguish between these different types of input and assign features accordingly. As such, when a property is identified as

being coextensive with a particular category, some combination of the following questions must be asked:

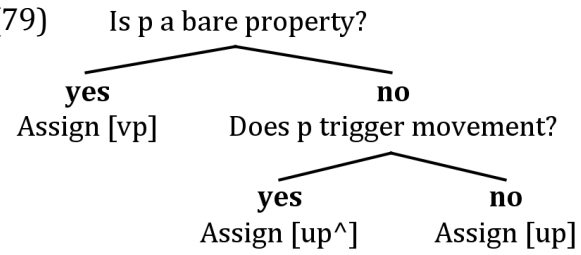
(78) a. Is p a bare property?

b. Is p a singleton set?

c. Is p an ordered pair of a property and "move"?

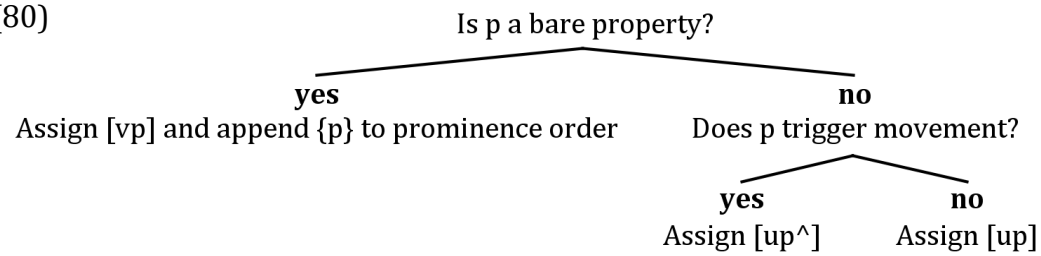
These can be simplified into the following schema, similar to the schemata in (ch.1:21-22) above, but less complex in structure and number of questions:

(79)



However, this approach can be simplified further. Since we have abstracted away from the activity condition in footnote 12 above, all [uf]s must have corresponding [vf]s, which they enter into Agree relations with. As a result, assignment of a [vf] entails the possible (but not necessary) assignment of a [uf] (or [uf^]) later in the course of acquisition. We can therefore make one small modification to (79) which allows us to eliminate anything other than bare properties from the initial prominence order:

(80)

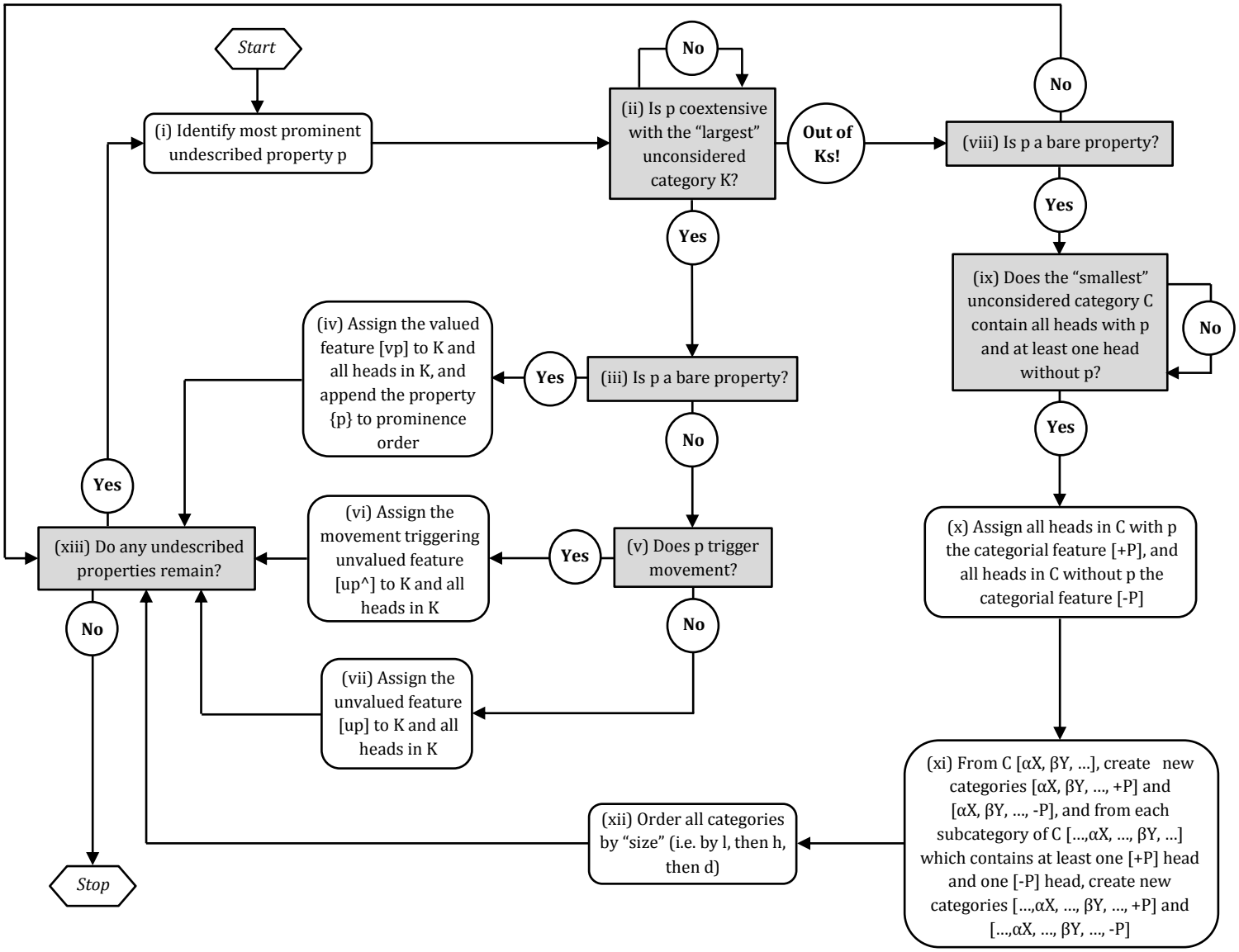


A positive answer to the first question not only encodes the property as a [vf], but also adds to the prominence order, essentially instructing the learner to later check for a corresponding [uf] or [uf^]. This therefore has the result of assigning

unvalued features without them needing to be stated in the initial prominence order.

The simple schema in (80) may be combined with (35), yielding the following algorithm:

(81)


Start
(i) Identify most prominent undescribed property p
(ii) Is p coextensive with the "largest" unconsidered category K?
No
Out of Ks!
Yes
(iii) Is p a bare property?
Yes
(iv) Assign the valued feature [vp] to K and all heads in K, and append the property {p} to prominence order
No
(v) Does p trigger movement?
Yes
(vi) Assign the movement triggering unvalued feature [up^] to K and all heads in K
No
(vii) Assign the unvalued feature [up] to K and all heads in K
(viii) Is p a bare property?
No
Yes
(ix) Does the "smallest" unconsidered category C contain all heads with p and at least one head without p?
No
Yes
(x) Assign all heads in C with p the categorial feature [+P], and all heads in C without p the categorial feature [-P]
(xi) From C [αX, βY, ...], create new categories [αX, βY, ..., +P] and [αX, βY, ..., -P], and from each subcategory of C [...,αX, ..., βY, ...] which contains at least one [+P] head and one [-P] head, create new categories [...,αX, ..., βY, ..., +P] and [...,αX, ..., βY, ..., -P]
(xii) Order all categories by "size" (i.e. by l, then h, then d)
(xiii) Do any undescribed properties remain?
Yes
No
Stop

This algorithm is very similar to (35), with the key difference being that once the appropriate category for a property is identified, the schema in (80) is applied by steps (iii-vii). Only one additional step is needed – (viii), which ensures that [uf]s are not used to make categorial distinctions. The algorithm in (81) therefore represents a possible combination of the general cognitive algorithm (35) with the domain specific schema of (80).

This can now be used to demonstrate the acquisition of systems exhibiting the three-way feature typology in (73). For instance, consider the following toy input:

(82) C: {{ Ø,
C_{wh}: {q, <whq, m>},
T: {tense, <φ, m>},
V: {lex},
D: {n, φ},
D_{wh}: {n, φ, wh, whq},
N: {n, lex},
P: {n, lex, spat}}}

<n, lex, spat, φ, wh, whq, tense, q>

Here 'n' is a property common to D, D_{wh}, N, and P, perhaps because they all occupy the nominal extended projection (see e.g. Grimshaw 1991), 'lex(ical)' is a property of V, N, and P, 'spat(ial)' a property of P, and 'tense' a property of T. Additionally C and D have two distinct forms, marked by the 'q' and 'wh' properties respectively. Finally, 'φ' and 'whq' are both bare as well as more complex properties, depending on the head. Nevertheless, these complexities are not yet present in the prominence order, which consists only of bare properties.

Since 'n', 'lex', and 'spat' all make categorial distinctions, (81) treats the first three properties of the order in (82) exactly as (35) would, producing the following categorial system, with heads specified as in (84):

(83)

[ ]	l = 0, h = 8, d = 000
[-LEX]	l = 1, h = 5, d = 010
[+N]	l = 1, h = 4, d = 200
[-N]	l = 1, h = 4, d = 100
[+LEX]	l = 1, h = 3, d = 020
[-N, -LEX]	l = 2, h = 3, d = 110
[+N, +LEX]	l = 2, h = 2, d = 220
[+N, -LEX]	l = 2, h = 2, d = 210
[-N, +LEX]	l = 2, h = 1, d = 120
[+N, +LEX, +SPAT]	l = 3, h = 1, d = 222
[+N, +LEX, -SPAT]	l = 3, h = 1, d = 221

(84)

C:	[-N, -LEX]
C_{wh}:	[-N, -LEX]
T:	[-N, -LEX]
V:	[-N, +LEX]
D:	[+N, -LEX]
D_{wh}:	[+N, -LEX]
N:	[+N, +LEX, -SPAT]
P:	[+N, +LEX, +SPAT]

The next item in the prominence order is 'φ', which step (ii) finds to be coextensive with the category [+N, -LEX]. At this point the algorithm departs from the operation of (35), as shown below:

(85) (ii) Is 'ϕ' coextensive with [+N, -LEX]?
Yes

(iii) Is 'ϕ' a bare property?
Yes

(iv) Assign the valued feature [vϕ] to [+N, -LEX] and all heads in [+N, -LEX], and append the property '{ϕ}' to prominence order.
Assign [vϕ] to [+N, -LEX], D, D_{wh}
<~~n, lex, spat,~~ ϕ, wh, whq, tense, q, {ϕ}>

In addition to [vφ] being assigned, {φ} is added to the prominence order. The process then continues as in (35) until 'whq,' where a similar series of operations occurs, and then categorial distinctions continue to be made until [±Q]. At this point the system is in the following state:

(86)

[ ]	l = 0, h = 8, d = 000000
[-LEX]	l = 1, h = 5, d = 010000
[+N]	l = 1, h = 4, d = 200000
[-N]	l = 1, h = 4, d = 100000
[+LEX]	l = 1, h = 3, d = 020000
[-N, -LEX]	l = 2, h = 3, d = 110000
[+N, +LEX]	l = 2, h = 2, d = 220000
[+N, -LEX] [vφ]	l = 2, h = 2, d = 210000
[-N, +LEX]	l = 2, h = 1, d = 120000
[-N, -LEX, -TENSE]	l = 3, h = 2, d = 110010
[+N, -LEX, +WH] [vwhq]	l = 3, h = 1, d = 210200
[+N, -LEX, -WH]	l = 3, h = 1, d = 210100
[+N, +LEX, +SPAT]	l = 3, h = 1, d = 222000
[+N, +LEX, -SPAT]	l = 3, h = 1, d = 221000
[-N, -LEX, +TENSE]	l = 3, h = 1, d = 110020
[-N, -LEX, -TENSE, +Q]	l = 4, h = 1, d = 110012
[-N, -LEX, -TENSE, -Q]	l = 4, h = 1, d = 110011

C:	[-N, -LEX, -TENSE, -Q]	
C_{wh}:	[-N, -LEX, -TENSE, +Q]	
T:	[-N, -LEX, +TENSE]	
V:	[-N, +LEX]	
D:	[+N, -LEX, -WH]	[vφ]
D_{wh}:	[+N, -LEX, +WH]	[vφ, vwhq]
N:	[+N, +LEX, -SPAT]	
P:	[+N, +LEX, +SPAT]	

<~~n, lex, spat, φ, wh, whq, tense, q,~~ {φ}, {whq}>

Providing we interpret coextensivity of a property '{p}' to include heads with '<p, move>' as well as those with '{p}',[10] step (ii) of (81) will at this point find '{φ}' to be coextensive with [-N,-LEX,+TENSE]. The following then occurs:

[10] More formally, I define coextensivity for each type of property as follows:

(i) p: Do all heads in K have p, and all heads not in K not have p?

(ii) {p}: Do all heads in K have {p} and all heads not in K not have {p} OR do all heads in K have <p, m> and all heads not in K not have <p, m>?

(87) (ii) Is ‘{ϕ}’ coextensive with [-N, -LEX, +TENSE]? (i.e. do all heads in [-N, -LEX, +TENSE] have ‘{ϕ}’ and all heads not in [-N, -LEX, +TENSE] not have ‘{ϕ}’ OR do all heads in [-N, -LEX, +TENSE] have ‘<ϕ, m>’ and all heads not in [-N, -LEX, +TENSE] not have ‘<ϕ, m>’?)
Yes

(iii) Is ‘{ϕ}’ a bare property?
No

(v) Does ‘{ϕ}’ trigger movement?
Yes

(vi) Assign the movement triggering unvalued feature [uϕ^] to [-N, -LEX, +TENSE] and all heads in [-N, -LEX, +TENSE]
Assign [uϕ^] to [-N, -LEX, +TENSE], T

On the following loop, a similar process occurs for ‘{whq}’, assigning [vwhq^] to [-N, -LEX, -TENSE, +Q] and its contents. At this point the algorithm terminates, yielding the following categorial system and specification of heads:

(88)

[ ]	l = 0, h = 8, d = 000000
[-LEX]	l = 1, h = 5, d = 010000
[+N]	l = 1, h = 4, d = 200000
[-N]	l = 1, h = 4, d = 100000
[+LEX]	l = 1, h = 3, d = 020000
[-N, -LEX]	l = 2, h = 3, d = 110000
[+N, +LEX]	l = 2, h = 2, d = 220000
[+N, -LEX] [vφ]	l = 2, h = 2, d = 210000
[-N, +LEX]	l = 2, h = 1, d = 120000
[-N, -LEX, -TENSE]	l = 3, h = 2, d = 110010
[+N, -LEX, +WH] [vwhq]	l = 3, h = 1, d = 210200
[+N, -LEX, -WH]	l = 3, h = 1, d = 210100
[+N, +LEX, +SPAT]	l = 3, h = 1, d = 222000
[+N, +LEX, -SPAT]	l = 3, h = 1, d = 221000
[-N, -LEX, +TENSE] [uφ^]	l = 3, h = 1, d = 110020
[-N, -LEX, -TENSE, +Q] [uwhq^]	l = 4, h = 1, d = 110012
[-N, -LEX, -TENSE, -Q]	l = 4, h = 1, d = 110011

(89)

C:	[-N, -LEX, -TENSE, -Q]	
C_{wh}:	[-N, -LEX, -TENSE, +Q]	[uwhq^]
T:	[-N, -LEX, +TENSE]	[uφ^]
V:	[-N, +LEX]	
D:	[+N, -LEX, -WH]	[vφ]
D_{wh}:	[+N, -LEX, +WH]	[vφ, vwhq]
N:	[+N, +LEX, -SPAT]	
P:	[+N, +LEX, +SPAT]	

This system therefore encodes the fact that T probes DPs for valued φ-features, that interrogative C probes *wh*-items for some form of valued question feature, and that the Agree relation taking place in both these cases triggers movement. This increase in explanatory power is achieved at the cost of asserting (80) to be innate, but this schema is sufficiently simple that it is not significantly divorced from merely making the [vf]/[uf]/[uf^] distinction itself innate. The system still remains a simplification, since more complex properties of features such as specific values are not represented, with such complications being left to further research. Nevertheless, as we shall see in the following chapters, the feature typology used here is adequate for the description and parameterisation of focus constructions. One further component is needed, however, which is considered in the following subsection.

2.4.2 C-selection.[11]

The algorithm developed so far is able to give heads a categorial and featural specification, with the modifications introduced in the previous section making finer distinctions between these features. This yields fairly complex representations, but does not account for one aspect of heads that we have yet to consider: their combinatorial properties. Chomsky (1965) argued that heads should be able to select complements independently of meaning, a property termed "strict subcategorization." This notion has undergone much debate, with e.g. Pesetsky (1982) (who introduced the term "c(ategorial)-selection") suggesting that many seemingly c-selectional properties of verbs in fact result from case assignment, an argument supported by Chomsky (1986), Bošković (1997), Levin & Rappaport Hovav (2005), *inter alia*. This is not necessarily the dominant view, however, with for instance Grimshaw (1979), Chomsky & Lasnik (1993:517) suggesting there remains a purely syntactic component to selection, and Emonds (2000) arguing for widescale use of subcategorization in the grammar. Moreover, Pollard & Sag (1987:121-129) argue at length that some kind of c-selection is necessary, and make the observation that verbs similar in meaning show

[11] The opening of this section draws on the discussion in Bazalgette (2011a:9).

idiosyncratic variation in selection of complements, variation which Ian Roberts (p.c.) notes is equally present crosslinguistically.

(90) a. Kim grew poetical.
b. * Kim grew a success.
c. * Kim grew sent more and more leaflets.
d. * Kim grew doing all the work.
e. Kim grew to like anchovies.

(91) a. Kim got poetical.
b. * Kim got a success.
c. Kim got sent more and more leaflets.
d. * Kim got doing all the work.
e. Kim got to like anchovies.

(92) a. Kim turned out poetical.
b. Kim turned out a success.
c. * Kim turned out sent more and more leaflets.
d. * Kim turned out doing all the work.
e. Kim turned out to like anchovies.

(93) a. Kim ended up poetical.
b. Kim ended up a success.
c. * Kim ended up sent more and more leaflets.
d. Kim ended up doing all the work.
e. * Kim ended up to like anchovies.

(94) a. Kim waxed poetical.

b. * Kim waxed a success.

c. * Kim waxed out more and more leaflets.

d. * Kim waxed doing all the work.

e. * Kim waxed to like anchovies.

(Pollard & Sag 1987:123)

Construction grammarians have presented more recent challenges to the notion of c-selection, with e.g. Goldberg (1995, 2005) arguing that complements may be determined not by the c-selectional properties of verbs, but by the constructions they participate in. For instance, though *sneeze* is usually intransitive, a complement is possible in (95b), which is claimed to result from this verb entering into a "Caused-Motion" construction, of which (95a) is a more canonical case:

(95) a. He pushed the napkin off the table.

b. He sneezed the napkin off the table.

((b) adapted from Goldberg 1995:54-55)

However, this perspective predicts that so long as the context is appropriate, a verb should be able to enter into a construction, and so take a complement appropriate to that construction. For instance, given (96a) takes a CP complement, so should (96b) given the context:

(96) a. John said that he needed help.

Context: John is trapped in a room made of cheese on top of a mountain, and can signal for help only by eating the walls of the room such that a message is formed that can be seen from afar.

b. %/? John ate that he needed help.

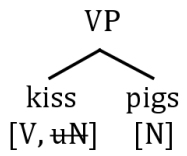
However, when presented with (96b) in context, about half of the native speakers I consulted found it entirely ungrammatical, suggesting that their grammar did not permit *eat* taking CP complements in any circumstances. As a result, while evidence such as (95a-b) suggests that certain verbs may c-select a wider range of

categories than previously thought, it does not mean there cannot be absolute c-selectional restrictions. As a result, I conclude that lexical categories such as nouns and verbs should somehow be specified for the complements they c-select.

Somewhat unlike lexical categories, functional categories appear to occur in a stricter "functional sequence," with e.g. Rizzi (1997), Cinque (1999) and a wide array of subsequent cartographic work suggesting this sequence is not only crosslinguistically fixed, but also complex. A number of approaches have been taken to derive this order, including formally stating the sequence as a condition on Merge (Starke 2001), taking the order to be axiomatic (e.g. Williams 2003, Adger 2013), postulating a hierarchy of projections (Adger 2003) or arguing it results from a semantic or logical basis (e.g. Ernst 2002, Nilsen 2003, Ramchand & Svenonius 2014). There are two reasons to avoid such analyses here. The first is that I have already committed to a mechanism for c-selection in the lexical domain, and so it is arguably more minimal to simply make use of this across the board. The second is that in the following chapters I will argue against the crosslinguistic universality of a Rizzi (1997)-style functional sequence for the left periphery, and so determining this order via the c-selectional properties of heads allows for parametrisation. Notwithstanding, this position remains compatible with the idea that much of the functional sequence is innately determined, but leaves the degree of determination open. I therefore tentatively suppose that c-selection underlies functional sequences as well as lexical complementation.

Having come to this conclusion, we now require an implementation for c-selection before we can approach its algorithmic acquisition. Formal approaches to c-selection remain fairly uncommon in the literature, although Svenonius (1994), Holmberg (2000), Collins (2002), Julien (2002), Adger (2003), Hallman (2004), Pesetsky & Torrego (2006), Wurmbrand (2014) and Panagiotidis (2015) all make use of some form of checking or Agree-based mechanism. For instance, Adger (2003) supposes that heads bear uninterpretable c-selectional features that must be checked with matching categorial features under sisterhood, yielding licit combinations:

(97)



(Adger 2003:86)

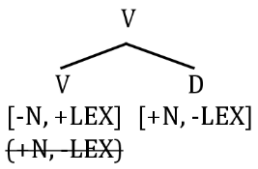
Combined with the assumption that it is selecting categories that project, also made by Boeckx (2008), Cecchetto & Donati (2011, 2015), this provides a straightforward foundation for structure-building.

We can adapt this view to the current approach by supposing that in addition to categorial features, [vf]s, [uf]s, and [uf^]s, heads may also bear c-selectional features, which specify a particular category. For instance, we might enrich the specification of V in (89) above as follows:[12]

(98) V [-N, +LEX] (+N, -LEX)

This states that in addition to having the category [-N, +LEX], V can c-select any [+N, -LEX] category. In the system of (88-89), V would therefore be able to select D and D_{wh}, since they are both [+N, -LEX], with the further [±WH] distinction not being relevant here. Adapting Rizzi's (2008) suggestion that external and internal merge are more specific versions of the general operation Search, we can suppose that a head bearing a c-selectional feature probes the tree it is selecting for the nearest categorial specification. If these features match, then external merge is permitted, the c-selectional feature deletes, and the probing head projects. Selection by V for D in this system may therefore be represented as follows:

(99)



With this view of c-selection in place, we can now consider the representation of c-selectional properties in the linguistic input. Since there is initially no notion of categorial structure, the learner is presumably able at first only to determine the set of heads that a particular head may select. For instance, before the learner

[12] I use round brackets to denote c-selectional features.

determines the categories of 'D' and 'N,' they will be unable to make generalisations such as "Ds c-select NPs," but will be able to note that e.g. *the* c-selects a large set of heads, including *man*, *dog*, *apple*, and so on. This set of c-selected heads may therefore be specified as a property of each head. While it may be possible to continue to view heads as sets of properties here, aside from other concerns[13] this would lead to extremely lengthy representations, and so it is probably simpler to introduce names for heads into the input. As a result, a specific head has the following representation:

(100) $<A, \{p_i, p_j, p_k, \ldots, \{p_l\}, \{p_m\}, \{p_n\}, \ldots, <p_o, m>, <p_p, m>, <p_q, m>, \ldots, \{B, \Gamma, \Delta, \ldots\}\}>$

Rather than sets of properties, heads are represented as an ordered pair of a name and a set of properties, with one of these properties being the set of names of heads selected by that head. This naming means that the input no longer needs to be a multiset, since we may suppose that each name is unique. As a result, the input may be depicted as follows:

(101) $\{<A, \{p_i, p_j, p_k, \ldots, \{p_l\}, \{p_m\}, \{p_n\}, \ldots, <p_o, m>, <p_p, m>, <p_q, m>, \ldots, \{B, \Gamma, \Delta, \ldots\}\}>,$
$<E, \{p_r, p_s, p_t, \ldots, \{p_u\}, \{p_v\}, \{p_w\}, \ldots, <p_x, m>, <p_y, m>, <p_z, m>, \ldots, \{Z, H, \Theta, \ldots\}\}>, \ldots\}$

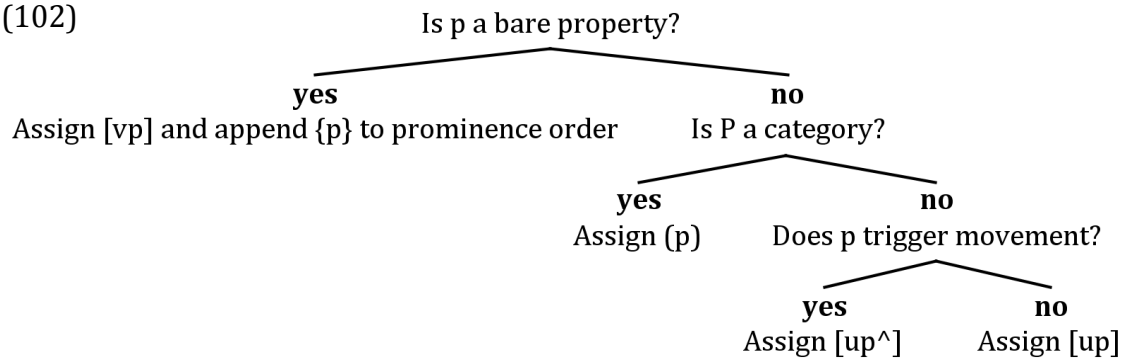
i.e. a set of ordered pairs of names and sets of properties, singleton sets of properties, ordered pairs of properties and the special property 'm(ove)', and a set of names.

This gives us all the components we need to adapt the algorithm to assign c-selectional features. In the previous subsection, we excluded the properties corresponding to [uf]s and [uf^]s from the prominence order, since their possible presence could be determined on the basis of previously assigned [vf]s. This exclusion is even more necessary in the case of c-selectional features, since they refer directly to the categories that emerge in the course of the algorithm's operation, and so could not be defined in advance of its application to the input. As a result, it makes sense to simply append newly generated categories to the

[13] In particular, the property {p} could mean both "this head selects the head that has only the property p" and "this head Agrees for p without triggering movement," and so the system would require some reformulation.

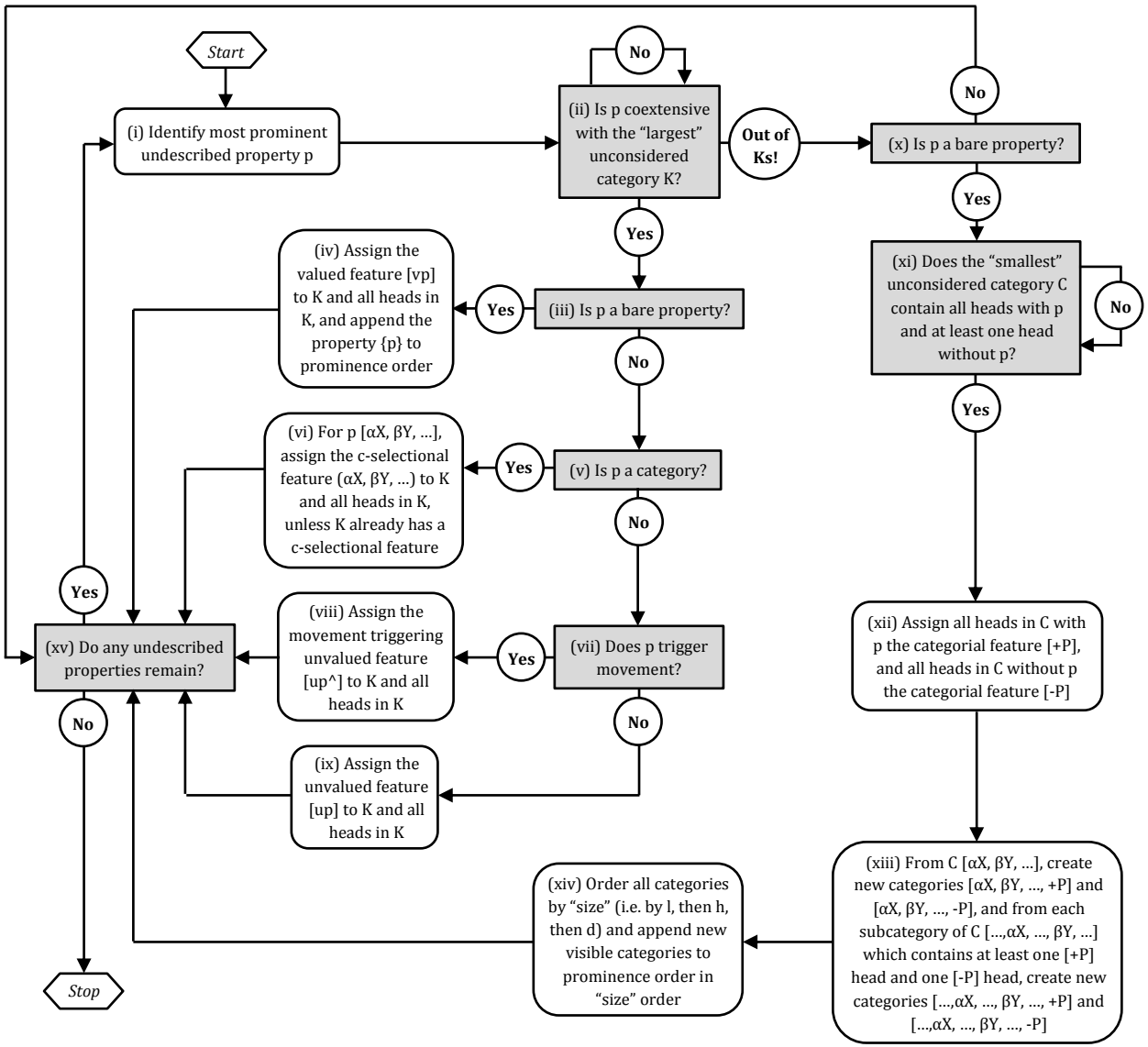
prominence order, for investigation as possible c-selectional features. Furthermore, if we interpret coextensivity of a categorial property as a head c-selecting all and only the heads in that category, then we can slightly adapt the schema in (80) to allow assignment of c-selectional features:

(102)



This schema may then be integrated with (35) to yield the following algorithm:

(103)


Start
(i) Identify most prominent undescribed property p
(ii) Is p coextensive with the "largest" unconsidered category K?
No
Out of Ks!
(x) Is p a bare property?
No
Yes
(xi) Does the "smallest" unconsidered category C contain all heads with p and at least one head without p?
No
Yes
(iii) Is p a bare property?
Yes
(iv) Assign the valued feature [vp] to K and all heads in K, and append the property {p} to prominence order
No
(v) Is p a category?
Yes
(vi) For p [αX, βY, ...], assign the c-selectional feature (αX, βY, ...) to K and all heads in K, unless K already has a c-selectional feature
No
(vii) Does p trigger movement?
Yes
(viii) Assign the movement triggering unvalued feature [up^] to K and all heads in K
No
(ix) Assign the unvalued feature [up] to K and all heads in K
(xii) Assign all heads in C with p the categorial feature [+P], and all heads in C without p the categorial feature [-P]
(xiii) From C [αX, βY, ...], create new categories [αX, βY, ..., +P] and [αX, βY, ..., -P], and from each subcategory of C [...,αX, ..., βY, ...] which contains at least one [+P] head and one [-P] head, create new categories [...,αX, ..., βY, ..., +P] and [...,αX, ..., βY, ..., -P]
(xiv) Order all categories by "size" (i.e. by l, then h, then d) and append new visible categories to prominence order in "size" order
(xv) Do any undescribed properties remain?
Yes
No
Stop

This algorithm is only minimally different from (81), with the addition of steps (v) and (vi) for the assignment of c-selectional features, and the alteration of step (xiv) so that new categories are added to the prominence order. (This step also specifies that only "visible" categories should be added, a point I will return to below.)

(103) is therefore able to acquire c-selectional features alongside categorial features, [vf]s, [uf]s, and [uf^]s. This can be demonstrated by adapting the toy grammar of (82) so that it includes c-selectional properties:

(104) { <C, {{T}}>,
<C_{wh}, {q, <whq, m>, {T}}>,
<T, {tense, <φ, m>, {V}},
<V, {lex, {D, D_{wh}}}>,
<D, {n, φ, {N}}>,
<D_{wh}, {n, φ, wh, whq, {N}}>,
<N, {n, lex, {P}}>,
<P, {n, lex, spat}> }

<n, lex, spat, φ, wh, whq, tense, q>

Aside from the introduction of c-selectional sets (and the formal introduction of names), this example is unchanged from (82). Heads are given the simple (and rather unrealistic) specification that C and C_{wh} select T, T selects V, V selects D and D_{wh}, D and D_{wh} select N, N selects P, and P selects nothing, and the prominence order is unchanged.

The algorithm initially proceeds exactly as for (81) applied to (82), with the added complexity that new categories are appended to the prominence order. As a result, when the algorithm reaches 'φ', the prominence order is as follows:

(105) <~~n, lex, spat,~~ φ, wh, whq, tense, q, [ ], [+N], [-N], [-LEX], [+LEX], [-N, -LEX], [+N, +LEX], [+N, -LEX], [-N, +LEX], [+N, +LEX, +SPAT], [+N, +LEX, -SPAT]>

As before, '{φ}' is then appended to this, and then as new categories are produced, the algorithm continues to add to the prominence order, yielding the following after consideration of 'q':

(106) <~~n, lex, spat, φ, wh, whq, tense, q,~~ [ ], [+N], [-N], [-LEX], [+LEX], [-N, -LEX], [+N, +LEX], [+N, -LEX], [-N, +LEX], [+N, +LEX, +SPAT], [+N, +LEX, -SPAT], {φ}, [+N, -LEX, +WH], [+N, -LEX, -WH], {whq}, [-N, -LEX, -TENSE], [-N, -LEX, +TENSE], [-N, -LEX, -TENSE, +Q], [-N, -LEX, -TENSE, -Q]>

At this point, categories may be checked as possible candidates for c-selectional features, as follows (shown for [+N] rather than [ ] for expositional purposes). This requires a third notion of coextensivity for categorial properties: a categorial property X is coextensive with K iff every member of K c-selects all and only the members of X.[14] This allows step (ii) to be used once again for categorial properties:

(107) (ii) Is '[+N]' coextensive with []? (i.e. does every [] head c-select all and only the [+N] heads?)
No

(ii) Is '[+N]' coextensive with [-LEX]? (i.e. does every [-LEX] head c-select all and only the [+N] heads?)
No

…

(ii) Is '[+N]' coextensive with [-N, -LEX, -TENSE, -Q]? (i.e. does every [-N, -LEX, -TENSE, -Q] head c-select all and only the [+N] heads?)
No
Out of Ks!

(x) Is '[+N]' a bare property?
No

(xv) Do any undescribed properties remain?
Yes

(i) Identify most prominent undescribed property p

p = [-N]

When a category *is* identified as being coextensive with a categorial property, the following occurs:

[14] A more formal version of this statement can be added to the definitions in footnote 10 above, yielding the following notions of coextensivity for each type of property:

(i) p: Do all heads in K have p, and all heads not in K not have p?

(ii) {p}: Do all heads in K have {p} and all heads not in K not have {p} OR do all heads in K have <p, m> and all heads not in K not have <p, m>?

(iii) [αX, βY, …]: Do all heads in K have a set with the names of all and only the members of [αX, βY, …]?

(108) (ii) Is '[+N, -LEX]' coextensive with [-N, +LEX]? (i.e. does every [-N, +LEX] head c-select all and only the [+N, -LEX] heads?)
Yes

(iii) Is '[+N, -LEX]' a bare property?
No

(v) Is '[+N, -LEX]' a category?
Yes

(vi) For '[+N, -LEX]' assign the c-selectional feature (+N, -LEX) to [-N, +LEX] and all heads in [-N, +LEX], unless [-N, +LEX] already has a c-selectional feature.
Assign (+N, -LEX) to [-N, +LEX] & V

(103) thus uses step (ii) to assign three different kinds of properties, with each having a slightly different notion of coextensivity. For (104), this yields the following system:

(109)

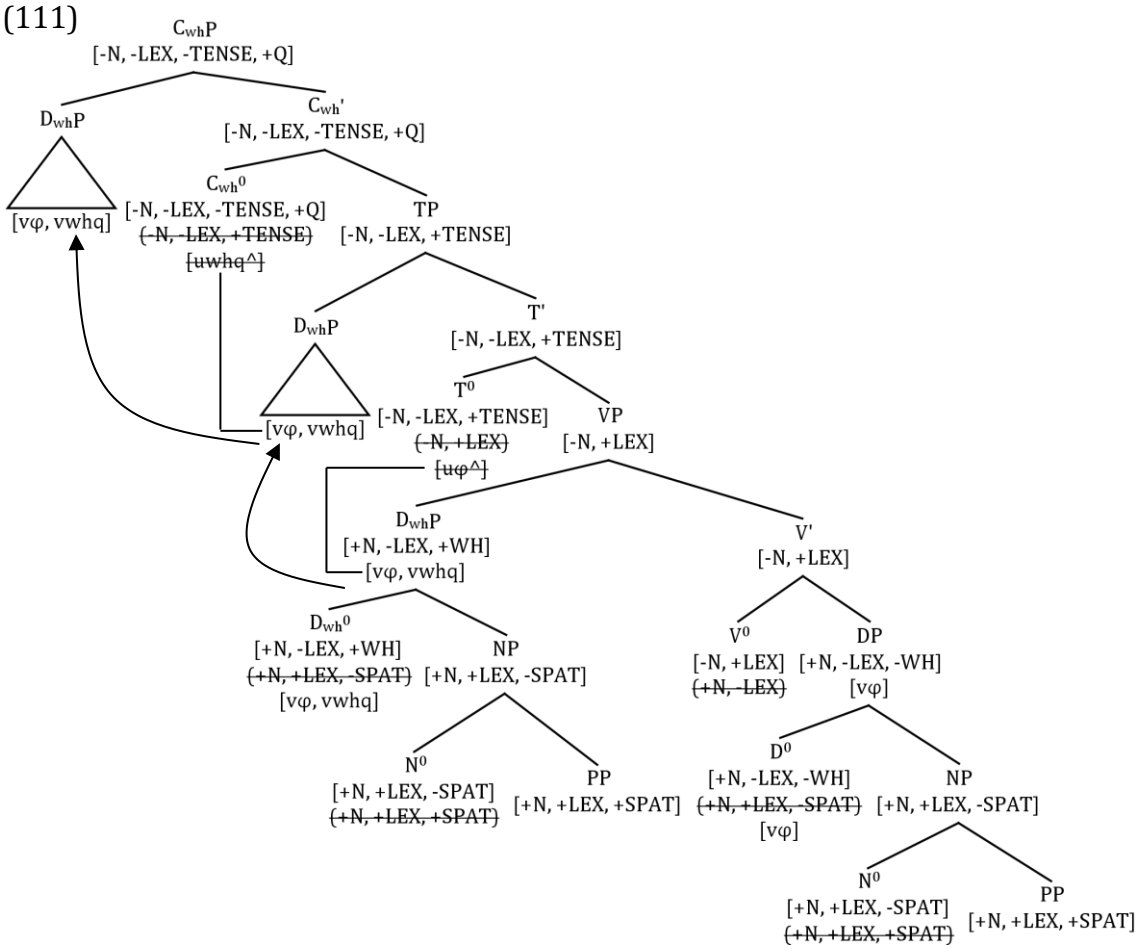
[ ]	l = 0, h = 8, d = 000000
[-LEX]	l = 1, h = 5, d = 010000
[+N]	l = 1, h = 4, d = 200000
[-N]	l = 1, h = 4, d = 100000
[+LEX]	l = 1, h = 3, d = 020000
[-N, -LEX]	l = 2, h = 3, d = 110000
[+N, +LEX]	l = 2, h = 2, d = 220000
[+N, -LEX] (+N, +LEX, -SPAT) [vφ]	l = 2, h = 2, d = 210000
[-N, +LEX] (+N, -LEX)	l = 2, h = 1, d = 120000
[-N, -LEX, -TENSE] (-N, -LEX, +TENSE)	l = 3, h = 2, d = 110010
[+N, -LEX, +WH] [vwhq]	l = 3, h = 1, d = 210200
[+N, -LEX, -WH]	l = 3, h = 1, d = 210100
[+N, +LEX, +SPAT]	l = 3, h = 1, d = 222000
[+N, +LEX, -SPAT] (+N, +LEX, +SPAT)	l = 3, h = 1, d = 221000
[-N, -LEX, +TENSE] (-N, +LEX) [uφ^]	l = 3, h = 1, d = 110020
[-N, -LEX, -TENSE, +Q] [uwhq^]	l = 4, h = 1, d = 110012
[-N, -LEX, -TENSE, -Q]	l = 4, h = 1, d = 110011

(110)

C:	[-N, -LEX, -TENSE, -Q]	(-N, -LEX, +TENSE)	
C_{wh}:	[-N, -LEX, -TENSE, +Q]	(-N, -LEX, +TENSE)	[uwhq^]
T:	[-N, -LEX, +TENSE]	(-N, +LEX)	[uφ^]
V:	[-N, +LEX]	(+N, -LEX)	
D:	[+N, -LEX, -WH]	(+N, +LEX, -SPAT)	[vφ]
D_{wh}:	[+N, -LEX, +WH]	(+N, +LEX, -SPAT)	[vφ, vwhq]
N:	[+N, +LEX, -SPAT]	(+N, +LEX, +SPAT)	
P:	[+N, +LEX, +SPAT]		

These heads have the appropriate selection properties to create clausal and nominal spines, allowing for the formation of structures such as the following:[15]

(111)



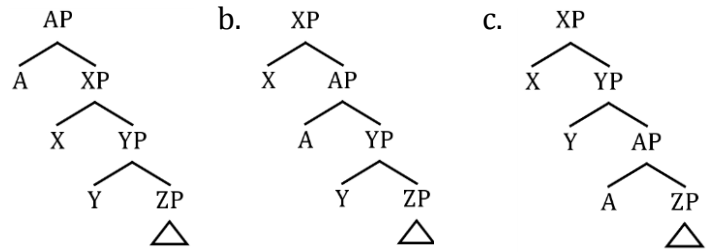
Nevertheless, this example remains fairly unrealistic, since with the exception of V, each head may select only one other category, whereas in fact heads appear to be able to c-select a far wider range of categories. For instance, N may select relative clauses as well as PPs, some Vs may select CPs as well as DPs, and so on. However, before considering a slightly more complex example, we have one final question to consider – are all heads c-selected?

[15] One aspect of this structure is not accounted for in the current system: the base generation of the subject ($D_{wh}P$) in the specifier of VP. Since (103) only assigns at most one c-selectional feature to every head, this problem cannot be solved by giving V two c-selectional features, an approach taken by Adger (2003). However, as the majority of specifiers are not produced in this fashion, I take the ability of v and V to host external arguments in their specifiers to be exceptional, attributable to some other factor. In chapter 8, I suggest a similar external argument property for N. Leaving aside such complications allows for an acquirable c-selection system concerned specifically with complementation, at the cost of some explanatory power.

From early on in the cartographic program, it has been recognised that certain categories do not exhibit the same ordering properties as other heads. For instance, after a crosslinguistic consideration of negation positions, Cinque (1999:126) argues that "the evidence points to the possibility of generating a NegP on top of every adverb-related functional projection, even simultaneously, up to a certain height." Such variation may equally be system-internal, with e.g. Wiltschko (2006) showing that both German negation and Halkomelem diminutive markers may combine with a wide range of different categories, and Simpson (2008) demonstrating similar properties for Burmese nominalisers. Moreover, in their discussion of Kiowa, Adger et al. (2009) identify certain particles as "non-selective," in that they do not exhibit a fixed order. Biberauer & Sheehan (2011) discuss such data in some detail, further noting that similar properties hold for focus and topic markers, Q-particles, and modal markers, and Biberauer et al. (2014b) further argue that coordination exhibits such behaviour. In the following chapters we will in particular consider this property for a number of focus-related heads.

To account for such data, some researchers have suggested that these heads are in some way "syncategorematic" or "acategorial" – e.g. Wiltschko (2006), Biberauer (2009), Bayer & Obenauer (2011), Biberauer et al. (2014a), since their promiscuous selection is taken to result from an absence of formal c-selectional features. However, one advantage of the current framework, where categories are derived from subdivision of the total set of heads, is that heads c-selecting a wider range of categories may be taken as simply having a supercategory as their c-selectional feature. To demonstrate this, consider a variety which allows for the following structures:

(112) a. b. c.



Here X, Y, and Z form a strict hierarchy, but A may select any of these heads. As a result, instead of viewing A as acategorial, I take it to have as its c-selectional feature a category including X, Y, and Z. However, there is one serious complication here – how is the ordering of X, Y, and Z maintained across A? While it is possible to assign c-selectional specifications that maintain the orderings in (112a-c), this would require an extremely complex categorial system (e.g. X would have to c-select a category containing A and Y, Y a category containing A and Z, and so on). Moreover, such a specification seems to obscure the fact that X, Y, and Z maintain a hierarchy while A does not. Instead, then, we can simplify these specifications by suggesting that X, Y, and Z c-select *through* A, and thus each c-selects only the category of the next head in the hierarchy. As a result, the claim is not that elements such as A do not c-select, but they are not c-selected.

Formalising this notion requires such heads to be specified for a special property, which I term 'invis(ible).'[16] C-selecting heads therefore probe a phrase marker for the "nearest" visible head, with Agreement between c-selectional features and the categorial features of this head occurring as before. However, this sense of "nearest" cannot be determined by c-command, since if the c-selected phrase marker has an invisible root YP, then visible heads in Spec,YP may be c-commanded before those in Comp, YP. As a result, we require a formal notion of "nearest," which I define below:

[16] [+INVIS] categories need not be appended to the prominence order by step (xiv) of (103) since they cannot be c-selected, and so cannot become c-selectional features. Since c-selectional features probe the categorial features of heads, I suppose that 'invis' always encodes a categorial distinction.

(113) For a head X selecting a phrase marker with root YP, the "nearest" node Z is determined as follows:

a. If YP is [-INVIS] or unspecified for [±INVIS], Z = YP.

b. If YP is [+INVIS] then replace YP for Comp,Y^0 and return to (a).

As a result, the probing of a c-selecting head varies somewhat from the probing of a head bearing a [uf] or [uf^]. However, at the cost of this new definition, we can readily account for the structures in (112a-c) – for instance, they could have the following specifications:

(114)

X:	[+X]	(+Y)
Y:	[+Y]	(+Z)
Z:	[+Z]	
A:	[+INVIS]	( )

We are now in a position to consider a more complex input than (104). For instance, consider a system of heads with the following c-selectional properties:

(115)

C, C_{wh}, C_{rel}	select	T
T, Neg	select	V
V	selects	C, C_{wh}, D, D_{wh}, P
D, D_{wh}	select	N
N	selects	C_{rel}, P
P	selects	D, D_{wh}, P

Though still very much a toy example, this pattern of c-selection is more realistic than (104), since in addition to preserving the clausal and nominal hierarchies, heads may select a wider array of complements. For instance, V may select DPs, PPs, and both declarative and interrogative CPs; N may select relative CPs as well as PPs, and so on. Moreover, we may suppose that Neg is invisible to c-selection in the sense described above.

We cannot simply alter (104) by stating that the relevant heads have these c-selectional properties, since the categorial system that results does not have all the categories we require – for instance, there is no category containing C, C_{wh}, D, D_{wh}, and P, but no other heads. This view of c-selection therefore makes a strong prediction about the categorial structure of heads – that any class of heads that is

c-selected must be represented by a category in the system. In the case of this example, we can suggest an input that does exhibit the properties of (115) by altering the properties involved:

(116) { <C, {{T}}>,
<C_{wh}, {q, {whq, m}, {T}}>,
<C_{rel}, {rel, z, {T}}>,
<T, {mid, {φ, m}, {V}}>,
<V, {op, {C, C_{wh}, D, D_{wh}, P}}>,
<D, {n, φ, {N}}>,
<D_{wh}, {n, φ, wh, whq, {N}}>,
<N, {mid, op, n, {C_{rel}, P}}>,
<P, {n, z, {D, D_{wh}, P}}>,
<Neg, {mid, invis, {V}}> }

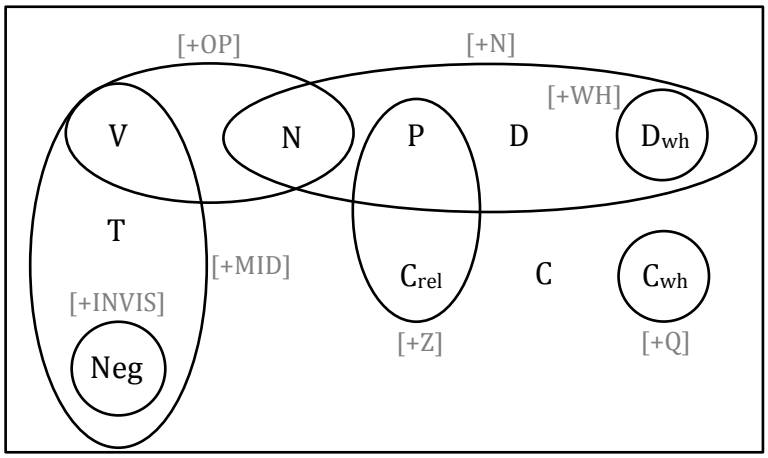
<mid, op, rel, n, z, φ, q, wh, whq, invis>

These features are therefore expositional rather than a constituting a theoretical claim. However, 'mid(dle)' indicates a head that occurs in the middle of an extended projection, 'op(en)' indicates heads that are widely open class, and 'z' is some property that C_{rel} and P have in common (see Emonds 1985:ch.7 for a discussion of the commonalities of C and P). Application of (103) results in the following system:

(117)

[ ]	l = 0, h = 10, d = 00000000
[-OP]	l = 1, h = 8, d = 01000000
[-MID]	l = 1, h = 7, d = 10000000
[-N]	l = 1, h = 6, d = 00010000
[+N]	l = 1, h = 4, d = 00020000
[+MID]	l = 1, h = 3, d = 20000000
[+OP]	l = 1, h = 2, d = 02000000
[-MID, -OP]	l = 2, h = 6, d = 11000000
[-OP, -N]	l = 2, h = 5, d = 01010000
[-MID, -N]	l = 2, h = 4, d = 10010000
[-MID, +N]	l = 2, h = 3, d = 10020000
[-OP, +N]	l = 2, h = 3, d = 01020000
[+MID, -OP] (-MID, +OP)	l = 2, h = 2, d = 21000000
[+MID, -N]	l = 2, h = 2, d = 20010000
[+MID, +OP] (-MID, -OP, +Z)	l = 2, h = 1, d = 22000000
[+MID, +N]	l = 2, h = 1, d = 20020000
[-MID, +OP] (-MID, -OP, -REL)	l = 2, h = 1, d = 12000000
[-MID, -OP, -REL]	l = 3, h = 5, d = 11100000
[-MID, -OP, -Z]	l = 3, h = 4, d = 11001000
[-MID, -OP, +N]	l = 3, h = 3, d = 11020000
[-MID, -OP, -N] (+MID, -N, -INVIS)	l = 3, h = 3, d = 11010000
[-MID, -OP, +Z]	l = 3, h = 2, d = 11002000
[+MID, -N, +INVIS]	l = 3, h = 1, d = 20010002
[+MID, -N, -INVIS] [uφ^]	l = 3, h = 1, d = 20010001
[-MID, -OP, +REL]	l = 3, h = 1, d = 11200000
[-MID, -OP, -REL, -Z]	l = 4, h = 4, d = 11101000
[-MID, -OP, -REL, +N]	l = 4, h = 3, d = 11120000
[-MID, -OP, -REL, -N]	l = 4, h = 2, d = 11110000
[-MID, -OP, -N, -Z]	l = 4, h = 2, d = 11011000
[-MID, -OP, -REL, +Z] (-MID, +N)	l = 4, h = 1, d = 11102000
[-MID, -OP, +N, +Z]	l = 4, h = 1, d = 11022000
[-MID, -OP, +N, -Z] (+MID, +OP) [vφ]	l = 4, h = 1, d = 11021000
[-MID, -OP, -N, +Z]	l = 4, h = 1, d = 11012000
[-MID, -OP, -REL, +N, -Z]	l = 5, h = 2, d = 11121000
[-MID, -OP, -REL, +N, +Z]	l = 5, h = 1, d = 11122000
[-MID, -OP, +N, -Z, +WH] [vwhq]	l = 5, h = 1, d = 11021020
[-MID, -OP, +N, -Z, -WH]	l = 5, h = 1, d = 11021010
[-MID, -OP, -N, -Z, +Q] [uwhq^]	l = 5, h = 1, d = 11011200
[-MID, -OP, -N, -Z, -Q]	l = 5, h = 1, d = 11011100

(118)



Furthermore, the heads involved have the following specifications, yielding exactly the behaviour in (115):

(119)	C:	[-MID, -OP, -REL, -N, -Z]	(+MID, -N, -INVIS)	
	C_{wh}:	[-MID, -OP, -REL, -N, -Z]	(+MID, -N, -INVIS)	[uwhq^]
	C_{rel}:	[-MID, -OP, +REL, -N, +Z]	(+MID, -N, -INVIS)	
	T:	[+MID, -OP, -N, -INVIS]	(-MID, +OP)	[uφ^]
	V:	[-MID, +OP, -N]	(-MID, -OP, -REL)	
	D:	[-MID, -OP, -REL, +N, -Z]	(+MID, +OP)	[vφ]
	D_{wh}:	[-MID, -OP, -REL, +N, -Z]	(+MID, +OP)	[vφ, vwhq]
	N:	[+MID, +OP, +N]	(-MID, -OP, +Z)	
	P:	[-MID, -OP, -REL, +N, +Z]	(-MID, +N)	
	Neg:	[+MID, -OP, -N, +INVIS]	(-MID, +OP)	

This example therefore demonstrates two properties of the system developed. The first is that c-selectional features may be acquired, including in cases involving promiscuous selection and invisible elements. The second is that this approach to c-selection makes strong claims about the categories that exist in particular systems, which if true should be corroborated by other evidence for categorial structure. There are a wide range of linguistic properties that might yield such evidence, including shared behaviour, distribution of formal features, and positions in the implicational hierarchies of typology.

2.5 Conclusion.

We began this chapter with an attempt to create an explicit system for the distribution of features alongside the development of categorial structure. This led to the proposal of the algorithm in (35), which provided solutions to many of the outstanding questions of chapter 1. Moreover, in 2.3, this algorithm was applied to a number of non-syntactic domains, supporting its hypothesised status as a domain-general cognitive process. Finally, in 2.4, (35) was enriched to (103), which supports more syntactically realistic structures. This result required the proposal of a number of properties as specific to the syntactic domain:

(120) a. The four-way distinction between [vf]/[uf]/[uf^]s and c-selectional features.

b. The mechanisms of Agree and Move corresponding to the [vf]/[uf]/[uf^] system.

c. The mechanism of c-selection, including invisibility and "nearness."[17]

d. The relevant notions of coextensivity for the properties corresponding to each type of feature.

e. The schema in (102) relating these four types of features.

However, though these properties must be stated, this nevertheless allows for a relatively minimal account of parametrisation, with the majority of the work being attributed to a domain-specific algorithm. The representations generated by this algorithm remain simplified, with a number of properties such as feature values, Case/the activity condition, and the theta-system not being encoded. Notwithstanding, (103) may acquire fairly complex syntactic systems, and in part III it is applied to the parameterisation of focus constructions. First, though,

[17] The process of probing through invisible elements may in fact have a phonological correlate in processes such as Finnish vowel harmony, which passes through /i/ and /e/ without affecting their specification (Ringen 1975). See Nevins (2010) for an explicit implementation of such processes via Agree, and Perry (2012) for a general minimalist architecture for phonology extending this insight. If these phenomena can be accounted for with the same processes that govern c-selection through invisible heads, then our list of syntactically-specific properties is reduced.

significant work must be carried out to better understand this aspect of the grammar, which is the subject of second part of this thesis.

Part II

On the Compositionality of Focus

3. A Unified Perspective for the Analysis of Focus.

3.1 Introduction.

The previous chapter developed an explicit approach to lexicocentric parameterisation. Despite this, we have thus far only seen the application of this approach to toy examples, yet if it is to be successful as a theory of variation, it should be capable of accounting for more complex and realistic linguistic data. To this end, I turn to the domain of focus expression, which exhibits considerable inter- and even intralinguistic variation. Nevertheless, part III demonstrates that this domain is entirely amenable to parameterisation via the algorithm of chapter 2. Before we can reach this point, however, it is necessary to attain a better theoretical understanding of focus itself, which is the goal of this part of the thesis.

The current chapter introduces this goal, first giving an initial overview of the variation seen (section 3.2), before considering potential theoretical approaches to its analysis (section 3.3). Section 3.4 then outlines the framework of alternative semantics (Rooth 1985 *et seq.*), and adapts it to develop a perspective for the comparison of focus constructions. Section 3.5 assesses the consequences of this perspective for syntactic analysis, ultimately arguing that compositionality should be used as a heuristic in the investigation of focus. Section 3.6 concludes.

3.2 The range of variation in focus expression.

Focus is primarily an information-structural notion that has long been recognised across many different approaches to linguistics, but it has been very variably defined. Usually, however, these definitions involve some combination of the introduction of "new" information (e.g. Halliday 1967, Jackendoff 1972, Rochemont 1986, Sgall et al. 1986) and/or the invocation of alternatives (e.g. Krifka 1991, 2007, Rooth 1985, 1992, 1996). Moreover, there is some debate as to whether or not focus is a uniform category, with e.g. Drubig (2003), Krifka (2007), Zimmermann & Onea (2011) taking this position, and Wedgwood (2009), Matić & Wedgwood (2013) the opposite. Below, I initially make use of an intuitive notion of focus, combining the properties above; we will, however, soon see that to characterise the variation in its expression fully, a more precise approach is necessary, and in section 3.4 I will take focus to be characterised and unified by the invocation of alternatives.

While we might hope that focus can be analysed as crosslinguistically uniform, it would be impossible to maintain the same hypothesis about its *expression*, which exhibits a vast degree of variation both within and across languages. For instance, English alone expresses focus using prosodic prominence (1), *it*-clefting (2), specific lexical items (3), and even some apparent form of reduplication (4):[1]

(1) I gave it to [*John*]$_{\text{Foc}}$.

(2) It was [*John*]$_{\text{Foc}}$ that I gave it to.

(3) I **only** gave it to [*John*]$_{\text{Foc}}$.

(4) I didn't give it to John [*Smith*]$_{\text{Foc}}$, I gave it to [***John*-John**]$_{\text{Foc}}$.[2]

[1] Throughout this thesis I use italics to indicate prosodic emphasis, contrasting with bold font, used to highlight information for the reader. The [.]$_{\text{Foc}}$ notation indicates the scope and position of focus within an example. The presence of this bracketing should not be taken as a hypothesis of any specific syntactic structure, but instead as a relatively pretheoretical identification of focused expressions. However, in 3.4 I argue for a syntactic marker underlying all foci, which is explicitly implemented in the analyses of chapters 7-10.

[2] Here John-*John* denotes an apparently prototypical referent of *John*. This construction is considered in detail in chapter 8.

Each of the sentences in (1-4) expresses focus using a different combination of linguistic machinery. While it is true that each of these constructions appears to differ in meaning (with such differences and their potential consequences being investigated below), it is nonetheless the case that all highlight the referent of *John*, which contrasts with potential alternatives, and this identification of *John* is not presupposed information. As such, all appear to involve some form of focus. When we move beyond English, an even wider array of strategies is seen, as exemplified below.

3.2.1 No marking.

In at least one instance, it has been argued that particular foci are not linguistically marked at all. This is the case of Fongbe non-subject focus. In (5a), there are two possible responses to question A, both of which encode object focus. However, though the B' response makes use of fronting and an optional focus marker, the less marked B response appears to show no linguistic marking at all. This contrasts with subject focus (5b), where use of a focus marker is obligatory:

(5) a. A: What did the woman eat?

B: é ɖù [àyìkún]$_{\text{Foc}}$ (unmarked)
3SG eat bean
'She ate *beans*.'

B': [àyìkún]$_{\text{Foc}}$ (**wɛ́**) é ɖù (marked)
bean **FOC** 3SG eat
'She ate *beans*.' ~ 'It is *beans* that she ate.'

b. A: Who ate the beans?

B: [nyɔ̀nú ɔ́]$_{\text{Foc}}$ *(**wɛ́**) ɖu àyìkún
woman DEF **FOC** eat bean
'*The woman* ate the beans.'

(Fongbe (Kwa), Fiedler et al. 2010:237, 239, 245; Zimmermann & Onea 2011:1662)

3.2.2 Marking with stress.

More usually, however, some form of marking is involved. We have already seen that English makes use of stress to mark foci:

(6) I gave it to [*John*]$_{\text{Foc}}$.

(English, repeated from (1))

This is in fact an extremely common strategy for marking foci crosslinguistically, with the below examples showing similar forms of marking in German (7), Hungarian (8b), and Arabic (9b):

(7) A: Wen bewundert der Professor?
whom admires the.NOM professor
'Who(m) does the professor admire?'

B: Er bewundert einen [*Musiker*]$_{\text{Foc}}$
he admires a.ACC musician
'He admires a *musician*.'

(German, Breul 2013:3)

(8) a. Anna énekel a mezōn
Anna-NOM sings the field-on
'Anna sings on the field.'

b. *Anna* énekel [*a mezōn*]$_{\text{Foc}}$
Anna-NOM sings the field-on
'Anna sings on *the field*.'

(Hungarian, Csimraz ms.:8-9)

(9) a. ʔallafat Zaynab-u riwaayat-an
wrote Zaynab-NOM novel-ACC
'Zaynab wrote a novel.'

b. ʔallafat Zaynab-u [*riwaayat-an*]$_{\text{Foc}}$
wrote Zaynab-NOM novel-ACC
'Zaynab wrote a *novel*.'

(Arabic, adapted from Ouhalla 1997:11)

3.2.3 Marking with prosody.

However, phonological strategies beyond simply stress are used, with several languages marking focus in more complex prosodic ways. For instance, in Japanese, focus can be marked by a process of prosodic rebracketing (Büring 2010:187-188). In the unmarked (10a), each word is wrapped in a distinct prosodic phrase, which resets tonal downstep at its start. By contrast, the focus on *Nagoya* in (10b) bears an increased tonal pitch, and erases all prosodic phrases to its right, preventing any further resetting of downstep:

(10) a. (φ Naoko-wa) (φ nichiyoobi-ni) (φ Nagoya-de) (φ Mari-ni) (φ atta)
Naoko-TOP Sunday-DAT Nagoya-INS Mari-DAT met
'Naoko met Mari in Nagoya on Sunday.'

b. (φ Naoko-wa) (φ nichiyoobi-ni) **(φ [Nagoya]$_{Foc}$-de Mari-ni atta)**
Naoko-TOP Sunday-DAT Nagoya-INS Mari-DAT met
'Naoko met Mari in *Nagoya* on Sunday.'

(Japanese, Büring 2010:187)

Even more complex prosodic systems than this are attested, such as Yixing Chinese, where focus of phrases involving attributive adjectives blocks the application of tonal pattern substitution:

(11) a. A: What happened?

B: (φ páŋ láo níŋ) (φ bɔ̀ndào gə̀) (φ só láo níŋ)
fat ATTR people meet ASP thin ATTR people
'Fat people met thin people.'

b. A: Who met thin people?

B: **[(φ pâŋ lào nǐŋ)]$_{Foc}$** (φ bɔ̀ndào gə̀) (φ só láo níŋ)
fat ATTR people meet ASP thin ATTR people
'*Fat people* met thin people.'

c. A: Who did fat people meet?

B: (φ páŋ láo níŋ) (φ bɔ̀ndào gə̀) **[(φ sô lào nǐŋ)]$_{Foc}$**
fat ATTR people meet ASP thin ATTR people
'Fat people met *thin people*.'

(Yixing Chinese, Perry 2013, Hu & Perry 2014, p.c.[3])

Perry (2013, p.c.) argues that in unfocused positions the apparently attributive particle *láo* triggers a tone sandhi process leading to a substitution of the normal tonal pattern for a distinct one. Both *pấŋ* 'fat' and *sõ* 'thin' are argued to have the following lexically specified tonal patterns:

(12) HL H%
|
paŋ

[3] This data was elicited from Xuhui Hu, a linguist and native speaker of Yixing Chinese, with the help of Joe Perry.

i.e. an HL tone anchored to the vowel, along with a floating high boundary tone. In the citation forms *pãŋ* and *sõ*, this shows up as an HLH pattern on the vowel, but in unfocused positions involving *láo*, as in (11a), this pattern does not emerge, being substituted for a pattern involving high tones throughout the phonological phrase. However, when these phrases are focused, as in (11b-c), this substitution process is blocked, and the lexical tone of the adjectives emerges:

(13) HL H%
(φ paŋ lao niŋ)

The anchored HL appears on the vowel of the adjective, and its L extends throughout the phonological phrase to its edge, where the boundary tone also associates. This leads to the tonal patterns seen on the focused phrases in (11b-c).

3.2.4 Morphological marking.

Marking need not be purely phonological, with morphological inflection of some kind commonly being used to mark focus. In Boni, for instance, focused arguments are suffixed with *-é*, whereas focused predicates are prefixed with *á-*:

(14) a. an biyóo ajika
I water drink
'I drink water.'

b. an [biyóo]$_{Foc}$-**é** ajika
I water-**FOC** drink
'It's *water* that I drink.'

c. an biyo **á**-[ajika]$_{Foc}$
I water **FOC**-drink
'I *drink* water.'

(Boni (Cushitic), Sasse 1981:271)

By contrast, Modern Colloquial Sinhala expresses argument focus through verbal inflection, along with an optional emphatic particle:

(15) a. eyaa gamətə **yanna**
he.NOM village-DAT go.PRS.**A**
'He goes to the village'

b. eyaa [*gamətə*]$_{\text{Foc}}$ (y/tamay) **yanne**
he.NOM village-DAT EMPH go.PRS.**E**
'It's to the village he goes.'

(Modern Colloquial Sinhala, Slade 2011:45)

In Gùrùntùm, the morpheme *á* prosodically cliticises onto the constituent preceding the focused one (16a), occurring as a free morpheme when the focus is sentence-intial (16b):

(16) a. Tí bà wúm-**á** [kwálíngálá]$_{\text{Foc}}$
3SG PROG chew-**FOC** colanut
'He is chewing *colanut*.'

b. **Á** [fúrmáyò]$_{\text{Foc}}$ bà wúm kwálíngálá
FOC fulani PROG chew colanut
'*The Fulani* is chewing colanut.'

(Gùrùntùm (West Chadic), Hartmann & Zimmermann 2009:1342; Zimmermann & Onea 2011:1660)

Morphological focus constructions can be more complex than this, however. For example, we have already seen (4), where focus is achieved by a process of reduplication:

(17) I didn't give it to John [*Smith*]$_{\text{Foc}}$, I gave it to [***John*-John**]$_{\text{Foc}}$

(English, repeated from (4))

Furthermore, in some cases the interaction between morphology and focus is not so clear – in Japanese, for instance, it is argued that the nominative morpheme *ga* is used to focus arguments in some cases. In (18a), the nominative subject is interpreted as exhaustively identifying the set of students; in the multiple nominative construction (18b), the first nominative phrase again receives an exhaustive reading (see Vermeulen 2012:196-197):

(18) a. [Taro]$_{\text{Foc}}$-**ga** gakusee desu
Taro-NOM student COP
'It's Taro who is a student.'

b. [zoo]$_{\text{Foc}}$-**ga** hana-**ga** nagai
elephant-NOM nose-NOM long
'It's the elephants that have long trunks.'

(Japanese, Vermeulen 2012:196-197)

3.2.5 Marking with lexical items.

The distinction between marking with lexical items and with morphology is not always a clear one – for instance, we saw in (16b) that a usually bound morpheme can occur in an apparently free position, and similarly (5b), repeated below, involves an obligatory focus marking morpheme that could potentially be analysed as either an inflection or a free morpheme, given its adjacency to the focused argument:

(19) A: Who ate the beans?
B: [nyɔ̀nú ɔ́]$_{\text{Foc}}$ *(**wɛ́**) ɖu àyìkún
woman DEF **FOC** eat bean
'*The woman* ate the beans.'

(Fongbe (Kwa), repeated from (5b))

However, in other cases morphemes marking focus appear in distinct structural positions to the focused argument, and so are perhaps better viewed as separate lexical items which mark focus. One example of this is Tseltal, where a sentence-initial *ja'* can mark focus on postverbal DPs:

(20) **ja'** lah s-lo' [alaxax]$_{\text{Foc}}$
FOC PFV 3.ERG-eat orange
'She ate an *orange*.'

(Tseltal (Mayan), Shklovsky 2005:128)

Other cases are even more clearly lexical items rather than morphological inflections, such as focus association particles (considered further in 3.4), which appear to have the distribution of separate words. Three such particles in English are given in (21):

(21) a. I **only** gave it to [*John*]$_{\text{Foc}}$

b. I **even** gave it to [*John*]$_{\text{Foc}}$

c. I **always** gave it to [*John*]$_{\text{Foc}}$

(English, (a) repeated from (3))

These occur just as commonly in other languages, with a Polish equivalent of English *only* being given in (22):

(22) Maria **tylko** [rozmawiała]$_{\text{Foc}}$ z menedżerem
Maria only talked with manager
'Maria only *talked* to the manager.'

(Polish, Tomaszewicz 2012)

Focus association particles are not limited to such meanings, however, with Bogal-Allbriten (2013) documenting a Navajo particle argued to have a modal effect, introducing uncertainty as to the truth of the focus:

(23) Mary bibid **daats'í** diniih
Mary [3.POSS.stomach]$_{\text{Foc}}$ **DAATS'Í** 3SG.hurt
'It might be Mary's stomach that hurts (or it might be her head).'

(Navajo (Athabaskan), Bogal-Allbriten 2013:1)

3.2.6 Syntactic marking.

Focus is also very frequently expressed syntactically. In some cases, relatively simple constructions are involved, such as those where focused items occur in sentence-final position, e.g. Spanish (24b):

(24) a. A: Qué pasó?
what happened
'What happened?'

B: Juan compró ayer el *periódico*.
Juan bought yesterday the newspaper
'Juan bought the newspaper yesterday.'

b. A: Quién compró el periódico ayer?
who bought the newspaper yesterday
'Who bought the newspaper yesterday?'

B: Ayer compró el periódico [*Juan*]$_{\text{Foc}}$.
yesterday bought the newspaper Juan
'*Juan* bought the newspaper yesterday.'

(Spanish, Büring 2010:190)

Conversely, focused constituents may also occur in initial position, as in the following cases in K'ichee' (25b) and Arabic (26b):

(25) a. A: What happened?

B: x-u-tij jun leej ri a Xwaan
INC-A3SG-eat a tortilla DET youth Juan
'Juan ate a tortilla.'

b. A: What did he eat?

B: [Jun leej]$_{\text{Foc}}$ x-u-tij-oh
a tortilla INCOMPL-A3SG-eat-SS
'He ate *a tortilla*.'

(K'ichee' (Mayan), Velleman 2013:4)

(26) a. ʔallafat Zaynab-u riwaayat-an
wrote Zaynab-NOM novel-ACC
'Zaynab wrote a novel.'

b. [*riwaayat-an*]$_{\text{Foc}}$ ʔallafat Zaynab-u (laa [*zaynab-a*]$_{\text{Foc}}$)
novel-ACC wrote Zaynab-NOM not poem-ACC
'It was a *novel* that Zaynab wrote(, not a *poem*).'

(Arabic, adapted from Ouhalla 1997:11-12)

Other syntactic positions are also possible – Hungarian, for instance, famously has a preverbal focus position (27b), which is also seen in Yucatec Maya (28b), and Podoko has a postverbal focus position (29):

(27) a. Tegnap este be mutattam Pétert Marinak
last night PRF introduced.1SG Peter.ACC Mary.DAT
'Last night I introduced Peter to Mary.'

b. Tegnap este [*Marinak*]$_{Foc}$ mutattam be Pétert
last night Mary.DAT introduced.1SG PRF Peter.ACC
'It was *to Mary* that I introduced Peter last night.'

(Hungarian, É. Kiss 1998:247, András Bárány p.c.)

(28) a. T=u hàant-ah òon Pèedróoh
PFV=A3 eat:TRANS-COMPL.B3SG avocado Pedro
'Pedro ate avocado.'

b. òon t=u hàant-ah Pèedróoh
avocado PFV=A3 eat:TRANS-COMPL.B3SG Pedro
'Pedro ate an *avocado*.'

(Yucatec Maya, Skopeteas & Verhoeven 2015:3-4)

(29) a. A: Who cooked the meat?

B: a təla [mala]$_{Foc}$
VM cook mother.my
'*My mother* cooked it.'

b. A: What did one cook?

B: a təla [sləɓə]$_{Foc}$ nda
VM cook meat one
'One cooked *meat*.'

(Podoko (Biu-Mandara/Central Chadic), Jarvis 1981:160)

Furthermore, more complex syntactic structures are frequently used to express focus, including clefts, shown here for English (30), Irish (31), and French (32):

(30) It was [*John*]$_{Foc}$ that I gave it to.

(English, repeated from (2))

(31) Is é [Séan]$_{Foc}$ aL thigeann' nabhaile
COP him Sean COMP comes home
'It's Sean that comes home.'

(Irish, McCloskey 1979:110 via Drubig & Schaffar 2001:1091)

(32) A: Who ate a cookie?

B: C'est [*Ella*]$_{Foc}$ (qui a mangé un biscuit).
it-is Ella that has eaten a cookie
'*Ella* ate a cookie.'

(French, Hamlaoui 2007:1-2)

Somewhat similarly, American Sign Language (ASL) expresses focus with (33), argued to be a pseudocleft by Wilbur (1994a, 1996) and Grolla (2004) (though see Hoza et al. 1997, Caponigro & Davidson 2011):

(33) _____br _____hn
CHAIR PAINT WHO, [LEE]$_{Foc}$
'The one who painted the chair was Lee.'

(ASL, Wilbur 1994a:653)

Finally, cleft-like structures are not the only more complex syntactic ways of indicating foci. For instance, in the emphatic doubling construction of ASL, a focused sign is doubled under strict syntactic conditions (considered in detail in chapters 7-8):

(34) _____hn
ANN [LIKE]$_{Foc}$ ICE-CREAM [*LIKE*]$_{Foc}$
'Ann really *likes* ice-cream.'

(ASL, Petronio 1993:129)

3.2.7 Multiple markings.

We have already seen that in many cases some form of prosodic marking is used in addition to syntactic, lexical or morphological marking (e.g. (15b), (17), (21), (27b), (28b), (33), (34)), so it could be argued that all these structures make use of a kind of multiple marking. However, though I will discuss the role of phonology in various focus marking constructions in section 3.3.1, and in further detail in chapter 9, the primary concentration is on phenomena that are more clearly related to the syntactic structure. It thus makes sense to ask whether the types of structures in the previous three sections can occur in tandem to mark focus, and the answer is an unambiguous yes.

Let us return to Fongbe non-subject focus:

(35) A: What did the woman eat?

B: é ɖù [àyìkún]$_{\text{Foc}}$ (unmarked)
3SG eat bean
'She ate *beans*.'

B': [àyìkún]$_{\text{Foc}}$ (**wɛ́**) é ɖù (marked)
bean **FOC** 3SG eat
'She ate *beans*.' ~ 'It is *beans* that she ate.'

(Fongbe (Kwa), repeated from (5a))

In 3.2.1, we considered the unmarked B response, which has been argued to involve no linguistic encoding. However, this is clearly not true of the B' response, which is marked through fronting of the object, as well as an optional focus particle. As a result, this strategy makes use of syntactic and lexical means to encode focus.

Somewhat similarly, in addition to the marking with a lexical item *ja'* that we saw in (20), repeated here as (36a), Tseltal also allows for fronted foci, with the focus morpheme then becoming optional, as shown in (36b):

(36) a. **ja'** lah s-lo' [alaxax]$_{\text{Foc}}$
FOC PFV 3.ERG-eat orange
'She ate an *orange*.'

b. (**ja'**) [alaxax]$_{\text{Foc}}$ lah s-lo'
FOC orange PFV 3.ERG-eat
'It was an orange that she ate.'

(Tseltal (Mayan), (a) repeated from (20), (b) Shklovsky 2005:128)

Jamaican creole also combines both fronting and an initial focus morpheme, *a*:

(37) a. Mieri bai wan bami an wan bredrut
Mary buy one bammy and one breadfruit
'Mary bought one bammy and one breadfruit.'

b. **A** [wan bami an wan bredrut]$_{\text{Foc}}$ Mieri bai
FOC one bammy and one breadfruit Mary buy
'What Mary bought was (only) *one bammy and one breadfruit*.'

(Jamaican Creole, adapted from Durrleman & Shlonsky 2015:97-98)

Languages make use of many other mixed strategies. For instance, if we return to the Sinhala examples from (15), we first see that the combination of verbal inflection with the emphatic particle in (38b) could be viewed as a kind of mixed marking. However, a more complex strategy than this is available – in (38c), as well as the verb inflecting, the focused item occurs in a sentence-final position, and so this strategy makes use of both syntax and morphology to indicate foci.

(38) a. eyaa gamət̪ə **yanna**
he.M.NOM village-DAT go.PRS.**A**
'He goes to the village'

b. eyaa [*gamət̪ə*]$_{\text{Foc}}$ (**y/tamay**) **yanne**
he.NOM village-DAT EMPH go.PRS.**E**
'It's to the village he goes.'

c. mamə **yanne** [*gamət̪ə*]$_{\text{Foc}}$
I.NOM go.PRS.**E** village-DAT
'It's to the village I go.'

(Modern Colloquial Sinhala, (a, b) repeated from (15), (c) Slade 2011:45-46)

Moreover, Kaqchikel uses a combination two of the above structures in (39b) – verbal inflection for agent focus, -*ö*, and an optional focus morpheme, *ja*:

(39) a. Ri.a.Juan x-Ø-u-tëj ri wäy
Juan COMPL-B3SG-A3SG-eat the tortilla
'Juan ate the tortilla.'

b. (**Ja**) [ri.a.Juan]$_{\text{Foc}}$ x-Ø-tj-**ö** ri wäy
FOC Juan COMPL-B3SG-eat-**AF** the tortilla
'It's *Juan* that ate the tortilla.'

(Kaqchikel (Mayan), Erlewine 2013:5)

Makhuwa similarly marks foci using both verbal inflection and placing the focused phrase in a specific position, though this is harder to demonstrate. The basic contrast between the conjoint and disjoint verbal forms is given in (40a-b), with only the conjoint form yielding focus. Conjoint inflection on the verb also triggers a tonal process of predicative lowering on some foci (van der Wal 2006).

(40) a. nthíyáná o-**hoó**-cá nráma
1.woman 1SM-PRF.**DJ**-eat 3.rice
'The woman ate rice.'

b. nthíyáná o-c-**aalé** [nramá]$_{Foc}$
1.woman 1SM-eat-PRF.**CJ** 3.rice
'The woman ate *rice*.'

(Makhuwa (Bantu), van der Wal 2011:1735)

This is made even clearer in (41a-b), which demonstrates that the disjoint form is incompatible with foci marked with the exclusive particle *paáhi*:

(41) a. * ki-**náá**-thúma [etomátí]$_{Foc}$ **paáhi**
1SG.SM-PRS.**DJ**-buy 10.tomatoes only

b. ki-**n**-thúm' [étomati]$_{Foc}$ **paáhi**
1SG.SM-PRS.**CJ**-buy 10.tomatoes only
'I buy only tomatoes.'

(Makhuwa (Bantu), van der Wal 2011:1739)

There is also a requirement for the focused expression to be immediately postverbal. This is shown in (42a-b), which demonstrate that a focused indirect object must occur before the direct object, despite the unmarked order being the opposite of this (van der Wal p.c.):

(42) a. o-n-koh-**al'** [éshéeni]$_{Foc}$ Apákhári
2SG.SM-1OM-ask-PRF.**CJ** 9.what 1.Apakhari
'What did you ask Apakhari?'

b. * o-n-koh-**alé** Apákhári [eshéeni]$_{Foc}$
2SG.SM-1OM-ask-PRF.**CJ** 1.Apakhari 9.what

(Makhuwa (Bantu), van der Wal 2009:225)

Thus Makhuwa marks focus with verbal conjoint inflection, by placing the focused phrase immediately after the verb, and in some cases by predicative lowering.

Several other complex mixed strategies for marking focus exist, such as Gungbe verbal focus, which involves doubling of the verb and a focus marker *wɛ̀* that is obligatory in some dialects (43), and comparably Kabiye predicate focus, where partial verbal doubling and a focus marker *ki* lead to an interpretation apparently similar to English *only* (44b):

(43) [Ðù]$_{\text{Foc}}$ (%**wɛ̀**) Sɛ́ná [ɖù]$_{\text{Foc}}$ blɛ́ɖì lɔ́
eat **FOC** Sena eat bread DET
'Sena *ate* the bread.'

(Gungbe (Kwa), Aboh & Dyakonova 2009:1044)

(44) a. ma-ní-ʊ kabiyɛ
1SG-understand-IPFV Kabiye
'I understand Kabiye.'

b. [ma-**ní-ʊ**]$_{\text{Foc}}$ kabiyɛ **kí** [**ní-ʊ**]$_{\text{Foc}}$ ma-a yɔɔd-ʊ kʊ́
1SG-**understand-IPFV** Kabiye **KÍ** **understand-INF** 1SG-NEG speak-IPFV it
'I only understand Kabiye. I don't speak it.'

(Kabiye (Gur), Collins & Essizewa 2007:1-2)

Finally, the following case in Mandarin Chinese involves two particles along with placement of the focused phrase in a preverbal position (45b):

(45) a. Tā bù xǐhuan chī píngguǒ
3SG NEG like eat apple
'He doesn't like eating apples.'

b. Tā (**lián**) [píngguǒ]$_{\text{Foc}}$ **yě** bù xǐhuan chī
3SG **even** apples **also** NEG like eat
'He doesn't even like eating *apples*.'

(Mandarin Chinese, Alison Biggs p.c.; see also Badan 2008)

3.2.8 Other dimensions of variation.

The variation surveyed above attests to the wide range of linguistic markings that are used to encode focus, both within and across languages. However, focus constructions differ in more ways than simply their form. One aspect of variation that has been implicit in the above, but not explicitly discussed, is that not all constructions target the same range of expressions. We have, for instance, already considered the distinction Fongbe makes between subject and non-subject focus:

(46) a. A: What did the woman eat?

B: é dù [àyìkún]$_{Foc}$ (unmarked)
3SG eat bean
'She ate *beans*.'

B': [àyìkún]$_{Foc}$ (**wɛ́**) é dù (marked)
bean **FOC** 3SG eat
'She ate *beans*.' ~ 'It is *beans* that she ate.'

b. A: Who ate the beans?

B: [nyɔ̀nú ɔ́]$_{Foc}$ *(**wɛ́**) ɖu àyìkún
woman DEF **FOC** eat bean
'*The woman* ate the beans.'

(Fongbe (Kwa), repeated from (5))

Here the constructions available differ depending on the kind of expression in focus – the options in (46a) are available only for object focus, with subjects being focused instead by (46b). Such restrictions are by no means specific to Fongbe. For instance, the Gungbe doubling structure from (43) applies only to verbs:

(47) [Ðù]$_{Foc}$ (%**wɛ̀**) Sɛ́ná [ɖù]$_{Foc}$ blɛ́ɖì lɔ́
eat **FOC** Sena eat bread DET
'Sena *ate* the bread.'

(Gungbe (Kwa), repeated from (43))

Furthermore, the ASL doubling construction in (34) may apply to a wide range of heads (48a-d), but cannot target larger constituents, as shown by the ungrammaticality of (48e):

(48) a. _____ hn
ANN [LIKE]$_{Foc}$ ICE-CREAM [LIKE]$_{Foc}$
'Ann really *likes* ice-cream.'

b. _____ whq ____ E-foc
[WHO]$_{Foc}$ BUY c-a-r [*WHO*]$_{Foc}$
'Who was it that bought the car?'

c. _____ q
ANN [WILL]$_{Foc}$ LEAVE [WILL]$_{Foc}$
'Will Ann leave?

d. JOHN [NEVER]$_{Foc}$ EAT FISH [NEVER]$_{Foc}$
'John won't eat fish.'

e. _____ neg
* ANNE [WANT LEAVE]$_{Foc}$ [WANT LEAVE]$_{Foc}$
'Anne *wants* to go'

(ASL, (a) repeated from (34); (b) Quadros & Lillo-Martin 2010:240, (d) Wood 1999:64 via Sandler & Lillo-Martin (2006), (c, e) Petronio 1993:134-135)

Conversely, English stress focus (1) may target many structures, including morphemes below the level of the word, whereas English clefts (2) target a far more restricted set of expressions:

(49) a. Did you [*in*]$_{Foc}$-hale or [*ex*]$_{Foc}$-hale?

b. * Was it [*in*]$_{Foc}$ that you haled?

(English)

As a result, constructions vary not just in their realisation, but also in the range of elements that they target, further adding to the difficulty of parameterising focus.

Secondly, just as focus constructions are not all alike in form, they do not all have the same meaning. Once again, this was implicit in the discussion above, and is apparent even from the initial examples of (1-4), each of which is appropriate in a different context:

(50) I gave it to [*John*]$_{Foc}$.

(51) It was [*John*]$_{Foc}$ that I gave it to.

(52) I **only** gave it to [*John*]$_{Foc}$.

(53) I didn't give it to John [*Smith*]$_{\text{Foc}}$, I gave it to [***John*-John**]$_{\text{Foc}}$.

(English, repeated from (1-4))

While (50) forms a relatively unmarked answer to a polar question, (51) and (52) are more marked, asserting more exhaustively that *John* is the beneficiary, although also differ from one another. Lastly, (53) is different again, adding a prototypical reading.

Such distinctions are equally present crosslinguistically, as reflected in the glosses, contexts, and discussions of the examples above. For instance, while (54) appears to be comparable in meaning to (50), (55b) seems more similar to (51), and (56b) to (52). Finally (57) has yet another reading, this time without a clear English counterpart.

(54) A: What did one cook?

B: a təla [sləɓə]$_{\text{Foc}}$ nda
VM cook meat one
'One cooked *meat*.'

(Podoko (Biu-Mandara/Central Chadic), repeated from (29a))

(55) a. Ri.a.Juan x-Ø-u-tëj ri wäy
Juan COMPL-B3SG-A3SG-eat the tortilla
'Juan ate the tortilla.'

b. (**Ja**) [ri.a.Juan]$_{\text{Foc}}$ x-Ø-tj-**ö** ri wäy
FOC Juan COMPL-B3SG-eat-**AF** the tortilla
'It's *Juan* that ate the tortilla.'

(Kaqchikel (Mayan), repeated from (39))

(56) a. ma-ní-ʊ kabiyɛ
1SG-understand-IPFV Kabiye
'I understand Kabiye.'

b. [ma-**ní-ʊ**]$_{\text{Foc}}$ kabiyɛ **kí** [**ní-ʊ**]$_{\text{Foc}}$ ma-a yɔɔd-ʊ kʊ́
1SG-**understand-IPFV** Kabiye **KÍ** **understand-INF** 1SG-NEG speak-IPFV it
'I only understand Kabiye. I don't speak it.'

(Kabiye (Gur), repeated from (44))

(57) Mary bibid **daats'í** diniih
Mary [3.POSS.stomach]$_{Foc}$ **DAATS'Í** 3SG.hurt
'It might be Mary's stomach that hurts (or it might be her head).'

(Navajo (Athabaskan), repeated from (23))

Moreover, as these cases show, apparent semantic similarity between constructions does not guarantee a similar means of expression. As a result, variation in meaning is yet another factor to consider, and one that will be considered in detail in the later sections of this chapter.

3.2.9 Summary.

This section illustrates the breadth of variation found in natural language focus expression when approached from a relatively pretheoretical perspective. As we have seen, focus may be encoded through no marking at all, phonological stress, other prosodic processes, marking with lexical items or morphemes, syntactic structures, or any combination of these. Moreover, this variation is not just interlinguistic, but intralinguistic, with individual languages exhibiting multiple constructions. Finally, means of expression is not the only dimension of variation, as constructions differ both in their meaning and in their targets.

This therefore makes the task of focus parameterisation appear rather intimidating at the outset. Nevertheless, the current chapter (and more generally the second part of this thesis) argues for a perspective under which focus constructions may be directly compared, and ultimately broken down into their constituent syntactic heads, providing a platform for parameterisation by the algorithm developed in part I. Key to this approach is the assumption that focus is unified by the invocation of alternatives, and the use of a null hypothesis of compositionality, allowing for a consolidation of the dimensions of variation presented here. However, before developing this perspective, I overview various other theoretical approaches to focus. While I do not fully adopt any of these theories, several of their components will also be useful below.

3.3 Theoretical approaches to capturing this variation.

As the previous section demonstrates, the diversity of focus expression is vast. This represents an immediate problem for any attempt to account for this variation from a parametric perspective – how can these often rather disparate constructions be compared, let alone analysed? Furthermore, for analyses to be fully successful, they should also break down what appear on the surface as constructions into their component parts, since the elimination of the notion of construction is one of the key advances of the principles and parameters perspective (Chomsky 1995:29). To this end, I briefly consider a number of theoretical attempts to describe and account for this variation, dividing them broadly into phonological (3.3.1), classificational (3.3.2), and syntactic (3.3.3), paving the way for 3.4, which outlines a specific semantic perspective in detail. These discussions are not intended to provide a complete overview of the field, but instead assess a number of approaches to focus, highlighting where they will and will not be useful for the current goal.

3.3.1 Phonological motivation.

If focus variation could be explained from a purely phonological perspective, then there would be no need for syntactic parameterisation. We have seen throughout 3.2, but especially in 3.2.2 and 3.2.3, that phonology is often closely associated with the expression of focus. We might therefore try to situate crosslinguistic differences in focus constructions in the phonology of the language. A large number of authors have proposed approaches along these lines, including Vallduví (1991), Cinque (1993), Reinhart (1995), Zubizarreta (1998), Schwarzschild (1999), van Valin (1999), Szendrői (2003), Samek-Lodovici (2005), Büring (2010), and Féry (2013). Büring (2010), for instance, suggests that languages realise focus so that it is maximally prominent, with e.g. stress indicating foci in pitch accent languages such as English and German, and word order indicating foci in languages where a certain position is maximally phonologically prominent.

We can then potentially explain the differences in the following data based on the distinct phonological systems involved in each case. As discussed in 3.2, focus is realised in (58) through stress, in (59b-c) through blocking of a tone sandhi process, and in (60b) through movement to a sentence-final position:

(58) I gave it to [*John*]$_{\text{Foc}}$.

(English, repeated from (1))

(59) a. A: What happened?

B: (φ páŋ láo níŋ) (φ bɔ̀ndào gə̀) (φ só láo níŋ)
fat ATTR people meet ASP thin ATTR people
'Fat people met thin people.'

b. A: Who met thin people?

B: **[(φ pâŋ lào nǐŋ)]$_{\text{Foc}}$** (φ bɔ̀ndào gə̀) (φ só láo níŋ)
fat ATTR people meet ASP thin ATTR people
'*Fat people* met thin people.'

c. A: Who did fat people meet?

B: (φ páŋ láo níŋ) (φ bɔ̀ndào gə̀) **[(φ sô lào nǐŋ)]$_{\text{Foc}}$**
fat ATTR people meet ASP thin ATTR people
'Fat people met *thin people*.'

(Yixing Chinese, repeated from (11))

(60) a. A: Qué pasó?
what happened
'What happened?'

B: Juan compró ayer el *periódico*.
Juan bought yesterday the newspaper
'Juan bought the newspaper yesterday.'

b. A: Quién compró el periódico ayer?
who bought the newspaper yesterday
'Who bought the newspaper yesterday?'

B: Ayer compró el periódico [*Juan*]$_{\text{Foc}}$.
yesterday bought the newspaper Juan
'*Juan* bought the newspaper yesterday.'

(Spanish, repeated from (24))

If we suppose that each language has a distinct "phonotype," then we are potentially able to explain these differences. English, as a stress-timed language, can place stress on foci to mark them (58); Yixing, which has a phonological system

that makes extensive use of tone sandhi, uses the prosodic system of focus marking seen in (59), and Spanish has a final nuclear stress, leading to focused items being placed at the end of the sentence to become prominent, as in (60). This is schematised below:

(61) Stress-timed → stress focus (e.g. English)
Prosodic/tone sandhi → prosodic focus (e.g. Yixing Chinese)
Fixed final nuclear stress → final focus (e.g. Spanish)

This is an interesting and readily testable hypothesis that suggests that some aspects of the realisation of focus constructions may in fact be a consequence of parameters that are not directly related to focus, and may only be concerned with phonology (perhaps the PF variation of Berwick and Chomsky 2011). However, though this is undoubtedly plausible in many cases, when we encounter the intralinguistic variation that we see in focus constructions, some problems arise.

A simple version of the above idea might suppose a one-to-one mapping between phonotype and focus, which would only allow for one focus construction per language. However it is reasonable to suppose that a particular language may be able to mark expressions as phonologically prominent in a number of ways. More worrying, though, are more complex syntactic focus constructions, which as we have seen in section 3.2, occur in a vast array of languages, if not all of them. For instance, English (62), French (63), and Yixing Chinese (64) all exhibit syntactically comparable cleft constructions, despite their widely differing phonological systems:

(62) It was [*John*]$_{\text{Foc}}$ that I gave it to.

(English, repeated from (2))

(63) A: Who ate a cookie?
B: C'est [*Ella*]$_{\text{Foc}}$ (qui a mangé un biscuit).
it-is Ella that has eaten a cookie
'*Ella* ate a cookie.'

(French, repeated from (32))

(64) dzáŋsá zə́ [lə́ bə́dʒíŋ]$_{\text{Foc}}$ wɔ̌ khǽtshò gə́
Zhangsan COP in Beijing study driving ASP
'It is in Beijing that Zhangsan learns driving.'
(Yixing Chinese, Hu & Perry p.c.)

Thus although phonological motivation may go some way towards explaining the different realisations of focus, it seems unlikely that it can account for the whole range of variation discussed in 3.2. Nevertheless, it remains an attractive option, and for now I tentatively suppose that it plays a role in constructions such as (58-60), returning to this hypothesis briefly in 3.4.4, and considering it in more detail in 9.2. However, there remains a significant residue of cases to account for, and so below I consider two more general perspectives, beginning with the categorisation of focus.

3.3.2 Categorising focus by discourse function.

It has long been recognised that focus is not always used for the same communicative purpose (e.g. Halliday 1967, Dik 1978, Guéron 1980, Rochemont 1986, Sgall et al. 1986). As a result, instances of focus have frequently been labelled according to the role they play in discourse, with for instance Dik (1997) presenting a complex hierarchy of focus subtypes. Following this system, we might describe all of (65-67) as "completive" focus, since despite their differing realisations, they all complete the open proposition of the question in A:

(65) A: Who did you give it to?
B: I gave it to [*John*]$_{\text{Foc}}$.
(English, partially repeated from (1))

(66) A: Who ate the beans?
B: [nyɔ̀nú ɔ́]$_{\text{Foc}}$ *(**wɛ́**) ɖu àyìkún
woman DEF **FOC** eat bean
'*The woman* ate the beans.'
(Fongbe (Kwa), repeated from (5b))

(67) A: Who cooked the meat?

B: a təla [mala]$_{\text{Foc}}$
VM cook mother.my
'*My mother* cooked it.'

(Podoko (Biu-Mandara/Central Chadic), repeated from (29a))

By contrast, although it is very similar in form to (65), (68) is "selecting," since instead of completing an open proposition, it selects an answer from a closed set:

(68) A: Which of John and Mary did you give it to?

B: I gave it to [*John*]$_{\text{Foc}}$.

(English)

Classification of constructions along these lines leads to a typology where discourse function is prioritised over means of linguistic realisation. The relevance of such groupings to syntactic parameterisation is therefore unclear at this point, and the extremely wide array of terminology that has arisen arguably increases the difficulty of this task. I consequently avoid using most such classifications throughout the majority of this thesis, instead developing an alternative means of semantic comparison in 3.4. Nevertheless, they will occasionally be useful, and I will return to the difference between (65) and (68) in 3.4.4.

Furthermore, not all distinctions between foci are quite as fine-grained and pragmatic as between completive and selecting focus. In particular, aspects of É. Kiss' (1998) broader division between identificational and information focus prove useful below. She notes that "[t]he claim that two different types of focus can be distinguished […] has been present in the linguistic literature for a long time[,] variously called contrastive focus versus presentational focus, narrow focus versus wide focus, or […] identificational focus versus information focus." (p. 245) Though the interpretational differences for each of these oppositions is not always the same, she semantically characterises her own distinction primarily in terms of exhaustivity. Whereas informational foci merely represent non-presupposed information, identificational foci are defined as follows:

(69) An identificational focus represents a subset of the set of contextually or situationally given elements for which the predicate phrase can potentially hold; it is identified as the exhaustive subset of this set for which the predicate phrase actually holds.

(É. Kiss 1998:245, 249)

This distinction is demonstrated by the contrast in (70). While (70a) expresses information focus, and so Peter may have been introduced to others, (70b) is argued to encode identificational focus, specifying Mary as the sole person that Peter was introduced to:

(70) a. Tegnap este be mutattam Pétert [*Marinak*]$_{\text{Foc}}$
last night PRF introduced.1SG Peter.ACC Mary.DAT
'Last night I introduced Peter *to Mary*.'

b. Tegnap este [*Marinak*]$_{\text{Foc}}$ mutattam be Pétert
last night Mary.DAT introduced.1SG PRF Peter.ACC
'It was *to Mary* that I introduced Peter last night.'

(Hungarian, partially repeated from (27), É. Kiss 1998:247)

Moreover, the distinction is not simply semantic, but also structural. According to É. Kiss (1998), it is no surprise that (70b) involves *ex-situ* marking of focus, since this is argued to be a consequence of the focus moving to the specifier of a preverbal exhaustive operator. Identificational focus is thus taken to have a syntactic reflex, with other examples including left-peripheral fronting in a variety of languages, as well as the English cleft construction, as in the gloss of (70b).

This distinction therefore appears somewhat more promising for parameterisation, since semantic differences are linked to differences in structure, and perhaps also the presence of covert operators. However, É. Kiss' analysis of Hungarian has proved contentious, with e.g. Kenesei (1986), Szabolcsi (1994), Onea (2007) and Onea & Beaver (2011) arguing the effect in (70b) is not truth-conditional, though see Szabolcsi (1981), Horváth (2007), É. Kiss (2008, 2009) *inter alia* for the opposing view. The crosslinguistic applicability of the distinction is also uncertain, with e.g. Frascarelli (2000:178-179) noting that "Italian Focus

does not entail exhaustiveness" even when initial, despite É. Kiss' (1998) claim to the contrary. Furthermore, it is unclear whether merely a two-way distinction is sufficient for the full range of semantic variation seen. Notwithstanding, this approach has much to offer this thesis: many of É. Kiss' (1998) diagnostics for exhaustiveness will be put to use in chapters 3-6, and the idea that specific syntactic focus constructions might encode particular meanings is employed throughout. Thus far, though, we have not yet considered contemporary approaches to the syntactic representation of focus, which is the subject of the following subsection.

3.3.3 Existing syntactic approaches.

The leading approach to information structure in minimalist syntax is undoubtedly the cartographic program, which has its roots in Rizzi's (1997) analysis of the Italian left periphery, and continued with Cinque's (1999) study of adverb positions, ultimately leading to a vast and ongoing literature covering many languages. One of the main aims of cartography is to provide an accurate map of the fine-grained clausal positions available in a language and link these positions to their semantic functions; thus typically a distinct projection is proposed for each information-structural construction. For instance, Frascarelli and Hinterhöltzl (2007) argue that German and Italian have the following left peripheries:

(71) a. Italian: $[_{\text{ShiftP [+aboutness]}} [_{\text{ContrastiveP}} [_{\text{FocP}} [_{\text{FamiliarP}} [_{\text{IP}} \ldots$

b. German: $[_{\text{ShiftP [+aboutness]}} [_{\text{ContrastiveP}} [_{\text{FamiliarP}} [_{\text{IP}} \ldots$

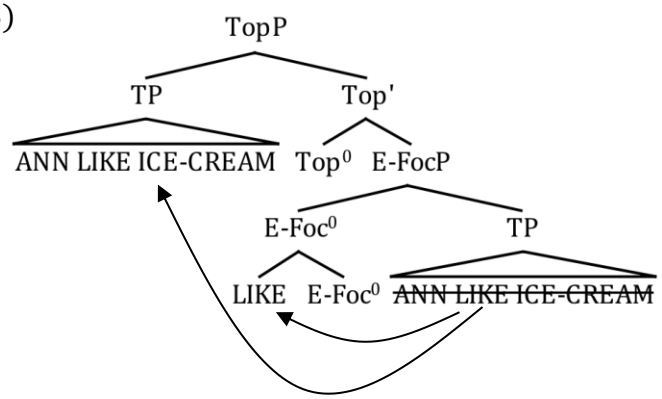
While only one focus position is present here, this example demonstrates how crosslinguistic variation is often approached in cartography, at least in the domain of information structure. German is argued not have a left-peripheral focus position, and so this projection is said to absent from that language's left periphery. Moreover, languages that are radically different from German and

Italian have been argued to have radically different left peripheries, as seen for ASL (adapted from Lillo-Martin & Quadros 2008):[4]

(72) [T-CP [FocP [TopP [Emphatic-FocP [IP …

In addition, specific constructions are often linked to specific positions. For instance, the ASL doubling construction seen in (34) appears to be used for emphasis (discussed in chapters 6-7). This construction is therefore associated with an E(mphatic)-Foc position, and derived as follows (Nunes & Quadros 2005, 2008, Lillo-Martin & Quadros 2008):

(73)



This approach means that though cartography provides a wealth of detailed data on the crosslinguistic expression of information structure, it does not fully escape the strictures of constructions. Furthermore, crosslinguistic differences are often simply stipulated in the clausal hierarchy, raising more questions for parameterisation. In the following chapters, I retain the notion of a divided left periphery, but allow it to vary significantly, and decompose constructions into their component heads, allowing for parameterisation through their specification.

One major alternative to cartography is presented in Neeleman & van de Koot (2008), Neeleman et al. (2009) *inter alia*. Under this perspective, information-structural movement to the left periphery takes place not to occupy a dedicated position, but instead to ensure that the complement of topics and foci form constituents and so satisfy the interface conditions necessary for them to act as

[4] "T-CP" is a position for base-generated "topic-comment"-style topics.

comments and grounds respectively. While this is an interesting trigger for movement, it does not bring us closer to distinguishing between focus constructions for the purposes of parameterisation, and bears some similarities to the cartographic approach in that the order at the left periphery is still ultimately stipulated, albeit at the level of interface conditions (see e.g. Neeleman and van de Koot 2008). Nevertheless, the derivations proposed in chapters 7-8 involve two specific cases of semantic motivation, and so are arguably in line with the suggestion that information-structural movements may occur to satisfy non-syntactic requirements.

Both perspectives therefore take us some of the way towards the goal of breaking down focus constructions and comparing them, but neither distances us entirely from the notion of construction itself, which is a barrier to directly comparing the syntax of focus both within and across languages.

3.3.4 Conclusion.

In the brief overview, we have seen that the various theories of focus reviewed each takes us some way towards accounting for the variation in 3.2, but none that provides a clear pathway to parameterisation. Though phonological motivation gives an emergent and non-syntactic explanation of focus diversity, it suffers when coming up against the range of variation found within as well as across languages. By contrast, syntactic approaches account for this more readily, but at the cost of reliance on the notion of construction. Finally, É. Kiss' (1998) contrast between identificational and information focus presents an interesting platform for comparison, but suffers from a potential lack of crosslinguistic generality, and its binary distinction may be too limited for the range of variation seen. For this reason, in the following section I turn to a formal semantic characterisation of focus, allowing for finer and more precise comparison of constructions.

3.4 A semantic perspective on focus constructions.

At the start of 3.2 it was noted that focus could be seen as inducing alternatives; here this notion is made explicit. This is precisely the definition of focus given by Krifka's (2007) – "[f]ocus indicates the presence of alternatives that are relevant for the interpretation of linguistic expressions." (p.18) Furthermore, in Rooth's (1985, 1992, 1996) approach to focus, alternatives are given centre stage, and so this perspective is investigated in this subsection. The theory is outlined in 3.4.1, and its extension to syntax is assessed in 3.4.2, leading to the development of a technique for direct semantic comparison of all focus constructions. Section 3.4.3 considers how this view of focus might accommodate the pragmatic subtypes discussed in 3.3.2. Finally, 3.3.4 suggests how semantic comparison of constructions might aid the investigation of syntactic structure.

3.4.1 The alternative semantics approach to focus.

The theory of alternative semantics (Rooth 1985, 1992, 1996) makes two key assumptions about the representation and interpretation of focus. Firstly, for foci to be treated as distinct from non-foci, the semantic system must have some way to identify an expression as focused, and so following Jackendoff (1972), Selkirk (1984), "focus is [assumed to be] a feature marked on syntactic phrases." (Rooth 1985:10). This is marked using $[.]_F$ notation, and can be viewed as a formal syntactic counterpart of the informal $[.]_{Foc}$ notation used above. Its specific implementation in this thesis is considered in 3.4.2 below.

Secondly, every expression is taken to have both an ordinary semantic value, $[[.]]^o$, which corresponds to the usual values given to expressions under a standard type-theoretic approach, along with a focus semantic value, $[[.]]^f$. Each of these values can be computed for an expression whether it is focused or not, since unlike $[.]_F$, which syntactically marks focus, $[[.]]^f$ is merely part of the semantic machinery computing focus.

When unfocused, individual words have the singleton set containing their ordinary semantic value as their focus semantic value, whereas the focus semantic value of a

focused word is instead the set of denotations in the discourse universe of the same semantic type as that expression. The focus semantic values of more complex constituents are then arrived at by a compositional procedure.

As an example, take the English sentence (74):

(74) David gave a book to $[\textit{John}]_F$.

The words making up this sentence have the following ordinary semantic and focus semantic values, given a universe with a set E of individuals (leaving aside *to* and the tense of *give*):

(75) $[[\text{David}]]^o = d$ $\quad$ $[[\text{David}]]^f = \{d\}$
$[[\text{a book}]]^o = b$ $\quad$ $[[\text{a book}]]^f = \{b\}$
$[[[\textit{John}]_F]]^o = j$ $\quad$ $[[[\text{John}]_F]]^f = \{y \mid y \in E\}$
$[[\text{gave}]]^o = \text{give}()$ $\quad$ $[[\text{gave}]]^f = \{\text{give}()\}$

These are combined to give:

(76) $[[\text{gave a book to } [\textit{John}]_F]]^o = \lambda x.\text{give}(x,b,j)$
$[[\text{gave a book to } [\textit{John}]_F]]^f = \{\lambda x.\text{give}(x,b,y) \mid y \in E\}$

Ultimately leading to the following overall semantic values for the sentence:

(77) $[[\text{David gave a book to } [\textit{John}]_F]]^o = \text{give}(d,b,j)$
$[[\text{David gave a book to } [\textit{John}]_F]]^f = \{\text{give}(d,b,y) \mid y \in E\}$

Thus the ordinary semantic value of the sentence in this case is simply the proposition without the focus, and the focus semantic value is the set of all possible propositions of the form "David gave a book to y," where y ranges over individuals in the universe. The ordinary reading is therefore contrasted with this set of alternatives, leading to the information-structural effect of focus.[5, 6]

[5] Rooth (1992, 1996) modifies this theory by restricting it pragmatically, largely because the alternative set is often far larger than the sensible set of alternatives to consider. For instance, in (i), the natural alternative set would be {give(d,b,m), give(d,b,j)}, but the actual alternative set derived is far larger: {give(d,b,y) | y∈E}.

(i) A: Did David give a book to Mary or John?

Thus far, then, this notion of focus is purely pragmatic, but a significant body of literature concentrates on a phenomenon known as association with focus (originating with Jackendoff 1972), which involves focus contributing to the ordinary semantic value as well as the focus semantic value. This occurs in (78):

(78) a. David **only** gave [*a book*]$_F$ to John.

b. David **only** gave a book to [*John*]$_F$.

Despite only differing in the placement of focus, the two sentences above are truth-conditionally distinct from one another. For instance, if David gave John a book and an apple, Mary an orange, and Sue a magazine, then (78a) would be false, but (78b) would be true. By contrast, if *only* were not present, as in (74), then both proposition would be true.

Here, then, the contribution of focus is no longer solely pragmatic. This is because *only* is a focus-sensitive particle, whose meaning is dependent on focus semantic values as well as ordinary semantic values. While it is difficult to give a complete definition of the semantics of *only* (see e.g. Rooth 1985, 1992, 1996, Kratzer 1991, Bonomi & Casalegno 1993, Büring & Hartmann 2001, Beaver & Clark 2008 among many others), a simple definition is as follows:

(79) $\forall p \in [[\varphi]]^f, \text{true}(p) \rightarrow (p = [[\varphi]]^o)$

This states that for an expression φ, "only φ" is the proposition that the one true proposition in the focus semantic value of φ is the ordinary value of φ. If for expositional simplicity we assume that *only* acts on the entire proposition, $[[\varphi]]^f$ is {give(d,y,j) | y ∈ E} (as in (77)), and so the following semantics result for (78b):

B: David gave a book to [*Mary*]$_F$.

Thus Rooth suggests the actual alternative set (termed C) is pragmatically determined, but related to $[[.]]^f$ by the operator ∼, which states for a syntactic phrase φ, if φ∼C, then C must be a subset of $[[\varphi]]^f$, and must contain $[[\varphi]]^o$ and at least one other element.

[6] The other semantic leading theory of focus is structured meaning semantics (Krifka 1991), which I do not detail here; while there are small predictive differences between the two theories, both essentially make use of a form of alternative set, as do the neo-Davidsonian approaches of Bonomi and Casalegno (1993) and Herburger (2000). Beaver and Clark (2008:ch.4.5) demonstrate the rough equivalence of all these frameworks, despite small differences in expressivity.

(80) [[David only gave a book to [*John*]$_F$]]^o =
$\forall p \in \{give(d,y,j) \mid y \in E\}, true(p) \rightarrow (p = give(d,b,j))$

Thus the ordinary semantic value is explicitly related to the alternative set, leading to the statement that David gave a book to John, and to no other individuals in the discourse universe.

3.4.2 Extending alternative semantics to more complex constructions.

It would seem from the above that there is something of a disconnect between the syntactic and semantic approaches to focus. While syntactic approaches concentrate on relatively complex constructions involving focus (as we saw in section 3.3), alternative semantics is instead designed to investigate the properties of simple focus constructions such as (74), and the semantic behaviour of focus association particles such as *only*.

Thus we are not immediately closer to accurate characterisation of the meaning of more complex syntactic constructions. However, if we take seriously the suggestion that the indication of alternatives is the most fundamental function of focus, then it is not unreasonable to suppose that *all* focus constructions involve marking with [.]$_F$. Nevertheless, Zimmermann & Onea (2011) argue that data such as (81) is problematic for this approach, despite following Krifka (2007) in taking focus to indicate the presence of alternatives.

(81) a. A: What did the woman eat?

B: é dù [àyìkún]$_{Foc}$ (unmarked)
3SG eat bean
'She ate *beans*.'

B': [àyìkún]$_{Foc}$ (**wɛ́**) é dù (marked)
bean **FOC** 3SG eat
'She ate *beans*.' ~ 'It is *beans* that she ate.'

b. A: Who ate the beans?

B: [nyɔ̀nú ɔ́]$_{Foc}$ *(**wɛ́**) dụ àyìkún
woman DEF **FOC** eat bean
'*The woman* ate the beans.'

(Fongbe (Kwa), repeated from (5))

As discussed in 3.2.8, Fongbe marks subject and non-subject focus asymmetrically, with only subjects requiring obligatory *wɛ́*-marking (81b), and only non-subjects being able to undergo fronting or be realised *in-situ* without marking (81a). Zimmermann & Onea (2011:1662) suggest that "the existence of [such] asymmetries in the grammatical realisation of focus casts doubt on accounts in the tradition of Jackendoff (1972), which relate the information-structural prominence of a focused constituent and its grammatical realisation by means of (mandatory) abstract F-features." However, very similar asymmetries are well-attested in a closely-related area of syntax – that of *wh*-expression. English, for instance, exhibits a systematic asymmetry in root subject (82) and object (83) *wh*-questions:

(82) a. Who sees John?

b. * Who does see John?

(83) a. * Who John sees?

b. Who does John see?

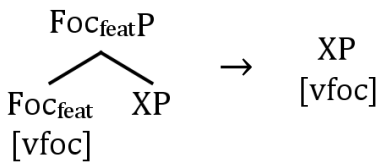
That is, *do*-support (or more generally, subject-aux inversion) is ungrammatical for subjects in non-emphatic contexts, yet obligatory for objects. The pattern in (82-83) is thus comparable to (81), yet it by no means refutes the postulation of mandatory abstract *wh*-features in the grammar – in fact, investigations such as

Koopman (1983) use the data in (82-83) to shed more rather than less light on the *wh*-system of the syntax.

There is thus no clear motivation for abandoning a consistent F-marking approach in the vein of Jackendoff (1972), with the key semantic role of this feature being the indication of alternatives. Phenomena such as association with focus arguably support this claim, since they demonstrate that in these cases at least, focus must be formally marked for interpretational purposes. Extending this to all constructions remains an assumption, but it is one that will enable us to directly compare the meaning of focus constructions, and ultimately break them down into constituent heads. The following chapters therefore demonstrate the utility of pushing this stipulation to its limit.

One outstanding difficulty is how a feature such as $[.]_F$ should be represented in the system outlined in chapter 2. The feature types assignable by the syntactic algorithm in (ch.1:103) are [vf], [uf] and [uf^]. It seems reasonable to assume that the focus feature is valued/interpretable, since it indicates that an expression is focused. However, unlike the features discussed in chapter, it cannot be a general property of a category, since it appears only when that category is focused. As a result, I suppose it is introduced on a c-selectionally invisible head Foc_{feat}, which has the special behavior of combining with a phrase it c-selects to mark it for [vfoc]:

(84)



These assumptions are used in 3.5.2, and are necessary for the formal analyses in chapters 7 and 10, where Deg_{feat}, a [vdeg]-assigning counterpart to Foc_{feat} is also introduced. However, for the rest of this thesis, it suffices to assume that focused expressions bear the feature [vfoc].

It is now possible to connect the semantic approach to the wide range of constructions that we saw in section 3.2. If the above assumptions are correct, then

all focus constructions will generate an alternative set, and in some cases, as with English *only*, this set will be explicitly related to the ordinary semantic value. This relation can in fact be generalised to *all* constructions, even for those where it is simply one of inclusion, leading to the following general statement of a focus construction:

(85) $[[\text{constr}(\varphi)]]^{o}$ **R** $[[\varphi]]^{f}$
i.e. ord **R** ALT

R, then, is an abstract description of the contribution that the alternatives to an expression (ALT) makes to the ordinary value (ord) of a construction (constr) applied to that expression.

To demonstrate this more clearly, let us return to (1-3):

(86) I gave it to $[\textit{John}]_{\text{Foc}}$.

(87) It was $[\textit{John}]_{\text{Foc}}$ that I gave it to.

(88) I only gave it to $[\textit{John}]_{\text{Foc}}$.

(repeated from (1-3))

If we suppose these sentences are David describing having given a book to John, then the semantics of (86) and (88) have already been addressed in 3.4.1, with them having the following denotations:

(89) a. $[[(86)]]^{o} = \text{give}(d,b,j)$

b. $[[(88)]]^{o} = \forall p \in \{\text{give}(d,b,y) \mid y \in E\}, \text{true}(p) \rightarrow (p = \text{give}(d,b,j))$

However, the contribution of each construction to the meaning of the sentence can also be assessed according to (85). For instance, in (88), the application of *only* to the propostion has the following effect on the meaning:

(90) only(φ)

ALT: $[[\text{I gave it to } [\textit{John}]_{[\text{vfoc}]}]]^{f} = \{\text{give}(d,y,j) \mid y \in E\}$

ord: $[[\text{only}(\text{I gave it to } [\textit{John}]_{[\text{vfoc}]})]]^{o} = \forall p \in \{\text{give}(d,b,y) \mid y \in E\}, \text{true}(p) \rightarrow (p = \text{give}(d,b,j))$

As seen in 3.4.1, *only* directly relates ord to ALT via a truth-conditional exhaustivity: ord is the sole true member of ALT. This contrasts with a simple application of stress, as in (86):

(91) stress(φ)

ALT: $[[[\text{John}]_{[vfoc]}]]^f = \{y \mid y \in E\}$

ord: $[[\text{stress}([\text{John}]_{[vfoc]})]]^o = j$

Here there is no direct relation, with $[[\text{stress}([\text{John}]_{[vfoc]})]]^o$ being equivalent to $[[[\text{John}]_{[vfoc]}]]^f$, but ord and ALT are nevertheless related by inclusion due to the mechanics that generate alternatives.

However, (87) has yet to be addressed, which appears distinct in meaning from both (86) and (88). Though there is a complex literature on the semantics of *it*-clefts, it is generally assumed that, like *only*, they convey exhaustivity. Nevertheless, there is much debate on the precise nature of this exhaustivity, with suggestions including a truth-conditional exhaustivity comparable to *only* (Atlas & Levinson 1981, Szabolcsi 1981, É. Kiss 1998), a conversational implicature (Horn 1981), a uniqueness presupposition (Halvorsen 1978, Delin & Oberlander 1995, Percus 1997, Wedgwood et al. 2006), a conditional exhaustive presupposition (Büring 2011), a combination of a focus-sensitive maximality presupposition and asserted minimality (Velleman et al. 2012) and a mereological presupposition (Büring & Kriz 2013).

With the exception of the first three approaches, it generally supposed that the exhaustiveness of clefts does not modify the truth-conditional meaning as it does for *only*, with this claim additionally being supported by psycholinguistic (Destruel et al. 2015) and neurolinguistic (Drenhaus et al. 2011) evidence. I therefore suppose that clefts involve some form of exhaustive presupposition, which I tentatively represent as a focus sensitive conditional, combining aspects of (Büring 2011) and (Velleman et al. 2012):

(92) $\text{true}([[\varphi]]^o) \rightarrow (\forall p \in [[\varphi]]^f, \text{true}(p) \rightarrow (p = [[\varphi]]^o))$

Consequently (87) has the following denotation:

(93) give(d,b,j) & pres. true(give(d,b,j)) → (∀p∈{give(d,y,j) | y∈E}, true(p) → (p = give(d,b,j)))

i.e. it is asserted that David gave John the book, and presupposed that if this is true, then it is the only true possibility out of the alternatives. The difference between ord and ALT is therefore as follows:

(93) cleft(φ)

ALT: $[[\text{I gave it to } [\textit{John}]_{[\text{vfoc}]}]]^{f} = \{\text{give}(d,y,j) \mid y \in E\}$

ord: $[[\text{cleft}(\text{I gave it to } [\textit{John}]_{[\text{vfoc}]})]]^{o} =$
give(d,b,j) & pres. true(give(d,b,j)) → (∀p∈{give(d,y,j) | y∈E}, true(p) → (p = give(d,b,j)))

We now have representations of all three sentences. Thus far, the relation between ord and ALT has been given in terms of specific examples, but following (85) this may be generalised to a construction, as in (94-96). Here I further abbreviate $[[\varphi]]^{o}$ as 'base', since this is the "basic" meaning of the expression without the focus construction.

(94) English stress focus:
$[[\text{stress}(\varphi)]]^{o} = [[\varphi]]^{o}$
i.e. ord = base
the relation between ord and ALT is simply one of inclusion

(95) English *it*-cleft focus:
$[[\text{cleft}(\varphi)]]^{o} = [[\varphi]]^{o}$ & pres. true($[[\varphi]]^{o}$) → (∀p∈$[[\varphi]]^{f}$, true(p) → (p = $[[\varphi]]^{o}$))
i.e. ord = base & pres. true(base) → (∀p∈ALT, true(p) → (p = base))
ord is related to ALT by a presupposition of exhaustivity

(96) English *only* focus:
$[[\text{only}(\varphi)]]^{o}$ = ∀p∈$[[\varphi]]^{f}$, true(p) → (p = $[[\varphi]]^{o}$)
i.e. ord = ∀p∈ALT, true(p) → (p = base)
ord is related to ALT by a truth conditional exhaustivity

Thus in each of (86-88), the relation **R** between ord and ALT is different, and so we can directly compare the semantic complexity of each focus construction. For

instance, it seems reasonable to suppose that a presupposition of exhaustivity is more complex than a relation of inclusion. However, a truth-conditional relation of exhaustivity is even semantically stronger than a presupposition, and so this may be viewed as more complex still. This leads to the following rough scale of complexity for the constructions considered:

(97) Simple **R** ⟷ Complex **R**

English stress focus — English *it*-cleft focus — English *only* focus

The analyses of these constructions are of course preliminary, and the scale of complexity itself is not yet formalised, a topic that will be considered in 3.5. Nevertheless, the approach outlined above gives us a technique for directly comparing the meaning of different constructions.

3.4.3 When should constructions be distinguished?

The constructions considered in the previous subsection exhibit relatively large semantic differences between one another. However, as we saw in 3.3.2, some uses of focus can have more subtle pragmatic differences, as with the completive/selecting distinction between (98) and (99):

(98) A: Who did you give it to?
B: I gave it to [*John*]$_{\text{Foc}}$.
(English, repeated from (65))

(99) A: Which of John and Mary did you give it to?
B: I gave it to [*John*]$_{\text{Foc}}$.
(English, repeated from (68))

It is unclear how such distinctions should be specified, and the similarity of form between the two examples presents another difficulty: when should two focus constructions be considered distinct? I begin by addressing the first of these problems using the framework of Beaver & Clark (2008), with the resulting solution providing an approach to the second.

Beaver & Clark (2008) make use of Rooth's (1985, 1992, 1996) theory of alternative semantics, but extend it in a number of respects. Firstly, they take every instance of focus to be an answer to a (possibly implicit) question. Following e.g. Hamblin (1973), Karttunen (1977), Groenendijk & Stokhof (1984), questions are denoted as sets of answers. These sets are determined in the same manner as Roothian alternatives, leading to an approach they term "Rooth-Hamblin" question semantics, explaining the close correspondence between *wh*-elements and foci.

Secondly, they adapt the conversational model of Roberts (1996, 2004), where discourse is viewed as a collaborative game to answer the overall question: "What is the way things are?" Moves in this game consist of either sub-questions of this overall question, or declarative statements, with sub-questions forming a stack until they are answered. As a result, discourses proceeds by eliminating possible worlds until the correct world is identified.

These two approaches are connected by the focus principle:

(100) *Focus Principle:*
Some part of a declarative utterance should evoke a set of alternatives containing all the Rooth-Hamblin alternatives of the C[urrent]Q[uestion].

(Beaver & Clark 2008:37)

This framework may be roughly demonstrated through analysis of (98) and (99). Let us suppose that in both cases the discourse has reached a point where it has been established that "B gave it to someone." The following worlds are therefore possible candidates for the correct word:

(101) w_J: B gave it to John.
w_M: B gave it to Mary.
w_P: B gave it to Paul.
etc.

As a result, in (98), A asks B the question "Who did you give it to?", which can be analysed as follows:

(102) A: [[Who did you give it to?]] = {B gave it to x | x ∈ E}
B: [[I gave it to [*John*]$_F$.]]^f = {B gave it to x | x ∈ E}
We are in w_J

Here, A the alternative set for B's statement is equivalent to the denotation of the question, satisfying the focus principle, and so the response is appropriate. Moreover, this response allows the speakers to determine exactly which of the worlds in (101) is correct, and so the dialogue is successful.

The exchange in (99) is very similar to this, but A instead asks a question with only two possible answers, perhaps because other possible worlds have already been eliminated. This is modelled below:

(103) A: [[Which of John and Mary did you give it to?]]
= {B gave it to x | x ∈ {John, Mary}}
B: [[I gave it to [*John*]$_F$.]]^f = {B gave it to x | x ∈ E}
We are in w_J

Though B's response has the same alternative set, in this case A's question denotes a much smaller set. However, this set is nevertheless a subset of the alternatives to B's response, and so the focus principle is satisfied once again. Finally, as before, the response allows the conversants to identify the correct universe.

Though these examples are simple, they nevertheless demonstrate that under this approach, sentences with the same denotation may be used appropriately in different discourse contexts, with the differences in meaning arising not from the construction itself, but from its contextual environment. Beaver & Clark (2008) further argue that in cases where a focus is compatible with multiple possible questions, specific intonational profiles may distinguish between these questions, even when they are implicit. For instance, the declarative statement in (104) could be a response to either the question in (104a), or the one in (104b), having significant consequences for the meaning of the sentence (Beaver & Clark 2008:45-49). This difference is reflected by different intonational profiles, leading to reconstruction of different implicit questions:

(104) a. profile 1
Kim doesn't study [*linguistics*]$_F$ at Northwestern.
↓
What does Kim study at Northwestern?

b. profile 2
Kim doesn't study [*linguistics*]$_F$ at Northwestern.
↓
What doesn't Kim study at Northwestern?

(English, adapted from Beaver & Clark 2008:45-49)

Consequently, this framework provides a wide-reaching explanation for the varying effects arising from use of specific focus constructions in discourse, and so below I take such effects to be modellable along these lines. However, since the goals of this thesis are primarily syntactic, I only rarely return to this approach. Nevertheless, I take the denotation of questions to be their set of answers in chapter 7, and make use of question reconstruction via intonational profiles in 6.2.2 and 9.2.1.

It should now be clear that we need not treat similar cases such as (98-99) as independent constructions, but can instead take them to be instances of the same construction in different contexts. We can now return to the question that began this subsection: when *should* constructions be viewed as distinct? One reason for making such a distinction would be if a particular structure is associated with a conventionalised meaning, one that cannot be explained through contextual factors alone. Secondly, and arguably more importantly for the current approach, if two constructions differ syntactically, then they must be separated from one another, since they must be assigned distinct analyses.

3.4.4 From semantics to syntax.

Though we now finally have a way to compare focus constructions both within and across languages, it is not yet clear how this helps us in the task of breaking these constructions down into their constituent parts. In order to do this, one more assumption is necessary – a null hypothesis of compositionality. However, this is not straightforward to investigate, since as we have seen, there is no "strict

correlation between particular focus types and particular grammatical markings." (Zimmermann & Onea 2011:1662) For instance, both (105) and (106) appear to express a similar meaning, but while (105) does so with a single lexical item, (106) makes use two lexical items as well as syntactic movement:

(105) I **even** gave it to [*John*]$_{\text{Foc}}$

(English, repeated from (21b))

(106) a. Tā bù xǐhuan chī pínggǔo
3SG NEG like eat apple
'He doesn't like eating apples.'

b. Tā (**lián**) [pínggǔo]$_{\text{Foc}}$ **yě** bù xǐhuan chī
3SG **even** apples **also** NEG like eat
'He doesn't even like eating *apples*.'

(Mandarin Chinese, repeated from (45))

As a result, if a hypothesis of compositionality is to be maintained (and if these two examples are indeed equivalent in meaning), English must encode the entirety of this meaning on *even*, whereas Mandarin distributes it across the construction. As a result, we should not always expect for semantic complexity to equal syntactic complexity. However, we should equally not expect to see syntactic complexity that is vastly in excess of the semantic complexity of the construction, since this would require the introduction of syntactic elements that play no semantic role. In short, the hypothesis is that the following roughly holds:

(107) syntactic complexity ≤ semantic complexity

There is one major class of exceptions to (107) that we have already seen in 3.3.1: phonologically-motivated syntactic constructions. For instance, the focus in (108b) is semantically very simple, with the relation between ord and ALT appearing only to be one of inclusion. However, the construction is nevertheless syntactic, since the focus occurs finally, and so at least one movement must be involved.

(108) a. A: Qué pasó?
what happened
'What happened?'

B: Juan compró ayer el *periódico*.
Juan bought yesterday the newspaper
'Juan bought the newspaper yesterday.'

b. A: Quién compró el periódico ayer?
who bought the newspaper yesterday
'Who bought the newspaper yesterday?'

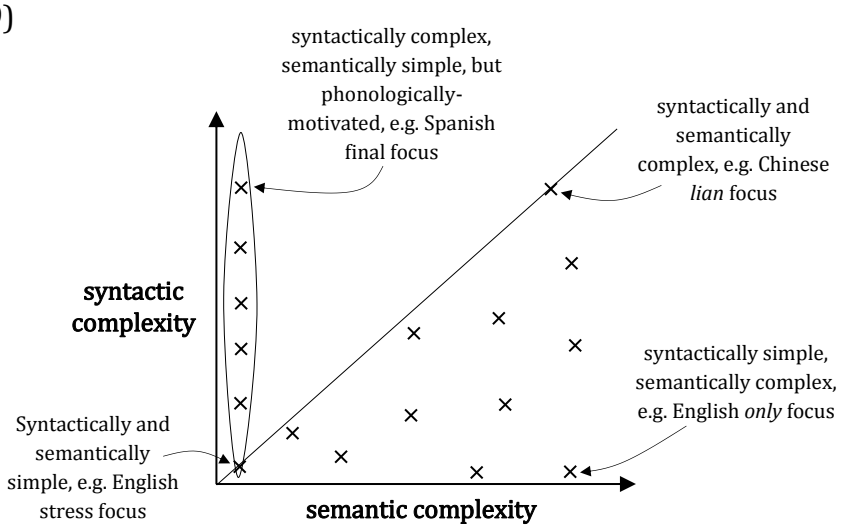
B: Ayer compró el periódico [*Juan*]$_{\text{Foc}}$.
yesterday bought the newspaper Juan
'*Juan* bought the newspaper yesterday.'

(Spanish, repeated from (24))

It therefore appears that additional syntactic structure in a focus construction does not always reflect more complex meaning. However, in 3.3.1, it was suggested the structure in (108b) is not entirely arbitrary, but instead occurs as a result of the phonological properties of Spanish. I therefore assume that certain semantically simple foci can nonetheless exhibit relatively complex syntactic structure, but only when this is justified by the phonology of the language. This assumption and its consequences are considered in 9.2.

Overall, the following rough distribution of data is predicted:

(109)



There are essentially two groups of data: phonologically-motivated constructions, which may be of varying syntactic complexity depending on the requirements of

the language, but are semantically simple, and constructions which are consistent with (107). It is analysis of this latter group that benefits most from a null hypothesis of compositionality, allowing for the use of semantics as a window into syntactic structure.

3.5 Formalising complexity?

The previous section concluded with the identification of two classes of focus construction based on their comparative syntactic and semantic complexities. Of these classes, the type most interesting for current purposes were said to be those that exhibit some degree of compositionality. The reason for concentrating on this class is that they allow for their syntax to be informed by their semantics, providing a potential avenue for navigating some of the difficulties surrounding the parametric analysis of focus. Nevertheless, it is not always so clear what it should mean to say that something is compositional (see e.g. the contents of Werning et al. 2012, among many others). In terms of the current argument, though, the following claim is under consideration:

(110) syntactic complexity ≤ semantic complexity

(repeated from (107))

However, in order to make sense of this formulation it is necessary to define measures of both semantic and syntactic complexity, and it is to this end that I turn to the notion of Kolmogorov complexity (Solomonoff 1960, Kolmogorov 1968, Ming & Vitányi 1997). Under this approach, the complexity of an object is given by the length of its shortest possible description. For instance, consider the following two strings:

(111) a. 101010101010101010

b. 110111101010001101

Although both strings are of length 18, the string in (111a) can be described simply (e.g. "print '10' 9 times") whereas a similar description does not seem to be possible for that in (111b), and so unless a shorter description can be found, (111b) is said to be more complex than (111a). Such a notion of complexity brings us closer to defining syntactic and semantic complexities. In order to do this, however, it is also necessary to to define a notion of description for each of these aspects of linguistic structure.

3.5.1 Semantic description.

Let us suppose we are trying to describe the complexity of a specific focus construction – for concreteness, take Mandarin *lian* focus:

(112) a. Tā bù xǐhuan chī píngguǒ
3SG NEG like eat apple
'He doesn't like eating apples.'

b. Tā **(lián)** [píngguǒ]$_{\text{Foc}}$ **yě** bù xǐhuan chī
3SG **even** apples **also** NEG like eat
'He doesn't even like eating *apples*.'

(Mandarin Chinese, repeated from (45))

(112b) is a good choice for the current purposes as it does not just express a semantically complex kind of focus, but also is fairly complicated syntactically, and so could be considered for assessment of the claim in (110). In order to carry out this assessment though, it is necessary to define both semantic and syntactic descriptions that some notion of complexity may be applied to.

In the semantic domain, this task initially seems fairly straightforward, given the previous section established a method for the abstract description of focus constructions. In the case of (112b), the semantics is similar to English *even* focus, with Badan (2008) supposing that the meaning is comparable but distributed across multiple particles. The literature on *even* is extensive, with no clear consensus (see e.g. Horn 1969, Karttunen & Peters 1979, Rooth 1985, Kay 1990, Lycan 1991, Wilkinson 1996, Rullmann 1997, Herburger 2000, Guerzoni 2003, Schwarz 2005, Beaver & Clark 2008 *inter alia*). Nevertheless, the scalar meaning can be roughly characterised by partially ordering alternatives for their perceived likelihood, with the proposition expressed belonging to some subset that is low in this ordering:

(113)

¬like.eating(h, kumquats) ¬like.eating(h, durians)

¬like.eating(h, persimmons)

¬like.eating(h, bananas) ¬like.eating(h, grapes)

¬like.eating(h, apples)

likelihood

Under such an analysis, (112b) can therefore be given a description along the following lines:

(114) ¬like.eating(h,a) & ¬like.eating(h,a)∈min(likelihood.order({¬like.eating(h,x) | x∈E}))

i.e. if "likelihood.order()" is a function that orders the set of alternatives for their perceived likelihood, and "min()" is a function that selects a lowly ordered subset of these, the assertion is that "¬like.eating(h,a)" is one such lowly ordered member of the alternatives. Out of things the subject of (110b) might not like eating, it is particularly unlikely for him to not like eating apples, but this is nonetheless the case.

The following statement generalises this meaning to all *lian* focus constructions:

(115) ord = base & base∈min(likelihood.order(ALT))

This can be viewed as a semantic description of the *lian* focus construction, and so initially seems fairly easy to assess for complexity – one simple measure could be simply to count the symbols in this description, which would be directly relatable to an upper bound on the Kolmogorov complexity.

However, a few problems still arise. The first is fairly straightforward – what should be treated as valid symbols for this count? It seems reasonable to include e.g. functions, predicates, and arguments, and not, say, disambiguating brackets, but symbols such as '∈' are potentially a little more problematic. Nonetheless, it would likely be possible to make reasonable decisions about which symbols to include and which to exclude, and so this problem is surmountable. However, this is not the only difficulty that emerges, as there is considerable freedom in the

logical description of (115), with the following all being definable as truth-conditionally equivalent to each other and to the second conjunct of (115):

(116) a. even(base, ALT)

b. base∈least.likely(ALT)

c. base∈MIN & MIN⊆ALT & ∀x∈(ALT–MIN), ∀y∈(MIN), $x >_{likely} y$

Each of these descriptions would obviously differ greatly in their complexity values from one another, making it difficult to know which should be chosen. One might follow the spirit of Kolmogorov complexity and claim the shortest known description should be used as an upper bound, but with sufficiently powerful definitions, all focus constructions would end up looking very simple and similar in complexity, as in the definition in (116a). One possibility then would be to restrict descriptions to a specific logic with limited descriptive power, say, first order predicate logic, or restrict predicates to be monadic. This would allow for more meaningful comparisons between the semantics of constructions, but would also require the specification of a particular logical metalanguage as being the one that is "correct" for making these calculations, which seems to be a premature decision to make, if it is even theoretically tenable.

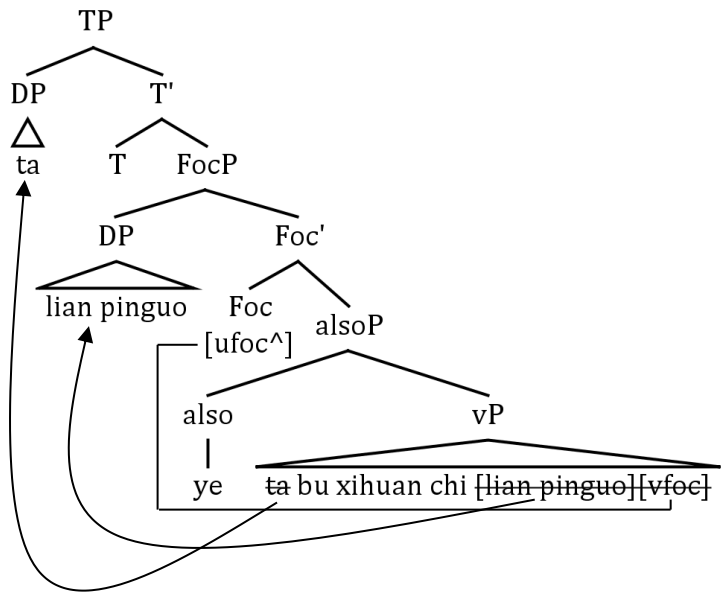
Finally, while the discussion has so far taken *even* to have truth-conditional import, in fact it has been commonly supposed since Horn (1969) that it merely introduces presuppositions, with only Lycan (1991) claiming it has truth-conditional content (though Schwarz (2005) also argues this for the German equivalents *einmal* and *auch nur*). While this is easily representable in a description, it adds an extra dimension of difficulty to the assessment of complexity – should presuppositional aspects of descriptions be assessed equivalently to truth-conditional ones, or otherwise, and if not, then how? Each decision here would radically alter the scale of complexity involved, and so this once again demonstrates the mutability of semantic complexity depending on the theoretical axioms chosen.

Thus while potential measures of semantic complexity do exist, they give considerably flexible results unless undesirable stipulations are made.

3.5.2 Syntactic description.

While we had a ready-made notion of description in the semantic domain, the same is not true in the syntactic one. However, any such description should be based not on the string of the sentence but on its syntactic structure, and so it only makes sense to consider the syntactic description that is associated with a particular analysis. In the case of Mandarin *lian* focus, Badan (2008) follows Ernst & Wang (1995), Qu (1994), and Shyu (1995, 2001) *inter alia*, arguing that the *lian*-marked phrase moves to a TP-internal position. The subject, meanwhile, remains Spec,TP (see Li 1990, Chou 2013 for arguments for this subject position in Chinese). A version of this analysis is therefore as follows:

(117)



This provides an analysis from which to extract a description of syntactic complexity. As it stands, however, the representation in (117) is difficult to use as a description – firstly, it is an object very different to a string, and more problematically, it is not general to the focus construction, but specific to the sentence in (112b). We therefore need to abstract from (117) some kind of representation that is both general for the construction and also more closely comparable to the logical strings we considered for semantic complexity.

One possibility, then, is to situate syntactic description not at the level of syntactic trees, but at that of the numeration. Follwing Chomsky (1995:225), this is “a set of

pairs (LI, *i*), where LI is an item of the lexicon, and *i* is its index, understood to be the number of times that LI is selected." The computational system maps this representation to a pair of structures compatible with the PF (phonetic form) and LF (logical form) interfaces. As a result, the numeration can essentially be viewed as a set of heads that deterministically contribute to the formation of a syntactic tree. From this set, we may select only those heads that contribute directly to the focus construction itself. For (117), the following selection would therefore be made:[7]

(118) {Foc, ye, lian, Foc_{feat}}

However, a number of features also contribute directly to the focus construction that are not present in this description, since it focuses on heads – specifically, the [vfoc] feature that is probed for, the [ufoc] feature that probes for it, and the movement trigger associated with this feature that leads to fronting. While these features are properties of the heads in (118), they do not appear in the description. It therefore makes more sense to adapt this description, listing features separately, leading to the following representation for *lian* focus:

(119) {Foc, [ufoc], [^], ye, lian, Foc_{feat}, [vfoc]}

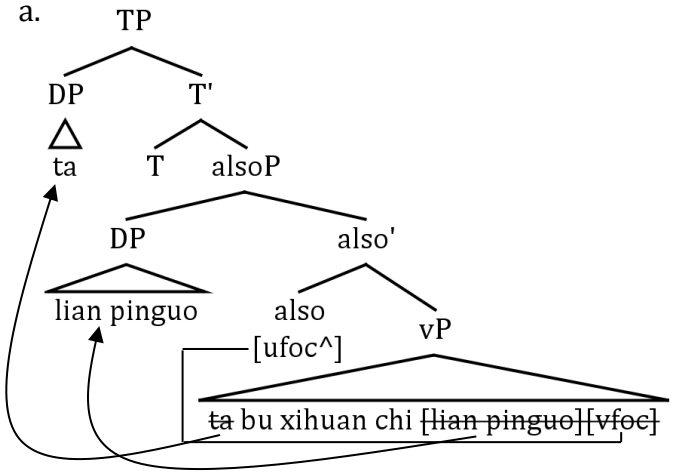
This provides a more viable description, and the cardinality of this set could potentially be used as some measure of syntactic complexity. But some difficulties still remain under this approach, such as which features to include. For instance, should movement triggers be treated as separate features? And should the categorial and/or c-selectional features of the relevant heads also be included in the syntactic description? Much as with the semantic difficulties of this type, such questions could largely be resolved by taking a strong position on which of such elements to include, but things become more worrying when we consider alternate syntactic analyses.

Thus far, the argument has been made on the basis of (117), but this is by no means the only possible analysis of the phenomenon. It is possible to make small

[7] As discussed in 3.4.2, I take [vfoc] to originally be introduced on a Foc_{feat} head.

alterations to this analysis that are unlikely to make severe differences to syntactic predictions, but nevertheless change the complexity description. For instance, the following example subtly changes (117) by removing the Foc projection:

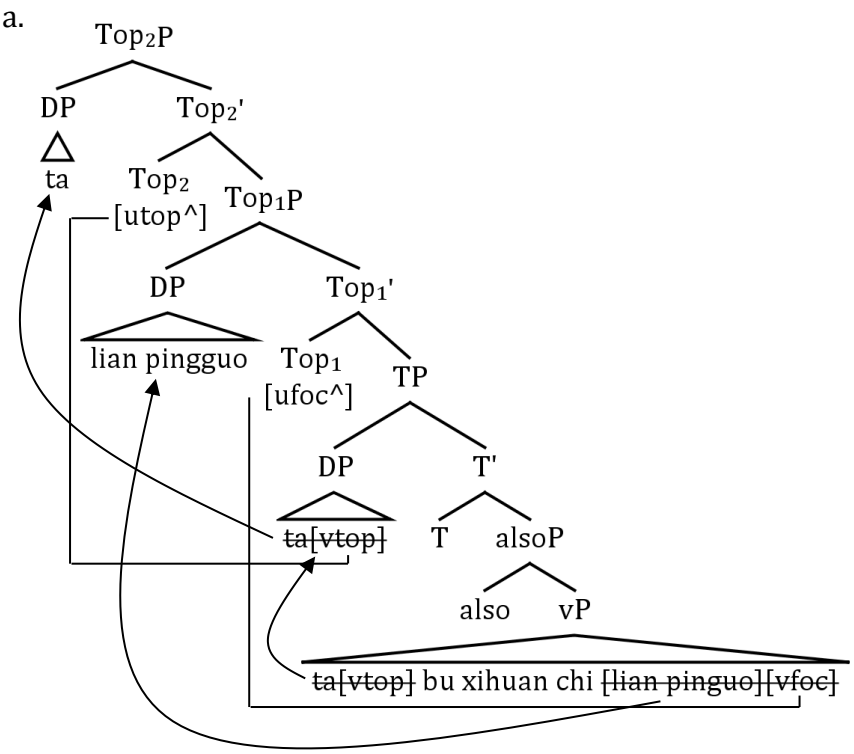
(120) a.



b. {ye, [ufoc], [^], lian, Foc_{feat}, [vfoc]}

In (120) the description has a cardinality of 6, compared to the cardinality of 7 in (119), despite the analyses being very similar. Furthermore, analyses that differ greatly will have greatly differing syntactic descriptions, as in (121), which adapts the double topicalisation hypothesis of Xu & Langendoen (1985), Lin (1992) *inter alia*:

(121) a.



b. {Top_2, [utop], [^], [Top_1], [ufoc], [^], Top_{feat}, [vtop], ye, lian, Foc_{feat}, [vfoc]}

Under this analysis, as the subject topicalisation is also argued to be part of the construction, all the heads and features associated with this movement must also be taken into account in the description,[8] giving it a cardinality of 12.

It is therefore clear that syntactic descriptions vary considerably depending on a number of factors, especially the specific analysis chosen, and so, as with the measure of semantic complexity discussed in the previous subsection, syntactic complexity may give very flexible results.

3.5.3 Compositionality as a heuristic.

The previous discussion has argued that although specific measures may be defined for both semantic and syntactic complexity, this leads to considerable difficulties when trying to define unambiguous complexity values for given constructions. This makes formally assessing the claim in (110) very difficult – while we could directly compare the symbol counts from each type of description,

[8] For consistency, I suppose [vtop] is introduced on a Top_{feat} head, directly comparable to Foc_{feat}.

each value is highly manipulable to yield the desired result. Furthermore, using a semantic description to inform a syntactic one seems equally problematic, since the analysis can be chosen to fit whatever semantics is necessary. So what is the use of compositionality in this enterprise? Following Janssen (1997), I posit that compositionality is nonetheless useful, not because it is an empirical property of constructions (Janssen 1997 in fact proves that any data may be given a compositional analysis), but because it is methodologically sound. In particular, using compositionality as a heuristic yields syntactic analyses that, in addition to being compositional, give better accounts of phenomena that both explain a wide range of data and make further empirically assessable predictions. The following chapters introduce a number of such cases.

3.6 Conclusion.

This chapter began with a review of the linguistic diversity of focus expression, which was shown to exhibit multiple dimensions of variation, both within and across languages. Many existing theoretical approaches take us some way towards explanation of this variation, but frequently fail to distance themselves from the notion of construction. Nevertheless, under the alternative semantics approach to focus, constructions may be directly semantically compared, which, when coupled with a null hypothesis of compositionality, brings us closer to their eventual decomposition into heads. However, rigourous assessment of compositionality is at best difficult, and at worst unfalsifiable, and so I argue that compositionality should be viewed not as an empirical property of constructions, but as a heuristic for the analysis of focus.

Over the following five chapters of this thesis, I apply this heuristic, first developing a series of semantic tests for the assessment of focus constructions (chapter 4), before considering specific constructions from Nepali, ASL, LSB (Brazilian Sign Language), BSL (British Sign Language), and English in detail (chapters 5-8). Chapter 9 then constructs a preliminary typology of focus along the lines outlined in this chapter, which concludes the second part of this thesis. This leaves the original goal of the parameterisation of focus, which is taken up in part III.

4. Semantic Tests for Focus.

4.1 Introduction.

In order to arrive at a compositional analysis of a focus construction, it is first necessary to determine its semantic properites. So far we have relied mainly on fairly intuitive semantic descriptions, but for analysis of the sort outlined in the previous chapter, it is necessary to make use of more rigorous criteria in the determination of these descriptions. Ideally there would exist a suite of linguistic tests that could be applied to a given focus construction to yield its exact semantic description, combining both semantic accuracy and empirical reliability. In reality, of course, such a complete range of tests does not yet exist; however, there is nevertheless a growing number of diagnostics in the literature for different semantic types of focus. An overview of many such tests is provided by van der Wal (2014), which directly inspires this chapter, and is referred to throughout.

I begin with a discussion of some of the key semantic distinctions made by focus tests, and present the three English constructions to be investigated in this chapter (section 4.2). This is followed by application of a wide range of tests to these cases (section 4.3), which when taken together demonstrate the utility of such diagnostics in the semantic differentiation of focus constructions (section 4.4).

4.2 Exhaustivity and exclusivity.

In 3.3.2, we encountered the claim that focus constructions divide into two broad semantic types, with É. Kiss' (1998) distinction between information and identificational focus being particularly influential. As noted in this section, whereas information foci simply represent non-presupposed information, identificational foci have the following definition:

(1) An identificational focus represents a subset of the set of contextually or situationally given elements for which the predicate phrase can potentially hold; it is identified as the exhaustive subset of this set for which the predicate phrase actually holds.

(repeated from (ch.3:69))

The key semantic difference here is thus one of exhaustivity; while identificational foci are said to be exhaustive, information foci are claimed not to be. This exhaustive/non-exhauastive distinction is therefore a clearly defined property of focus constructions that may be tested for, bringing us closer to our ideal of determining the semantic description of foci through linguistic tests.

Van der Wal (2014:106) further argues that "exclusivity (excluding some alternatives) differs from exhaustivity (excluding all alternatives)," and goes on to distinguish weak and strong versions of each. Unlike exhaustivity, which excludes all unfocused alternatives, weak exclusivity involves the exclusion of only some, with strong exclusivity being equivalent to exhaustivity.[1] Following Beck & Rullman (1999) and Bäurle & Zimmermann (1991), van der Wal (2014:106) also argues for a distinction between strong and weak exhaustivity, where "weak exhaustivity names all the referents for which the predicate is true, and strong exhaustivity names those referents and additionally gives the information that this is the complete set". Beck & Rullman (1999) propose this distinction originally for questions rather than focus, basing it on discussion in Groenendijk & Stokhof

[1] Molnár's (1998) system distinguishes these two categories, with weak exclusivity being encoded as [+exclusive,-exhaustive], and strong exclusivity being [+exclusive,+exhaustive].

(1982, 1984). While the distinction is readily adaptable to focus, as with questions, "there seems to be only one type of situation in which knowing [the referents for which the predicate is true] may turn out not to be the same as knowing [the referents for which the predicate is not true: when] the subject of the propositional attitude is not fully informed as to which set of individuals constitutes the domain of discourse." (Groenendijk & Stokhof 1982:180-181) Thus for most treatments of focus, where we would assume the domain of discourse to be known by the speaker and hearer, the strong/weak distinction is not relevant for exhaustivity.

For this reason, I do not divide exhaustivity into weak and strong versions, taking only the strong notion, which is also equivalent to strong exclusivity. Furthermore, we shall see that few if any of the tests considered below clearly distinguish between strong and weak exclusivity, and so for the most part the only semantic distinction made is a binary one between exhaustive and non-exhaustive. However, as will become clear in later chapters, properties of focus constructions other than exhaustivity are nonetheless possible. Exhaustivity is therefore by no means the only property of interest, although it is a good starting one given its easy testability.

In 3.4.2, we considered the constructions in (2-4):

(2) English stress focus:

a. I gave it to [*John*]$_{\text{Foc}}$.

b. ord = base
the relation between ord and ALT is simply one of inclusion

(3) English *it*-cleft focus:

a. It was [*John*]$_{\text{Foc}}$ that I gave it to.

b. ord = base & pres. true(base) → (∀p∈ALT, true(p) → (p = base))
ord is related to ALT by a presupposition of exhaustivity

(4) English *only* focus:

a. I only gave it to $[\text{John}]_{\text{Foc}}$.

b. ord = $\forall p \in \text{ALT}, \text{true}(p) \rightarrow (p = \text{base})$
ord is related to ALT by a truth-conditional exhaustivity

(repeated from (ch.3:1-3, 94-96))

Since these constructions differ clearly from one another in their exhaustivity as well as in other features such as potential presuppositions, they make good examples for demonstrating the distinguishing power of linguistic tests for focus, which is the subject of the following section.

4.3 A selection of tests for focus.

4.3.1 Question-answer correspondence. (QAC)

As van der Wal (2014:108, test 1) notes, the idea that foci correspond to the answers of *wh*-questions is extremely common, being used in Dik (1997), Rooth (1992), Krifka (2007), Lambrecht (1994), Kasimir (2005), Roberts (1996), Beaver & Clark (2008) *inter alia*. This can be seen most clearly for English stress focus – (2b) is a felicitous response to the question in (5), with *John* corresponding to the *wh*-element *who* from the question.

(5) Q: Who did you give it to?
A: I gave it to [*John*]$_{\text{Foc}}$.

This test does not behave identically for all foci, however, with (3b) and (4b) not being equivalently felicitous as responses:

(6) Q: Who did you give it to?
A: It was [*John*]$_{\text{Foc}}$ that I gave it to.
A': I only gave it to [*John*]$_{\text{Foc}}$.

Rizzi (1997, via van der Wal 2014:108) argues that such infelicitous responses arise because question-answer pairs indicate new information, and are not compatible with the exclusion of alternatives, which (3b) and (4b) clearly do if they are indeed exhaustive.

4.3.2 "Out-of-the-blue" responses. (OOTB)

A similar test (also part of van der Wal 2014:test 1) relates to the responses to questions such as "what happened?" These questions attempt to establish an entirely "out-of-the-blue" context without any information-structural prejudice (though see van der Wal 2014:110-111 for some criticism of this notion). Thus foci should always be infelicitous if such contexts are correctly set up:

(7) Q: What happened?
#? A: I gave a book to [*John*]$_{\text{Foc}}$.
A': It was [*John*]$_{\text{Foc}}$ that I gave a book to.
A'': I only gave a book to [*John*]$_{\text{Foc}}$.

4.3.3 Correction of a statement. (CORR)

In the context of correction of a statement, certain focus constructions may be excluded – see e.g. Skopeteas et al. (2006) and Kim (2012), discussed in van der Wal (2014:test 17). For the English examples under discussion, there does not appear to be a clear difference, with all constructions being felicitous, but this test distinguishes some constructions in later chapters.

(8) A: I gave it to John.
B: No, you gave it to [*Paul*]$_{\text{Foc}}$.
B': No, it was [*Paul*]$_{\text{Foc}}$ that you gave it to.
B'': No, you only gave it to [*Paul*]$_{\text{Foc}}$.

Van der Wal (2014:121) further argues, following Kim (2012), that with an explicit negator the focus in the correction "must be in exclusive focus." However, the construction need not *encode* exclusive focus, as evidenced by response B in (8).

4.3.4 Syntagmatic contrast. (SYNCON)

Van der Wal (2014:119, test 14) suggests, following Chafe (1976), that adding "… (and) not Y" to a sentence focusing X creates a syntagmatic contrast that is diagnostic of focus, and can also be used to determine the scope of the focus. This contrast is easily available for all three of the English constructions:

(9) a. I gave it to [*John*]$_{\text{Foc}}$, and not Paul.
b. It was [*John*]$_{\text{Foc}}$ that I gave it to, and not Paul.
c. I only gave it to [*John*]$_{\text{Foc}}$, and not Paul.

4.3.5 Contrast in a discourse. (DISCCON)

Contrast can equally be tested for paradigmatically, and Abner (2011a, b) suggests a diagnostic involving an explicitly non-constrastive situation, leading to infelicity when phrases are inherently contrastive. She demonstrates this for the English *it*-cleft, using the following example:

(10) Bruno and Eva went shopping…
It was [*Bruno and Eva*]$_{\text{Foc}}$ that bought something.

(adapted from Abner 2011b:27)

As the cleft excludes alternatives, its use in a discourse context where the focused items are already established is infelicitous, as is also the case for English *only*:

(11) Bruno and Eva went shopping… #Only [*Bruno and Eva*]$_{\text{Foc}}$ bought something.

However, less contrastive foci such as English stress focus are not as problematic in this position, although felicity still remains fairly dependent on the discourse:

(12) Bruno and Eva went shopping… [*Bruno and Eva*]$_{\text{Foc}}$ bought something.

4.3.6 Exactness of numerals. (NUMEXACT)

Van der Wal's (2014) test 6 derives from É. Kiss (2009), who argues that in exhaustively focused contexts, the usual pragmatic upper bound on numerals (see e.g. Horn 1972, Levinson 2000) becomes semantic, with the numeral instead denoting its exact quantity. Thus the following contrast arises:

(13) a. John has read five books. (= at least five)
b. It is [*five books*]$_{\text{Foc}}$ that John has read. (= exactly five)
c. John has only read [*five books*]$_{\text{Foc}}$. (= exactly five)

(14) John has read [*five books*]$_{\text{Foc}}$.

However, there are some difficulties with this test, as both (13a) and cases such as (14) still carry a strong but cancellable implicature that the numeral is exact, and so it is unclear how to best present this distinction to informants.

4.3.7 Compatibility with even. (EVEN)

Compatibility with focus particles is one promising avenue for focus diagnostics, and van der Wal (2014:test 4) specifically considers *even* and its crosslinguistic equivalents. *Even* specifically requires some alternatives in addition to the focused one to hold, and so it is incompatible with exhaustive foci, where these are excluded (see Brunetti 2004, Skopeteas & Verhoeven 2014, van der Wal 2011). Thus while English stress focus is compatible with *even*, *it*-clefts and *only* foci are not:

(15) a. I even gave it to [*John*]$_{\text{Foc}}$.

b. * It was even [*John*]$_{\text{Foc}}$ that I gave it to.

c. * I even only gave it to [*John*]$_{\text{Foc}}$.

4.3.8 Addition of a proposition. (ADD)

Since an exhaustive focus specifies the complete set of propositions that hold out of the alternatives, then it should be impossible to extend this set further by adding another proposition. A version of this idea is used in van der Wal's (2014:122-123) test 20, which originates from É. Kiss (1998). If a statement involving a focus can be felicitously enriched by adding further propositions from the alternatives, then it cannot be exhaustive:

(16) a. I gave it to [*John*]$_{\text{Foc}}$, (and I also gave it to Paul).

b. It was [*John*]$_{\text{Foc}}$ that I gave it to, # (and I also gave it to Paul).

c. I only gave it to [*John*]$_{\text{Foc}}$, # (and I also gave it to Paul).

4.3.9 Addition of a more likely proposition. (ADDLIKELY)

Skopeteas & Verhoeven (2015:19-21) use a similar test to ADD, but additionally make use of a restricted context involving a house containing beans, corn, and potatoes, and consider a number of Yucatec Maya examples involving a turkey eating, including the following:

(17) [bu'l]$_{\text{Foc}}$ k=u hàant-ik le úulum=o'
bean IPFV=A3 eat:TRANS-INCOMPL.B3SG DEF turkey=DIST
'The turkey is eating *beans*.' (but maybe other things too)

(Yucatec Maya, Skopeteas & Verhoeven 2015:19-20)

The advantage of this context is that speakers find it more likely for a turkey to eat corn than beans or potatoes, so even when "beans" is focused, the fact that the turkey may have eaten corn remains very salient. However, if "beans" were to be exhaustively focused, then the proposition that the turkey was eating corn should be false. Thus the possibility that the turkey may have eaten corn or potatoes in (17) is used to argue that pre-predicate focus in Yucatec Maya is not always exhaustive, as eating of beans is not the only possibility.

This test may equally be applied to English:

(18) *Context*: There is a chicken in a barn which contains both corn and potatoes. The chicken is eating potatoes, which is unexpected and so you remark on it, but it is eating corn too.

a. It ate [*potatoes*]$_{\text{Foc}}$, (but it also ate corn).

b. It was [*potatoes*]$_{\text{Foc}}$ that it ate, #? (but it also ate corn).

c. It only ate [*potatoes*]$_{\text{Foc}}$, # (but it also ate corn).

4.3.10 Entailment of a smaller set. (ENTAIL)

One test for exhaustivity originates with Szabolcsi (1981) and is also discussed in detail by É. Kiss (1998), as well as forming van der Wal's (2014) test 22. The diagnostic involves comparing two sentences, one of which has two coordinated DPs in its focus, and the other of which focuses only one of these coordinands, with the other being dropped. Under normal circumstances, the first of these sentences should entail the second, but if the focus is exhaustive, then this no longer holds:

(19) a. I met [*John and Mary*]$_{\text{Foc}}$.
entails
I met [*John*]$_{\text{Foc}}$.

b. It was [*John and Mary*]$_{\text{Foc}}$ that I met.
does not entail
It was [*John*]$_{\text{Foc}}$ that I met.

c. I only met [*John and Mary*]$_{\text{Foc}}$.
does not entail
I only met [*John*]$_{\text{Foc}}$.

4.3.11 Correction of overcomplete statements. (OVERCOMP)

Relatedly, and also originating with Szabolcsi (1981) (and forming van der Wal 2014:test 19), is a test making use of corrections to an overcomplete statement. For instance, if the sentences with two coordinands in (19) are corrected to the form with a single DP, then what is being corrected is the exhaustive aspect, and so such corrections should only be possible with exhaustive foci. This is shown below:

(20) a. I didn't meet [*John and Mary*]$_{\text{Foc}}$, #? I met [*John*]$_{\text{Foc}}$.

b. It wasn't [*John and Mary*]$_{\text{Foc}}$ that I met, it was [*John*]$_{\text{Foc}}$ that I met.

c. I didn't only meet [*John and Mary*]$_{\text{Foc}}$, I only met [*John*]$_{\text{Foc}}$.

However, as noted by van der Wal (2014:122), citing Onea (2007), it is possible that such effects could also be due to phenomena such as metalinguistic negation, or the negation of an implicature rather than a semantically specified exhaustivity. Moreover, implicatures of exhaustivity are also potentially problematic for the distinguishing power of the test in general, with even (20a) being construable as having such an implicature, making the correction far more felicitous.

4.3.12 Choice of conjunction. (AND, BUT, YESAND, YESBUT, NO)

Van der Wal (2014:123, test 21) notes that choice of conjunction when adding further propositions to a focused expression is also affected by the type of focus involved, and so can be used as a diagnostic. Specifically, the concessive meaning of

but makes it more compatible with contradiction than *and*, and so exclusive or exhaustive foci are sometimes more felicitous when extended with *but*.

(21) a. I gave it to [*John*]$_{\text{Foc}}$, and/but I also gave it to Paul.

b. It was [*John*]$_{\text{Foc}}$ that I gave it to, #?and/but I also gave it to Paul.

c. I only gave it to [*John*]$_{\text{Foc}}$, #and/#but I also gave it to Paul.

This already provides two diagnostics, compatibility with "and" extensions (AND) and compatibility with "but" extensions (BUT). Onea & Beaver (2011), Destruel et al. (2015) also use a similar test involving the presentation of picture stimuli and sample dialogues to subjects, with them then being asked choose appropriate responses to statements about the stimulus. Subjects were given the choice between answers of the type "yes, and…", "yes, but…", and "no…". If the statement is an incomplete description, the test is similar to the AND and BUT tests, as subjects must choose which conjunction to use when adding further propositions. The "no…" answer is therefore expected when the focus is truth-conditionally exhaustive, and the "yes, and…" answer when there is no exhaustivity. Finally, the "yes, but…" response is argued to show some degree of non-truth-conditional exhaustivity, such as an implication or presupposition. While Onea & Beaver (2011) suggest "yes, but…" indicates that the exhaustivity is not conventionally encoded in the construction, Destruel et al. (2015) argue that it in fact demonstrates exhaustivity that is not part of the at-issue meaning.

Responses to statements can also readily be used in a more informal intuition-based context, which is discussed for the "no…" cases in van der Wal (2014:test 18), following É. Kiss (1998, who cites p.c. with Donka Farkas). The same can equally be done for the "yes, and…" and "yes, but…" cases:

(22) a. A: I gave it to [*John*]$_{\text{Foc}}$.
B: Yes, and you also gave it to Paul.
B': Yes, but you also gave it to Paul.
#? B'': No, you also gave it to Paul.

b. A: It was [*John*]$_{\text{Foc}}$ that I gave it to.
#? B: Yes, and you also gave it to Paul.
B': Yes, but you also gave it to Paul.
B'': No, you also gave it to Paul.

c. A: I only gave it to [*John*]$_{\text{Foc}}$.
B: Yes, and you also gave it to Paul.
B': Yes, but you also gave it to Paul.
B'': No, you also gave it to Paul.

Though the judgements are not entirely clear in all cases, the above examples show roughly the behaviour found by Destruel et al. (2015), with the putatively truth-conditionally exhaustive construction in (22c) only being possible with "no…" and the cleft construction in (22b), which is suggested above to have a presupposition of exhaustivity, being more felicitous with "yes, but…" than with "yes, and…". This therefore provides three further tests, abbreviated as YESAND, YESBUT, and NO.

4.4 Summary of tests applied to English.

We have thus identified sixteen different diagnostics for focus, each of which has been applied to the three English constructions in (2-4), with the following results:

	English stress	**English cleft**	**English *only***
QAC	yes	no	no
OOTB	?	no	no
CORR	yes	yes	yes
SYNCON	yes	yes	yes
DISCCON	yes	no	no
NUMEXACT	no	yes	yes
EVEN	yes	no	no
ADD	yes	no	no
ADDLIKELY	yes	?	no
ENTAIL	yes	no	no
OVERCOMP	?	yes	yes
AND	yes	?	no
BUT	yes	yes	no
YESAND	yes	?	no
YESBUT	yes	yes	no
NO	?	yes	yes

Table 4.1: Focus tests applied to three English constructions.

The results of these tests broadly confirm the tentative analyses in (2-4). Stress focus largely patterns away from clefts and *only* focus, especially in the case of tests for exhaustivity. Furthermore, clefts and *only* focus largely pattern together, reflecting their similar semantics, but diverge in a few cases, especially the conjunction tests, which may reflect the presuppositional rather than truth-conditional properties of cleft exhaustivity.

Thus although we are still a long way away from having the array of diagnostics necessary to precisely determine the semantic description of focus constructions, the range of tests identified above can be used to glean further information about the semantic properties of these structures. So far, the use of these tests has been largely expositional, but in the following chapters we shall see more concrete examples of their use by applying them to novel constructions.

5. Nepali NAI Focus.

5.1 Introduction.

The focus tests discussed in the previous chapter were applied to three well-studied English examples. By contrast, I now consider a specific focus construction in Nepali, which involves the marking of focused constituents with various allomorphs of the morpheme NAI.[1,2] This is not the only option for focus in Nepali, and there are two types of focus marking possible in response to *wh*-questions, shown below for intransitive subjects (1), transitive subjects (2), and direct objects (3):

(1) A: ko laḍyo?
who fell
'Who fell?'

B: [*Rameś*]$_{\text{Foc}}$ laḍyo
Ramesh fell
'*Ramesh* fell.'

B': [*Rameś*]$_{\text{Foc}}$-**ai** laḍyo
Ramesh-**NAI** fell
'*Ramesh* fell.'

(2) A: kas-le kerā kʰāyo?
who-ERG banana ate
'Who ate a banana?'

B: [*us*]$_{\text{Foc}}$-le kʰāyo/kʰā-eko ho
3SG-ERG ate/eat-PST.PTCP AUX
'*He* ate (it).'

B': [*us*]$_{\text{Foc}}$-**ai**-le kʰāyo/kʰā-eko ho
3SG-**NAI**-ERG ate/eat-PST.PTCP AUX
'*He* ate (it).'

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[1] NAI has a number of different allomorphs, usually occurring as either *ai* or *nai*, but in a few cases it emerges as part of a fusional or suppletive form. The rules conditioning this behaviour appear to be complex, perhaps largely involving morphophonology, but they may also have some syntactic consequences. I do not investigate them here, however.

[2] Unless otherwise stated, all Nepali data was gathered from my informant, a middle-aged native speaker from the Chitwan district of Nepal who has lived in the UK for around 20 years. Joe Perry's help with carrying out this fieldwork was invaluable.

(3) A: Rameś-le ke kʰāyo
Ramesh-ERG what ate
'What did Ramesh eat?'

B: Rameś-le [*kerā*]$_{\text{Foc}}$ kʰāyo
Ramesh-ERG banana ate
'Ramesh ate a *banana*.'

B': us-le [*kerā*]$_{\text{Foc}}$-**nai** kʰāyo
3SG-ERG banana-**NAI** ate
'He ate a *banana*.'

While the B examples show an intonational strategy comparable to English stress focus, the B' examples demonstrate NAI focus,[3] which is the primary topic of this chapter. The fact that two different focus strategies are possible in answer to the same question might seem surprising, but is less so when it becomes clear that NAI focus is significantly more marked, and dispreferred over intonational focus in more neutral contexts. These parallel but distinct structures therefore offer an excellent case for application of the tests discussed in chapter 4. First, however, I provide more information on the construction itself, with an overview of the syntax of the NAI morpheme in section 5.2. This is followed by an application of the tests from chapter 4 (section 5.3), allowing for comparison with the English constructions investigated above (section 5.4).

[3] Items marked by NAI are usually also given intonational prominence, as indicated in the examples below, though the description of intonation here is only preliminary, and the full interaction between NAI and intonation remains unclear.

5.2 The syntactic distribution of NAI.

As seen in (1-3), the NAI morpheme directly attaches to constituents to mark them for focus, and it is furthermore capable of attaching to an extremely wide range of structures. We have already seen that it may mark both transitive (1) and intransitive subjects (2) as well as direct objects (3). Additionally, NAI usually may appear either side of the ergative case marker *le*, with its effect scoping over only the subject when to its left (4a), and over both the subject and the case marker when to its right (4b):

(4) a. [*Rameś*]$_{\text{Foc}}$-**ai**-le Lakṣmi-lāi kerā di-eko ho
Ramesh-**NAI**-ERG Laksmi-DAT banana give-PST.PTCP AUX
'*Ramesh* gave Laksmi a banana.'

b. [*Rameś-le*]$_{\text{Foc}}$-**nai** Lakṣmi-lāi kerā di-eko ho
Ramesh-ERG-**NAI** Laksmi-DAT banana give-PST.PTCP AUX
'*Ramesh* gave Laksmi a banana.'

Nonetheless, indirect objects cannot be focused by NAI, regardless of their position with respect to the case marker:

(5) Rameś-le Lakṣmi-(***ai**)-lāi-(***nai**) kerā diyo
Ramesh-ERG Laksmi-**NAI**-DAT-**NAI** banana gave
'Ramesh gave *Laksmi* a banana.'

As already seen in (2-3), NAI may also attach to pronouns. This marking of pronouns is very productive, occurring with multiple pronominal forms (6-7), and with ergative (8-9) as well as absolutive case marking. When the case marker is overt, NAI can once again occur either side of the case marker (9a-b), and even both sides (9c), though the full syntactic distribution and interpretational consequences of this variation remain to be investigated.

(6) [*ma*]$_{\text{Foc}}$-**nai** laḍyo
1SG-**NAI** fell
'*I* fell.'

(7) a. ū laḍyo
3SG fell
'He fell.'

b. [***uhi***]$_{\text{Foc}}$ laḍyo
3SG.**NAI** fell
'*He* fell.'

(8) [*mai-le*]$_{\text{Foc}}$-**nai** kerā kʰāyo
1SG-ERG-**NAI** banana ate
'*I* ate a banana.'

(9) a. [*us*]$_{\text{Foc}}$-**ai**-le kerā kʰāyo
3SG-**NAI**-ERG banana ate
'*He* ate a banana.'

b. [*us-le*]$_{\text{Foc}}$-**nai** kerā kʰāyo
3SG-ERG-**NAI** banana ate
'*He* ate a banana.'

c. [*us*]$_{\text{Foc}}$-**ai**-le-**nai** kerā kʰāyo
3SG-**NAI**-ERG-**NAI** banana ate
'*He* ate a banana.'

Moreover, NAI is compatible with many more categories, including numerals (10-11), DPs quantified with *sabai* 'all' and *harek* 'each' (12-13) (though not *harek* itself (13)), demonstratives (14-15), and adverbs (16-17):

(10) a. us-le syāu [*āṭʰ*]$_{\text{Foc}}$-**ai** kʰāyo
3SG-ERG apple eight-**NAI** ate
'He ate *eight* apples.'

b. us-le syāu [*āṭʰwa-ṭ*]$_{\text{Foc}}$-**ai** kʰāyo
3SG-ERG apple eight-CLF-**NAI** ate
'He ate (all) *eight* apples.'

(11) us-le [*eu-ṭ*]$_{\text{Foc}}$-**ai** syāu kʰāyo
3SG-ERG single-CLF-**NAI** apple ate
'He ate a *single* apple.'

(12) kerā-cāhĩ sabai kʰā-eko hoina, [*syāu*]$_{\text{Foc}}$-**nai** sabai kʰāyo
banana-CONTRTOP all eat-PST.PTCP COP.NEG apple-**NAI** all ate
'(He) didn't eat all the bananas, (he) ate all the *apples*.'

(13) harek-(***nai**) [*syāu*]$_{\text{Foc}}$-**nai** k^{h}āyo
each-**NAI** [apple]-**NAI** ate
'(He) ate each *apple*.'

(14) ma us-lāi [***tyahi***]$_{\text{Foc}}$ dinc^{h}u
1SG 3SG-DAT DEM.**NAI** give
'I'll give him *that*.'

(15) ma us-lāi [***tyahi***]$_{\text{Foc}}$ sāmān dinc^{h}u
1SG 3SG-DAT DEM.**NAI** stuff give
'I'll give him *that* stuff.'

(16) ma [*bistārai*]$_{\text{Foc}}$-**nai** gaẽ
1SG slowly-**NAI** went
'I went *slowly*.'

(17) ma [***hijai***/*hijo*]$_{\text{Foc}}$-**nai** gaẽ
1SG yesterday.**NAI**/yesterday-**NAI** went
'I went *yesterday*.'

NAI may also readily attach to non-finite verb forms:

(18) John-le syāu [*k^{h}ā-eko*]$_{\text{Foc}}$-**nai** ho
John-ERG apple eat-PST.PTCP-**NAI** AUX
'John *ate* an apple.'

Although this example shows V focus, this placement of NAI is in fact ambiguous between V and VP focus, as the contrasts in (19) demonstrate – while (19a) compares two distinct VPs, suggesting the VP of the second clause in in focus, (19b) compares two VPs which only differ in their verb, suggesting the verb itself is in focus:

(19) a. John-le ciyā pi-eko hoina, [syāu *k^{h}ā-eko*-**nai**]$_{\text{Foc}}$ ho
John-ERG tea drink-PST.PTCP COP.NEG apple eat-PST.PTCP-**NAI** AUX
'John didn't drink tea, he *ate apples*.'

b. John-le syāu ṭip-eko hoina, (syāu) [*k^{h}ā-eko*]$_{\text{Foc}}$-**nai** ho
John-ERG apple pick-PST.PTCP COP.NEG apple eat-PST.PTCP-**NAI** AUX
'John didn't pick apples, he *ate* apples.'

Various other verbal forms are also compatible with NAI, such as infinitives (20) and adnominal participials (21), but finite verb forms do not allow it (22):

(20) ma-lāi [*jān*]$_{\text{Foc}}$-**ai** par-c^{h}a
1SG-DAT go.INF-**NAI** must-PRS
'I must *go*.'

(21) [*ga-ek*]$_{\text{Foc}}$-**ai** mānc^{h}e
go-PST.PTCP-**NAI** person
'The person who went.'

(22) * u k^{h}āna [*k^{h}āyo*]$_{\text{Foc}}$-**nai**
3SG food ate-**NAI**
'He *ate* food.'

Finally, NAI may also attach to Ps, which, similarly to NAI focus on V, is ambiguous between P and PP focus:

(23) a. tyo mānc^{h}e-ko bāre-ma hoina, tyo mānc^{h}e-ko [*lāgi*]$_{\text{Foc}}$-**nai** ho
that person-GEN about-LOC COP.NEG that person-GEN for-**NAI** COP
'It's not about that person, it's *for* that person.'

b. yo mānc^{h}e-ko lāgi hoina, [tyo mānc^{h}e-ko *lāgi*-**nai**]$_{\text{Foc}}$ ho
this person-GEN for COP.NEG that person-GEN for-**NAI** COP
'It's not for this person, it's *for that person*.'

In the cases considered so far, though we have considered a wide range of different categories, NAI has behaved equivalently in each context, applying some kind of focused interpretation to the constituent it marks. However, in two syntactic contexts this interpretation does not necessarily arise. Let us first consider attachment of NAI to adjectives:

(24) a. ma-lāi ṭ^{h}ik c^{h}a
1SG-DAT alright COP
'I'm alright.' (i.e. fine)

b. ma-lāi *ṭ^{h}ik*-**ai** c^{h}a
1SG-DAT alright-**NAI** COP
'I'm alright.' (i.e. so-so)

(25) a. John aglo cʰa
John tall COP
'John's tall.'

b. John ***aglai*** cʰa
John tall.**NAI** COP
'John's (kind of/very) tall.'

In (24b), where we would expect a strengthening effect due to NAI focusing the adjective, addition of NAI in fact appears to create a weaker reading. The same is true in (25b), although in this case the strengthened reading is also possible, and can be forced:

(26) ū ***aglai***-ta cʰa, tara tyati aglo cʰaina
3SG tall.**NAI**-CONTRTOP COP but that.much tall COP.NEG
'He's tall, but not that tall.'

This is similarly the case for other adjectives, although some such as *saberai* 'early' appear to be more likely to yield the focused reading out of context:

(27) ma [*saberai*]$_{\text{Foc}}$-**nai** uṭʰchu
1SG early-**NAI** get.up
'I get up *early*.'

Nonetheless, the availability of this weakened reading for adjectives is very much unexpected, and suggests that NAI is not always behaving as a straightforward focus marker in adjectival cases.

Even more unexpected is the behaviour of NAI with *wh*-elements, where it leads not to focus but free choice items (FCIs):

(28) ḍʰoka kʰolā rākʰjo bʰane **kohi** mānchʰe āuna sakcʰa
door open put:PST if who.**NAI** person come.INF can
'If you open the door, **anyone** can come in.'

(29) kas-**ai**-lāi die huncʰa
who-**NAI**-DAT give.INF be.ok
'It's okay to give that to **anyone**.'

(30) jas-(***ai**)-le-(**nai**) pani kʰā-na ṭʰik cʰa
whoever-**NAI**-ERG-**NAI** also eat-INF alright be
'**Whoever** eats that, it'll be fine.'

Such cases also show different restrictions on the distribution of NAI, as can be seen in (29-30). In (29) NAI is grammatical on an indirect object, in contrast with (5). Finally, in (30), which involves the free relative item *jas*, NAI is restricted to following the case marker, in contrast with (4).

These are by no means isolated examples – the phenomenon is general to the *wh*-system, as demonstrated in the paradigm below:[4]

Interrogative	**FCI**	**Ergative FCI**	**Dative FCI**
ko 'who'	**kohi** who.**NAI** 'anyone'	kas-**ai**-le who-**NAI**-ERG 'by anyone'	kas-**ai**-lāi who-**NAI**-DAT 'to anyone'
ke 'what'	**kehi** what.**NAI** 'anything'	**kehi**-le what.**NAI**-ERG 'by anything'	**kehi**-lāi what.**NAI**-DAT 'to anything'
kun 'which one'	kun-**ai** which.one-**NAI** 'any one'	kun-**ai**-le which.one-**NAI**-ERG 'by any one'	kun-**ai**-lāi which.one-**NAI**-DAT 'to any one'
kahã̄ 'where'	**kahĩ** where.**NAI** 'anywhere'	-	-
kahile 'when'	**kahilyai** when.**NAI** 'anytime'	-	-
katā 'which way'	**katai** which.way.**NAI** 'any way'	-	-

Table 5.1: NAI in the Nepali interrogative/indefinite paradigm (Joe Perry p.c.).

In conclusion, NAI has a fairly unusual distribution for a focus marker – it can attach to an extremely wide range of constituents, but has some rather specific exceptions. In particular, it appears to be incompatible with finite verbs, despite its grammaticality with non-finite forms, and often cannot occur on indirect objects.

[4] Joe Perry (p.c.) notes that the "how" terms *kasto* (adjectival 'how'), *kasari* (adverbial 'how'), *kati* 'how much', and *katro* 'how big' do not undergo the same alternation, instead being used bare as indefinites. However, with the possible exception of *kasto*, they may all be focused with the NAI construction, yielding exclamative readings. In 7.3.4 I tentatively suggest such terms may have a distinct semantic representation – see ch.7, footnote 5.

Finally, and most importantly for the following chapters, in two cases it behaves unlike a focus marker – with adjectives, and with *wh*-expressions. However, we have yet to consider in any detail its semantic behaviour *as* a focus marker, which is the subject of the following section.

5.3 Semantic tests applied to NAI focus.

Out of the tests in chapter 4, we have already seen the results of QAC in (1-3) – both intonational focus and NAI focus may be used in response to *wh*-questions, but the latter is significantly more marked and dispreferred without context. The remaining tests are applied below.

5.3.1 "Out-of-the-blue" responses. (OOTB)

NAI focus is infelicitous in response to "out-of-the-blue" question for both intransitive (31) and transitive responses (32). Response B' of (31) shows the importance of context – if Ramesh's penchant for falling is incorporated into the background information, then NAI focus once again becomes acceptable. Note that the third person pronoun in (32) suggests some prior context, but is possible without if used ostensively.

(31) A: What happened?

B: Rameś laḍyo
Ramesh fell
'Ramesh fell.'

\# B': [*Rameś*]$_{\text{Foc}}$-**ai** laḍyo (unless Ramesh is known to be prone to falling)
Ramesh-**NAI** fell
'*Ramesh* fell.'

(32) A: What happened?

B: us-le kʰānā kʰāyo
3SG-ERG food ate
'He ate food.'

\# B': [*us*]$_{\text{Foc}}$-**ai**-le kʰānā kʰāyo
3SG-**NAI**-ERG food ate
'*He* ate food.'

5.3.2 Correction of a statement. (CORR)

NAI focus is possible in corrections, but with somewhat questionable felicity (33, response B). Response B' shows the preferred correction, which is also potentially possible with purely intonational focus, although my informant indicated that presence of *mātrai* 'only' is desirable.

(33) A: Rameś-ko syāu c^{h}a?
Ramesh-POSS apple COP
'Does Ramesh have apples?'

#? B: c^{h}aina, Rameś-ko [*nāspatī*]$_{\text{Foc}}$-**nai** c^{h}a
COP.NEG Ramesh-POSS pear-**NAI** COP
'No, Ramesh has pears.'

B': c^{h}aina, Rameś-ko [*nāspatī*]$_{\text{Foc}}$ #?(mātrai) c^{h}a
COP.NEG Ramesh-POSS pear only COP
'No, Ramesh only has pears.'

5.3.3 Syntagmatic contrast. (SYNCON)

NAI foci can readily be placed in syntagmatic contrasts, as shown in (34) for object DP focus, and (35) for verbal focus:

(34) John-le [*syau*]$_{\text{Foc}}$-**nai** k^{h}ā-eko ho, nāspatī k^{h}ā-eko hoina
John-ERG apple-**NAI** eat-PST.PTCP AUX pear eat-PST.PTCP COP.NEG
'John ate *apples*, he didn't eat pears.'

(35) John-le syāu [*ṭip-eko*]$_{\text{Foc}}$-**nai** ho, khā-eko hoina
John-ERG apple pick-PST.PTCP-**NAI** AUX eat-PST.PTCP COP.NEG
'John *picked* apples, he didn't eat them.'

5.3.4 Contrast in a discourse. (DISCCON)

Moreover, when the contrast is paradigmatic and within a discourse, NAI focus is completely acceptable, suggesting it does not exclude alternatives, despite being more marked than intonational focus:

(36) Rameś kinmel garna gayo … [*Rameś-le*]$_{\text{Foc}}$-**nai** sāmān kinyo
Ramesh shopping do.INF went Ramesh-ERG-**NAI** stuff bought
'Ramesh went shopping … *Ramesh* bought stuff.'

5.3.5 Exactness of numerals. (NUMEXACT)

Nonetheless, numerals appear to become exact when marked with NAI focus (37), even though this is thought to be a feature of exhaustive foci:

(37) a. us-le aṅgur [*aṭʰ*]$_{\text{Foc}}$-**ai** kʰāyo
3SG-ERG grape eight-**NAI** ate
'He ate *eight* grapes.' (= exactly 8)

b. us-le aṅgur [*aṭʰ-waṭ*]$_{\text{Foc}}$-**ai** kʰāyo
3SG-ERG grape eight-CLF-**NAI** ate
'He ate *eight* grapes.' (= exactly 8, higher register)

As noted in 4.3.6, this test is somewhat difficult to carry out accurately, but my informant specifically noted that NAI fixed the number, whereas as Joe Perry (p.c.) confirms, the same is not true of intonational focus:

(38) us-le aṅgur [*aṭʰ-waṭā*]$_{\text{Foc}}$ kʰāyo
3SG-ERG grape eight-CLF ate
'He ate *eight* grapes.' (= 8 or possibly more)

5.3.6 Compatibility with even. (EVEN)

Furthermore, NAI is incompatible with *pani* 'even/also' (39a), which is also characteristic of exclusive and exhaustive foci. By contrast, *pani* is entirely acceptable with intonational foci (39b):

(39) a. * mai-le harek kura kʰāẽ [*syāu*]$_{\text{Foc}}$-**nai** pani kʰāẽ
1SG-ERG each thing ate apple-**NAI** even ate
'I ate everything, even (the) *apples*.'

b. mai-le harek kura kʰāẽ [*syāu*]$_{\text{Foc}}$ pani kʰāẽ
1SG-ERG each thing ate apple even ate
'I ate everything, even (the) *apples*.'

5.3.7 Addition of a proposition. (ADD)

However, the set defined by NAI focus can be readily extended with a further proposition (40a), which is not expected for exhaustive foci. In this respect, it behaves in the same manner as intonational focus (40b):

(40) a. John-le [*aṇḍā*]$_{\text{Foc}}$-**nai** kʰāyo (, ani māsu pani kʰāyo holā)
John-ERG eggs-**NAI** ate and meat also ate perhaps
'John ate eggs (and, perhaps, he also ate meat).'

b. John-le [*aṇḍā*]$_{\text{Foc}}$ kʰāyo (, ani māsu pani kʰāyo holā)
John-ERG eggs ate and meat also ate perhaps
'John ate eggs (and, perhaps, he also ate meat).'

5.3.8 Addition of a more likely proposition. (ADDLIKELY)

Nevertheless, when a complex context is given that makes the added proposition more likely than the one in focus, NAI focus becomes infelicitous (41a), whereas intonational focus is entirely acceptable in this environment (41b):

(41) *Context*: There is a chicken in a barn which contains both corn and potatoes. The chicken is eating potatoes, which is unexpected and so you remark on it, but it is eating corn too.

a. [*alū*]$_{\text{Foc}}$-**nai** kʰā-eko ho # (tara makkāi pani kʰā-eko ho ni)
potato-**NAI** eat-PST.PTCP AUX but corn also eat-PST.PTCP AUX PART
'(It) ate *potatoes*, but (it) also ate corn.'

b. [*alū*]$_{\text{Foc}}$ kʰā-eko ho (tara makkāi pani kʰā-eko ho ni)
potato eat-PST.PTCP AUX but corn also eat-PST.PTCP AUX PART
'(It) ate *potatoes*, but (it) also ate corn.'

5.3.9 Entailment of a smaller set. (ENTAIL)

NAI focus also patterns unlike exclusive and exhaustive foci with respect to entailments: if two coordinated DPs are marked with NAI, then this still entails the equivalent sentence with one of the DPs being dropped:

(42) [*John ra Mary-le*]$_{\text{Foc}}$-**nai** paiṇṭ kinyo
John and Mary-ERG-**NAI** trousers bought
'*John and Mary* bought trousers.'

entails

[*John-le*]$_{\text{Foc}}$-**nai** paiṇṭ kinyo
John-ERG-**NAI** trousers bought
'*John* bought trousers.'

Once again, this is the same behaviour we would expect of less marked constructions like intonational focus, and the intonational equivalent to (42) is confirmed by Joe Perry (p.c.):

(43) [*John ra Mary-le*]$_{\text{Foc}}$ paiṇṭ kinyo
John and Mary-ERG trousers bought
'*John and Mary* bought trousers.'

entails

[*John-le*]$_{\text{Foc}}$ paiṇṭ kinyo
John-ERG trousers bought
'*John* bought trousers.'

5.3.10 Correction of overcomplete statements. (OVERCOMP)

The overcomplete statement test similarly implies that NAI focus patterns away from exhaustive focus. When an initial statement involving two coordinated DPs is NAI-focused, a correcting continuation with one of the DPs is infelicitous if marked with NAI (44a). This suggests that NAI-marking the response does not distinguish it sufficiently from original statement for it to be a valid correction. Furthermore, the same infelicity is seen with intonational focus (44b), and here the response becomes felicitous if *mātrai* 'only' is used, further demonstrating the contrast with exhaustive foci.

(44) a. [*Rameś ra Lakṣmi-le*]$_{\text{Foc}}$-**nai** curoṭ kʰã̃-dai-na, …
Ramesh and Laksmi-ERG-**NAI** cigarette eat-HAB-NEG
'*Ramesh and Laksmi* don't smoke, …'

[*Rameś-le*]$_{\text{Foc}}$-**nai** curoṭ kʰã̃-cʰa
Ramesh-ERG-**NAI** cigarette eat-HAB
'*Ramesh* smokes.'

b. [*Rameś ra Lakṣmi-le*]$_{\text{Foc}}$ curoṭ kʰã̃-dai-na, …
Ramesh and Laksmi-ERG cigarette eat-HAB-NEG
'*Ramesh and Laksmi* don't smoke, …'

[*Rameś-le*]$_{\text{Foc}}$ #(mātrai) curot kʰã̃-cʰa
Ramesh-ERG only cigarette eat-HAB
'(Only) *Ramesh* smokes.'

5.3.11 Choice of conjunction. (AND, BUT, YESAND, YESBUT, NO)

Examining the choice of conjunction when adding a proposition to one involving a NAI focus yields a very unusual pattern – while *ra* 'and' is felicitous (45a), *tara* 'but' is not (45b):

(45) a. [*us*]$_{\text{Foc}}$-**ai**-le kʰāna kʰāyo (ra mai-le pani kʰānā khāẽ)
3SG-**NAI**-ERG food ate and 1SG-ERG also food ate
'*He* ate food(, and I ate food too).'

b. [*us*]$_{\text{Foc}}$-**ai**-le kʰāna kʰāyo # (tara mai-le pani kʰānā khāẽ)
3SG-**NAI**-ERG food ate but 1SG-ERG also food ate
'*He* ate food(, but I ate food too).'

This is unlike the behaviour of any of the English constructions considered in the previous section. However, when we expand these conjunction tests to those involving correction of statements, then NAI focus (46a) seems to pattern exactly like Nepali intonational focus (46b), with both behaving very differently to *mātrai* 'only' focus (46c):

(46) a. A: [*Rameś*]$_{\text{Foc}}$-**nai** laḍyo
Ramesh-**NAI** fell
'*Ramesh* fell.'

B: ho, ani Lakṣmi pani laḍyo
COP and Laksmi also fell
'Yes, and Laksmi fell too.'

B': ho, tara Lakṣmi pani laḍyo
COP but Laksmi also fell
'Yes, but Laksmi fell too.'

B'': hoina, Lakṣmi pani laḍyo
COP.NEG Laksmi also fell
'No, Laksmi fell too.

b. A: *Rameś* laḍyo
Ramesh fell
'*Ramesh* fell.'

B: ho, ani Lakṣmi pani laḍyo
COP and Laksmi also fell
'Yes, and Laksmi fell too.'

B': ho, tara Lakṣmi pani laḍyo
COP but Laksmi also fell
'Yes, but Laksmi fell too.'

B'': hoina, Lakṣmi pani laḍyo
COP.NEG Laksmi also fell
'No, Laksmi fell too.

c. A: [*Rameś*]$_{\text{Foc}}$ mātrai laḍyo
Ramesh only fell
'Only Ramesh fell.'

B: ho, ani Lakṣmi pani laḍyo
COP and Laksmi also fell
'Yes, and Laksmi fell too.'

B': ho, tara Lakṣmi pani laḍyo
COP but Laksmi also fell
'Yes, but Laksmi fell too.'

B'': hoina, Lakṣmi pani laḍyo
COP.NEG Laksmi also fell
'No, Laksmi fell too.

5.4 A distinct type of focus in Nepali?

The results of these tests applications are summarised below, which also allows for direct comparison between Nepali and the English constructions of the previous chapter:

	Eng. stress	**Nep. int.**	**Nep. NAI**	**Eng. cleft**	**Eng. *only***
QAC	yes	yes	yes (marked)	no	no
OOTB	?	-	no	no	no
CORR	yes	?	?	yes	yes
SYNCON	yes	-	yes	yes	yes
DISCCON	yes	-	yes	no	no
NUMEXACT	no	no	yes	yes	yes
EVEN	yes	yes	no	no	no
ADD	yes	yes	yes	no	no
ADDLIKELY	yes	yes	no	?	no
ENTAIL	yes	yes	yes	no	no
OVERCOMP	?	no	no	yes	yes
AND	yes	-	yes	?	no
BUT	yes	-	no	yes	no
YESAND	yes	yes	yes	?	no
YESBUT	yes	yes	yes	yes	no
NO	?	yes	yes	yes	yes

Table 5.2: Focus tests applied to several English and Nepali focus constructions.

For the tests that were carried out, it appears that Nepali intonational focus largely patterns with English stress focus, except apart from for the CORR, OVERCOMP, and NO tests, all of which involve questionable rather than absolute differences. I therefore suppose, pending more detailed investigation, that intonational focus in Nepali is the same category as English intonational focus, having simply an inclusion relationship between ord and ALT.

By contrast, Nepali NAI focus does not pattern clearly with any of the constructions considered, in some cases following the behaviour of English clefts and/or *only* focus, in others with both intonational constructions, and in the case of QAC, unlike any of the other constructions. Thus the diagnostics applied do not yet provide any clear avenue for determining the precise semantic description of NAI focus, but they do tell us that it is unlikely to be equivalent to any of the descriptions previously considered. I thus tentatively suppose that it is a distinct type of focus,

with the semantic pattern of test results seen in table 5.2 above, and perhaps also the syntactic peculiarity of unusual behaviour with adjectives and *wh*-expressions seen in section 5.2. As we will see in the following chapter, this is not the only focus construction with this syntactic behaviour, which provides a more direct insight into its analysis in chapter 7.

6. Focus Doubling in ASL, LSB, and BSL.

6.1 Introduction.

The NAI focus construction considered in the previous chapter, though having unusual semantics and some somewhat surprising distributional properties, appears to be fairly structurally simple, consisting of just a morphological marker. However, as section 3.2 attests, focus expression is by no means limited to such simple constructions, with some involving significant syntactic structure, which is far more interesting from the perspective of compositionality. One such case is from ASL:

(1) _____hn[1]
ANN [LIKE]$_{Foc}$ ICE-CREAM [*LIKE*]$_{Foc}$
'Ann really *likes* ice-cream.'

(ASL, repeated from ch.3:34)

Doubling structures are crosslinguistically common in sign languages, although they do not always have the same syntactic properties (see Zeshan 2004:24, Šarac et al. 2007:215-220). We have already seen an analysis of (1) in 3.3.3 – the tree in (ch.3:73). However, in this chapter, I consider the properties of this construction in far more detail, comparing it to similar structures in LSB and BSL. From a syntactic perspective, the idiosyncratic behaviour of these constructions with *wh*-elements and (in the case of BSL) adjectives is reminiscent of Nepali NAI focus. Furthermore, both focus doubling and NAI-marking appear to encode a similar semantic type of focus. This investigation thus sets the stage for a compositional analysis of all these constructions, which is the subject of chapter 7.

[1] Petronio (1993:167, fn.4) notes that "the form of the final double is often articulated with more muscle tension than the citation form of the sign, particularly when the double is used for emphasis." Quadros & Lillo-Martin (2010:605, fn. 10) point out the same for LSB as well as ASL, and further note that a range of non-manuals are also associated with this final double, to which they give the cover term "E-Foc." However, Petronio (1993), Petronio & Lillo-Martin (1997), Quadros (1999), Lillo-Martin & Quadros (2005, 2008), Nunes & Quadros (2005, 2008), Sandler & Lillo-Martin (2006) do not gloss any non-manuals that are uniquely used for the doubled element. Nonetheless, it is clear that there is at least some emphasis associated with this final element, and so I mark this with italics, as in the spoken language examples. Wilbur (1994b, 1997 1999) argues that ASL always has a fixed stress in final position, and so it is not obvious that this emphasis is specific to the doubling construction.

Section 6.2 provides an overview of focus doubling in ASL and LSB, beginning with its syntactic properties, then considering its semantics, and finally reviewing a syntactic analysis of the phenomenon. Section 6.3 then introduces a comparable construction in BSL, concluding that it plays a similar semantic role to doubling in ASL/LSB, which is partially supported by semantic investigation of another BSL focus construction (section 6.4). Section 6.5 outlines possible syntactic analyses and some difficulties that arise. Section 6.6 concludes, summarising the key properties of the doubling construction in each variety.

6.2 Focus doubling in ASL and LSB.

6.2.1 Syntactic properties.

As (1) demonstrates, unlike Nepali NAI focus, ASL focus doubling may readily apply to finite verbs. However, it is far from limited to verbal focus. The structure was first investigated in detail by Petronio (1993) (though see also Kegl's 1977 "bracing constructions"), who notes that a wide range of elements can double, including modals (2), verbs (1, 3), quantifiers (4), negatives (5), and even *wh*-items (6):

(2) a. _____neg
ANN [CAN'T]$_{Foc}$ READ [*CAN'T*]$_{Foc}$
'Ann *can't* read.'

b. _____q
ANN [WILL]$_{Foc}$ LEAVE [*WILL*]$_{Foc}$
'Will Ann go?'

(ASL, (a) Petronio 1993:135; (b) repeated from (ch.3:48c))

(3) _____t _____hn
BOOK, ANN$_a$ [WANT]$_{Foc}$ READ [*WANT*]$_{Foc}$ INDEX$_a$[2]
'As for the book, Ann really wants to read it.'

(ASL, Petronio 1993:133)

[2] Subject pronouns commonly occur sentence-finally in ASL (Liddell 1980, Padden 1988, Petronio 1993), as seen in (i-ii) below. Petronio (1993:31) states that these pronouns are sometimes "used to emphasize the subject or confirm the statement," but may "also [appear] after neutral sentences without any apparent confirmation use or emphasis on the subject."

(i) _____hn
NANCY$_a$ HOPE INDEX$_2$ BUY COMPUTER INDEX$_a$
'Nancy hopes you buy the computer (she).'

(ii) ___t _____hn
c-a-r ANN$_a$ WANT INDEX$_a$
'As for the car, Ann wants it (she).'

(ASL, Petronio 1993:29, 32)

Petronio (1993:28-33) analyses these neutral cases as subject clitics adjoined to a head-final C, but the analyses we shall consider below assume a head-initial C. It is possible that they are extra-sentential elements, being identified as "tags" by Neidle et al. (2000), although the definition of "tag" used by these researchers is much broader, also including all final non-*wh* doubles. See Sandler & Lillo-Martin (2006:425-427) for a critique of this approach, but also a suggestion that tags may be necessary in some cases, especially when there is a pause before the pronoun.

(4) E-foc
INDEX$_1$ HAVE [TWO]$_{Foc}$ CAR [*TWO*]$_{Foc}$
'It's *two* cars that I have.'
(ASL/LSB, Quadros & Lillo-Martin 2010:239)

(5) a. JOHN [NOTHING]$_{Foc}$ FIND PAPER [*NOTHING*]$_{Foc}$
'John did not find any paper.'

b. JOHN [NEVER]$_{Foc}$ EAT FISH [*NEVER*]$_{Foc}$
'John won't eat fish.'

(ASL, (a) Wood 1999:63 via Sandler & Lillo-Martin 2006:418;
(b) repeated from (ch.3:48d))

(6) whq E-foc
[WHO]$_{Foc}$ BUY c-a-r [*WHO*]$_{Foc}$
'Who was it that bought the car?'

(ASL/LSB, Quadros & Lillo-Martin 2010:240, see also Petronio 1993:134)

There are nevertheless several restrictions on ASL doubling. For instance, in direct *wh*-questions, only the *wh*-element may double:

(7) a. whq
[WHO]$_{Foc}$ WILL BUY HOUSE [*WHO*]$_{Foc}$
'Who will buy a house?'

b. whq
* WHO [WILL]$_{Foc}$ BUY HOUSE [*WILL*]$_{Foc}$
(ASL, Petronio 1993:137)

Furthermore, as noted in 3.2.8, the double must be of a head, and not of a phrase:

(8) a. hn
* INDEX$_1$ [LIKE ICE-CREAM]$_{Foc}$ [*LIKE ICE-CREAM*]$_{Foc}$
'I *like* ice cream.'

b. hn
* ANN [WANT LEAVE]$_{Foc}$ [*WANT LEAVE*]$_{Foc}$
'Ann *wants* to go.'

(ASL, (a) Petronio 1993:135; (b) repeated from (ch.3:48e))

Petronio (1993) also shows that doubling cannot occur across syntactic islands, such as relative clauses (9a) and *wh*-islands (9b), suggesting that the structure is derived by movement.

(9) a. _____r
* WOMAN [WILL]$_{Foc}$ COME TOMORROW NAMED s-u-e [*WILL*]$_{Foc}$
'The woman who will come tomorrow is named Sue.'

b. _____hn
* MOTHER CURIOUS WHO [WILL]$_{Foc}$ SHOW-UP [*WILL*]$_{Foc}$
'(My) mother is curious who will show-up.'

(ASL, Petronio 1993:136-137; (a) trans. Sandler & Lillo-Martin 2006:419)

Finally, with the exception of sentence-final pronouns as in (3) (see footnote 2), "the double occurs at the end of the sentence, [and] there is only one double per sentence." (Petronio 1993:135) As a result, though subclause elements may double when this does not incur island violations (10a), this cannot be combined with doubling of another element (10b). Moreover, relative clause island violations such as (8) cannot be rescued by confining the doubling to that clause, since the double must occur at the end of the sentence (10c). This uniqueness and sentence-finality of the double suggests that ASL doubling is a process restricted to the matrix clause, though it may clearly target elements within subclauses.

(10) a. _____hn
INDEX$_1$ FEEL INDEX$_3$ [WILL]$_{Foc}$ WIN [*WILL*]$_{Foc}$
'I feel he will win.'

b. _____hn
* INDEX$_1$ [FEEL]$_{Foc}$ INDEX$_3$ [WILL]$_{Foc}$ WIN [*WILL*]$_{Foc}$ [*FEEL*]$_{Foc}$
'I feel he will win.'

c. _____r
* WOMAN [WILL]$_{Foc}$ COME TOMORROW [*WILL*]$_{Foc}$ NAMED s-u-e
'The woman who will come tomorrow is named Sue.'

(ASL, Petronio 1993:136; (c) trans. Sandler & Lillo-Martin 2006:419)

LSB also exhibits an extremely similar construction, originally described by Quadros (1999), which, as with ASL, occurs with modals (11), verbs (including when finite) (12), quantifiers (13), negatives (14), *wh*-items (15), and adverbs[3] (16):

[3] Quadros & Lillo-Martin (2010:241) state that ASL also allows for adverb doubling, but do not give examples.

(11) hn
INDEX$_1$ [CAN]$_{Foc}$ GO PARTY [*CAN*]$_{Foc}$
'I really *can* go to the party.'

(LSB, Quadros 1999:212, trans. Quadros & Lillo-Martin 2010:239)

(12) hn
INDEX$_1$ [LOSE]$_{Foc}$ BOOK [*LOSE*]$_{Foc}$
'Indeed I *lost* the book.'

(LSB, Quadros 1999:213, trans. Quadros & Lillo-Martin 2010:240)

(13) E-foc
INDEX$_1$ HAVE [TWO]$_{Foc}$ CAR [*TWO*]$_{Foc}$
'It's *two* cars that I have.'

(ASL/LSB, repeated from (4), see also Quadros 1999:213)

(14) neg neg
INDEX$_1$ [NO]$_{Foc}$GO PARTY [*NO*]$_{Foc}$
'I absolutely did *not* go to the party.'

(LSB, Quadros 1999:213, trans. Quadros & Lillo-Martin 2010:240)

(15) whq E-foc
[WHO]$_{Foc}$ BUY c-a-r [*WHO*]$_{Foc}$
'Who was it that bought the car?'

(ASL/LSB, repeated from (6))

(16) hn
[YESTERDAY]$_{Foc}$ INDEX$_3$ BUY CAR [*YESTERDAY*]$_{Foc}$

(LSB, Quadros 1999:213, no trans. given)

The constructions in LSB are therefore extremely similar to those in ASL, with two examples (4/13, 6/15) being identical to those in ASL, and Quadros & Lillo-Martin (2010:239) in fact claiming that all of (11-16) are grammatical in both languages. However, the non-manual marking is somewhat different in LSB, with Quadros & Lillo-Martin (2010:241; 605, fn.10) noting that unlike in ASL, it "is intensified after the double element is pronounced[, and] extends beyond the manual sign."

Despite this difference, LSB has similar restrictions on doubling to ASL: only heads may double (17), and doubling cannot occur across relative (18a) and *wh*- (18b) islands.

(17) hn
* JOHN [BUY CAR]$_{Foc}$ YESTERDAY [*BUY CAR*]$_{Foc}$
'Yesterday, John *bought* a car.'

(LSB, Nunes & Quadros 2005:465)

(18) a. r
* GIRL BICYCLE [FALL]$_{Foc}$ IS HOSPITAL [*FALL*]$_{Foc}$
'The girl that fell off the bicycle is in the hospital.'

b. wonder wh-e hn
* INDEX$_1$ WANT KNOW WHO [MEET]$_{Foc}$ INDEX$_{DET}$ MARY [*MEET*]$_{Foc}$
'I want to know who met Mary.'

(LSB, Quadros 1999:222, 224)

Nevertheless, there are some clear syntactic differences. Whereas ASL bans non-*wh*-doubling in all direct *wh*-questions, LSB allows it when the *wh*-sign is *in-situ* (19a), but not when it is left-peripheral (19b):

(19) a. focus
JOHN [WILL]$_{Foc}$ BUY BOOK WHEN [*WILL*]$_{Foc}$
'When *will* John really buy the book?'

b. whq
* WHEN JOHN [WILL]$_{Foc}$ BUY BOOK [*WILL*]$_{Foc}$
'When in fact *will* John really buy the book?'

(LSB, Nunes & Quadros 2005:472)

Finally, LSB permits doubling within matrix clauses (20a), subclauses (20b), and even both at once (20c). This contrasts with ASL, which allows only one double per sentence (10).

(20) a. hn
INDEX$_1$ [WOULD-LIKE]$_{Foc}$ PAY HOUSE [*WOULD-LIKE*]$_{Foc}$

b. hn
INDEX$_1$ WOULD-LIKE [PAY]$_{Foc}$ HOUSE [*PAY*]$_{Foc}$

c. hn
INDEX$_1$ [WOULD-LIKE]$_{Foc}$ [PAY]$_{Foc}$ HOUSE [*PAY*]$_{Foc}$ [*WOULD-LIKE*]$_{Foc}$
'I would like to pay for the house.'

(LSB, adapted from Quadros 1999:227, Sandler & Lillo-Martin 2006:424)

Despite these syntactic differences, ASL and LSB exhibit closely analogous doubling structures, which have been analysed as nearly equivalent (e.g. Nunes & Quadros 2008, Quadros & Lillo-Martin 2005, 2008, 2010). However, before considering these analyses, I first turn to the semantic properties of the doubling construction.

6.2.2 Semantic properties.

The English translations of the above examples use a mixture of stress focus, clefts, intensifiers and other periphrases to express the semantics of focus doubling, but there seems to be a general agreement that these structures have a specifically emphatic reading. Petronio (1993:130-131) describes the effect of ASL doubling as being "similar to the emphasis a stressed word receives in English," with doubled elements having "a stronger, more emphatic interpretation than […] neutral," and some cases "call[ing] attention to the doubled sign and mak[ing] that particular sign the focus of the sentence." Lillo-Martin & Quadros (2005, 2008) consider ASL and LSB doubling, and argue that they both involve emphatic focus (following Zubizarreta 1998:44-45), which they describe as focus which is "used to negate or affirm information previously presented." (Lillo-Martin & Quadros 2008:164) They suggest this emphatic function is expressed intonationally in English, giving the following examples:

(21) a. A: Someone lied to you.
B: *Nobody* lied to me.

b. A: I think Mary lied to you.
B: You are right; Mary *did* lie to me.

c. A: You read both books?
B: Yes, I read *both* books.

d. Put the book *under* the table.

e. *Those* students passed the test.

f. We will *af*firm our rights and *con*firm our goals.

(English, (a-b, d-f) Lillo-Martin & Quadros 2008:164; (c) 2005:366)

By contrast, they argue that in ASL and LSB, doubling is specifically reserved for the expression of this function, suggesting that it is used "to emphasize or make more prominent the final/doubled element," giving (22a), where "the doubling would be used to emphasize John's ability to read," and noting further that "in the case of WH-questions, doubling makes the question more insistent" (Lillo-Martin & Quadros 2008:167), e.g. (22b).

(22) a. hn
JOHN [CAN]$_{Foc}$ READ [*CAN*]$_{Foc}$
'John really *can* read.'

b. whq
[WHAT]$_{Foc}$ JOÃO BUY [*WHAT*]$_{Foc}$
'*What* was it that John bought?'

(ASL/LSB, Lillo-Martin & Quadros 2008:168)

They further show that unlike English intonational focus, ASL/LSB focus doubling does not take part in question-answer correspondences, showing that answers to questions either occur *in-situ* (23a-b, B') or in a fronted position along with a specific non-manual marker (23a-c, B).[4]

[4] Following Neidle (2002), Lillo-Martin & Quadros (2008:169) equate this marker with the "tm1" marker of Aarons (1994), described by Quadros & Lillo-Martin (2010:242-243) as involving "raised brows and a prosodic break before the rest of the utterance" in both languages. "I-focus" abbreviates information focus.

(23) a. A: WHAT YOU READ?
'What did you read?'

B: _____ I-focus
[BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'I read *Stokoe's book*.'

B': INDEX$_1$ READ [BOOK STOKOE]$_{Foc}$
'I read *Stokoe's book*.'

b. A: WHAT INDEX$_2$ READ INDEX SCHOOL?
'What did you read at school?'

B: _____ I-focus _____ top
[BOOK STOKOE]$_{Foc}$, INDEX SCHOOL, INDEX$_1$ READ
'At school, I read *Stokoe's book*.'

B': _____ top
INDEX SCHOOL, INDEX$_1$ READ [BOOK STOKOE]$_{Foc}$
'At school, I read *Stokoe's book*.'

c. A: FRUIT, WHAT JOHN LIKE?
'As for fruit, what does John like?'

B: ____ t-c ____ I-focus
FRUIT, [BANANA]$_{Foc}$, JOHN LIKE MORE
'As for fruit, John likes *bananas* best.'

(ASL/LSB, Lillo-Martin & Quadros 2008:169-170)

Additionally, they point out that a distinct but similar kind of focus marker is used in "contrastive" contexts, also involving fronting, but a different non-manual marker.[5]

(24) A: INDEX$_2$ READ CHOMSKY BOOK?
'Did you read Chomsky's book?'

B: _____ C-focus
NO, [BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'No, I read *Stokoe's book*.'

(ASL/LSB, Lillo-Martin & Quadros 2008:170)

Once again following Zubizarreta (1998), Lillo-Martin & Quadros (2008) argue that both information focus (23) and contrastive focus (24) involve a quantifier-variable relationship, consisting of an existential presupposition introducing a

[5] This marker is termed "C(ontrastive)-focus," and described as having "a more stressed non-manual marker associated with it." (Lillo-Martin & Quadros 2008:170) Photographs of both markers are given for LSB on their p. 169.

variable and a second statement quantifying this variable. This second quantifying statement is said to differ for information (25) and contrastive (26) focus:

(25) a. A: Who ate a pie?
B: [*John*]$_{\text{Foc}}$ ate a pie.

b. presupposition: there is an x, such that John ate x
quantification: the x, such that John ate x = the pie

(26) a. A: John is wearing a blue shirt.
B: No, John is wearing [*a red shirt*]$_{\text{Foc}}$.

b. pres.: there is an x, such that John is wearing x
quant.: it is not the case that the x (such that John is wearing x) = a blue shirt & the x (such that John is wearing x) = a red shirt

(English, Zubizarreta 1998:5, 7, Quadros & Lillo-Martin 2008:163-164)

Meanwhile, "[i]n the case of emphatic focus, there is no quantifier-variable relationship," distinguishing it from contrastive focus, because "emphasis can affect units which cannot enter into quantifier-variable relationships." (Lillo-Martin & Quadros 2008:164) Zubizarreta (1998:44) assumes that "variables range solely over propositions, phrasal arguments such as DPs and PPs, and predicates such as VPs and APs, but not over prepositions, functional categories (such as auxiliaries and determiners), and subparts of words (such as affixes)." The restriction of focus doubling to heads is taken as further support for this construction not involving a quantifier-variable relationship (Lillo-Martin & Quadros 2008:164).

This approach to focus is rather different to the Roothian perspective taken so far. In alternative semantics, quantifier-variable dependencies are not necessary for the construction of focus semantics due to the distinction made between focus denotations and ordinary denotations, and furthermore there is no restriction on the type of element that may be focused – it merely needs to have a denotation. Moreover, focus semantics need not be derived by movement, and in some cases, it arguably cannot be, as in the below example, where focus association occurs across

a syntactic island (though see e.g. Drubig 1994 for a solution involving pied-piping):

(27) They **only** investigated [the question of whether you know the woman who chaired [the *zoning board*]$_{\text{Foc}}$].

(i.e. they didn't investigate the question of whether you know the woman who chaired {the school board, the advisory board, the regulatory board, …}.)

(English, Kratzer 1991:828)

Thus from this perspective it is not possible to distinguish contrastive focus from emphatic focus simply on presence/absence of a quantifier-variable relationship, and we shall see below that there are good syntactic reasons for the restriction of focus doubling to heads.

Moreover, the distinction made between information and contrastive focus is also problematic to translate into a Roothian framework. The analysis of contrastive focus in (26) appears to explicitly exclude alternatives, making it weakly exclusive in the sense of van der Wal (2014), and suggesting a description such as the following:

(28) ord = base & $\exists p \in ALT, \neg true(p)$

However, the English example of contrastive focus given involves only stress focus, and so it is expressed using the same apparent construction as information focus, which was given the simple analysis of ord = base in (ch.3:94) above. Since these contrastive foci appear to be instances of the same construction, the null hypothesis would be to assume that the differences in interpretation arise not from semantically encoded distinctions, but from pragmatic effects arising from the environment in which they are used. This is discussed in 3.4.3 above, following Beaver & Clark's (2008) adaptation of Roberts' (1996) "current question" approach, where different uses of the same simple focus construction can lead to different interpretations, as the focus may correspond to distinct (and potentially implicit) questions. It therefore makes most sense to treat both "contrastive" focus and "information" focus in English as differing instances of the same stress focus

construction, perhaps with subtly different intonational profiles signalling different underlying questions.

We can now return to the same distinction in ASL/LSB, where we in fact see exactly the same thing – both information focus and contrastive focus make use of the same fronting construction, but with slightly different non-manual markings in each case. If we make the assumption that non-manual markings in signed languages correspond to aspects of prosody in spoken languages (e.g. Reilly et al. 1990, Wilbur 1991, Sandler & Lillo-Martin 2006:257-265, 459-470), then the situation is just as in English, only with a construction involving fronting to a specific intonational position rather than stress. Thus information and contrastive focus in ASL/LSB can be viewed as flavours of the same construction, and given its unmarked semantics and its usage in question-answer correspondences, we can suppose it has the description ord = base. Focus doubling therefore remains distinct from (23-24), being restricted to "emphatic" contexts in addition to its syntactic disparity, but the semantic distinction is altered from Lillo-Martin & Quadros (2008).

We might then wonder if focus doubling has semantics that are exhaustive in some way, such as the cleft and *only* focus of English that we considered in chapter 4. However, these structures do not match the emphatic description given by Petronio (1993) and Lillo-Martin & Quadros (2005, 2008), and also don't occur in the English environments for emphatic focus given in (21). Moreover, doubling structures are only occasionally translated with clefts, and never with *only*. Finally, there are a number of focus constructions documented in ASL that seem much more comparable in their semantics to English cleft and *only* focus.[6]

[6] One possible construction of this type that I do not consider further is clefted postnominal *THAT*, which appears in response to echo questions:

(i) A: You told *who*?
B: ____lb
[KAY]$_{Foc}$ **THAT**, TOLD FINISH
'It was *Kay* who I told.'

(ASL, Wilbur 1997:95)

Firstly, ASL has a clear counterpart of *only*:

(29) KNOW WHAT? **ONLY-ONE** [KIM]$_{\text{Foc}}$ GET-A
'Know what? Only Kim got an A.'

(ASL, Wilbur 1994a:659)

Secondly, ASL also exhbits a "rhetorical question" construction, which we previously saw in (ch.3:33):

(30) a. _____br ____hn
CHAIR PAINT WHO, [*l-e-e*]$_{\text{Foc}}$
'The one who painted the chair was Lee.'

b. _____br
d-o-n CUT WHERE, [*f-o-o-t*]$_{\text{Foc}}$
'It was his *foot* where Don got cut.'

c. _____br
d-o-n CUT WHERE, [*GARAGE*]$_{\text{Foc}}$
'Where Don cut something/got cut was in the garage.'

d. _____br
j-o-h-n THINK WHAT, [*b-i-l-l THIEF*]$_{\text{Foc}}$
'What John thinks is that Bill is a thief.'

(ASL, (a) repeated from (ch.3:33); (b-d) Wilbur 1994a:654-655)

These constructions have been variously analysed as pseudoclefts (Petronio 1991, Wilbur 1994a, 1996, Grolla 2004), discourse-level question-answer pairs (Hoza et al. 1997), and copular clauses combining interrogative and declarative clauses (Caponigro & Davidson 2011). However, it seems likely that whatever the correct analysis of the construction, it has some information structural complexity, with Petronio (1991) and Caponigro & Davidson (2011) noting it exhibits exhaustivity in some contexts. This is demonstrated by the infelicity of (31a): it appears that the list of purchased items must be complete.

Wilbur (1997:92) notes that Susan Fischer (via p.c.) suggests this structure is equivalent to English *it*-clefts, but it is far from clear that the semantics are comparable, despite the translation in (i). See Wilbur (2012:474-476) for an argument that *THAT* marks completive focus. Moreover, Caponigro & Davidson (2011:347) take *FINISH* to be a truth-conditional exhaustivity marker, as seen in (ii), which may account for some of the marked semantics of (i).

(ii) INDEX$_3$ BUY [BOOK]$_{\text{Foc}}$ **FINISH**
'She bought the book and nothing else.'

(ASL, Caponigro & Davidson 2011:347)

(31) *Context:* Meg bought the contextually salient book and CD.

a. # MEG BUY WHAT, [BOOK]$_{Foc}$
'The thing/What Meg bought is the book.'

b. MEG BUY WHAT, [BOOK, CD]$_{Foc}$
'The things/What Meg bought are/is the book and the CD.'

(ASL, Caponigro & Davidson 2011:347)

Finally, Abner (2011a, b) considers ASL final *wh*-constructions (32) in detail, arguing that they have the semantic properties of *wh*-clefts, as indicated in the translations.

(32) a. whq
WIN WHO
'Who is it that won?'

b. whq
INDEX$_2$ EAT(cont.) YESTERDAY WHAT
'What is it that you kept eating yesterday?'

c. whq
JOHN LIVE WHERE
'Where is it that John lives?'

(ASL, Abner 2011b:28-29)

While Neidle et al. (2000) argue that these structures are instances of rightward movement, Abner (2011a, b) demonstrates that their meaning is more characteristic of clefts, since they have a number of cleft-like properties including exhaustivity (33), existential presupposition (34), and contrastivity (35).

(33) a. A: MARY$_i$ BUY FOR JOHN WHAT
'What is it that Mary bought John?'

B: INDEX$_3$ BUY HAT FOR JOHN
'She bought him a hat.'

C: NO, WRONG, INDEX$_3$ BUY HAT PLUS COAT FOR JOHN
'No, you're wrong, she bought him a hat and a coat.'

b. A: MARY$_a$ BUY WHAT FOR JOHN
'What did Mary buy John?'

B: INDEX$_a$ BUY HAT FOR JOHN
'She bought him a hat.'

C: NO, WRONG, INDEX$_a$ BUY HAT PLUS COAT FOR JOHN
'No, you're wrong, she bought him a hat and a coat.'

(ASL, Abner 2011b:27)

(34) *Context:* You're a teacher who expects none of your class to have done their homework.

a. # FINISH WORK WHO
'Who is it that finished the homework?'

b. WHO FINISH WORK
'Who finished the homework?'

(ASL, adapted from Abner 2011b:27)

(35) *Context:* You're sick. Bill, Sue, and John all told me they might come visit you but I had no idea who did.

a. VISIT INDEX$_2$ WHO (preferred order)
'Who is it that visited you?'

b. VISIT WHO INDEX$_2$ (grammatical but dispreferred)
'Who visited you?'

(ASL, adapted from Abner 2011b:28)

In (33), the C response is felicitous only if the B response is thought to be exhaustively identifying a set of things bought. (34) presupposes that there is no positive answer to the question, and so is incompatible with an existential presupposition. Finally, the preference for the rightward construction in (35a) suggests that final *wh*-phrases are more acceptable in contrastive contexts.

All this suggests that the rightward *wh*-construction in ASL is actually a complex kind of focus construction involving exhaustive focus.[7] Moreover, this construction is distinct from the doubling cases, with informants only attributing the emphatic reading to the latter of these, and further supported by the existence of three speakers who exhibited the rightward structure, but not *wh*-doubling constructions (Abner 2011a:28). This is in opposition with Petronio (1993), Petronio & Lillo-Martin (1997), Quadros (1999), Lillo-Martin & Quadros (2005, 2008), Quadros & Lillo-Martin (2010), Sandler & Lillo-Martin (2006), Nunes & Quadros (2005, 2008), who suppose that the rightward *wh*-constructions are in fact variants of the doubling construction. However, as Abner (2011a, b) shows, the semantics in ASL at least are in fact very different. Abner (2011a:28) further notes that "modals and sentential negation were produced most often with the modal or negative element in a right peripheral position," suggesting that this construction might also be extendable to non-*wh*-items, where similar rightward constructions have been noted alongside the doubling cases.

Summarising, I have considered the interpretation of ASL/LSB doubling structures in some detail, following Lillo-Martin & Quadros (2005, 2008) in claiming that they are emphatic, but differing from them on several points. These doubling structures have been further situated within a range of different focus constructions with different properties, shown below:

[7] LSB also exhibits a rightward *wh*-construction, with Quadros (1999) giving one example:

(i) LIKE MARY WHO (whq)
'Who likes Mary?'

(LSB, Quadros 1999:196)

Though the semantics of (i) are not clear, it appears to be less common than the other *wh*-cases, with Quadros (1999:196) only noting after a review of other *wh*-question types that "there are [also] sentences with a wh-subject at the end of the sentence." More research is clearly necessary, but for current purposes I suppose these structures are comparable to their ASL equivalents.

syntactic properties	**Lillo-Martin & Quadros (2008)**	**current analysis**	**semantic description**
I-focus + fronting	information focus	simple focus	ord = base
C-focus + fronting	contrastive focus		
doubling	**emphatic focus**	**emphatic focus**	**?**
final item		(*wh*-)cleft focus	pres. of exhaustivity?
"rhetorical question" (ASL)	-	pseudocleft focus?	pres./impl. of exhaustivity?
ONLY-ONE particle (ASL)	-	exclusive focus	ord = ∀p∈ALT, true(p) → (p = base)

Table 6.1: Focus constructions in ASL/LSB and their analyses.

Focus doubling consequently appears to be semantically intermediate in the range of ASL/LSB focus constructions, being distinct from the simplest kind of focus, but also not having the hallmarks of more complex constructions, such as semantic exhaustivity. This intermediacy invites comparison with Nepali NAI focus, which, as we saw in 5.4, sits between simple focus constructions and exhaustive/exclusive ones.

Returning to the descriptions of the semantic role of emphatic focus, it is already appropriate to claim that NAI focus "calls attention[, making the marked expression] the focus of the sentence," and it is also not unreasonable to claim that expressions marked with NAI have "a stronger, more emphatic interpretation than […] neutral." (Petronio 1993:130-131) More specifically, though, is NAI focus commonly "used to negate or affirm information previously presented"? (Lillo-Martin & Quadros 2008:164) Of the tests applied in chapter 5, the closest to this is the SYNCON diagnostic, which shows direct negation of another possibility. Example (ch.5:34) demonstrated NAI focus being used to negate a previous possibility that appears to be discourse-salient:

(36) John-le [*syau*]$_{\text{Foc}}$-**nai** kʰā-eko ho, nāspatī kʰā-eko hoina
John-ERG apple-**NAI** eat-PST.PTCP AUX pear eat-PST.PTCP COP.NEG
'John ate *apples*, he didn't eat pears.'
(Nepali, repeated from (ch.5:34))

This is similarly seen in the following cases:

(37) a. John-le ciyā pi-eko hoina, [syāu *kʰā-eko*-**nai**]$_{\text{Foc}}$ ho
John-ERG tea drink-PST.PTCP COP.NEG apple eat-PST.PTCP-**NAI** AUX
'John didn't drink tea, he *ate apples*.'

b. John-le syāu ṭip-eko hoina, (syāu) [*kʰā-eko*]$_{\text{Foc}}$-**nai** ho
John-ERG apple pick-PST.PTCP COP.NEG apple eat-PST.PTCP-**NAI** AUX
'John didn't pick apples, he *ate* apples.'

(Nepali, repeated from (ch.5:19))

(38) a. tyo mānchʰe-ko bāre-ma hoina, tyo mānchʰe-ko [*lāgi*]$_{\text{Foc}}$-**nai** ho
that person-GEN about-LOC COP.NEG that person-GEN for-**NAI** COP
'It's not about that person, it's *for* that person.'

b. yo mānchʰe-ko lāgi hoina, [tyo mānchʰe-ko *lāgi*-**nai**]$_{\text{Foc}}$ ho
this person-GEN for COP.NEG that person-GEN for-**NAI** COP
'It's not for this person, it's *for that person*.'

(Nepali, repeated from (ch.5:23))

Furthermore, (ch.5:36) from the DISCCON test appears to involve the assertion of previously presented information:

(39) Rameś kinmel garna gayo … [*Rameś-le*]$_{\text{Foc}}$-**nai** sāmān kinyo
Ramesh shopping do.INF went Ramesh-ERG-**NAI** stuff bought
'Ramesh went shopping … *Ramesh* bought stuff.'

(Nepali, repeated from (ch.5:36))

This is also the case for example (ch.5:31) of the OOTB test – when Ramesh is known to be prone to falling, the use NAI focus becomes acceptable, suggesting that here Ramesh's previously known penchant for falling is being asserted by the construction:

(40) A: What happened?

B: Rameś laḍyo
Ramesh fell
'Ramesh fell.'

B': [*Rameś*]$_{\text{Foc}}$-**ai** laḍyo (unless Ramesh is known to be prone to falling)
Ramesh-**NAI** fell
'*Ramesh* fell.'

(Nepali, repeated from (ch.5:31))

The only instance of NAI focus that does not seem to fit with these definitions of emphatic focus is from (ch.5:33), with the CORR test (section 5.3.2), where using NAI in a direct correction is only marginal:

(41) A: Rameś-ko syāu c^{h}a?
Ramesh-POSS apple COP
'Does Ramesh have apples?'

#? B: c^{h}aina, Rameś-ko [*nāspatī*]$_{\text{Foc}}$-**nai** c^{h}a
COP.NEG Ramesh-POSS pear-**NAI** COP
'No, Ramesh has pears.'

B': c^{h}aina, Rameś-ko [*nāspatī*]$_{\text{Foc}}$ #?(mātrai) c^{h}a
COP.NEG Ramesh-POSS pear only COP
'No, Ramesh only has pears.'

(Nepali, repeated from (ch.5:33))

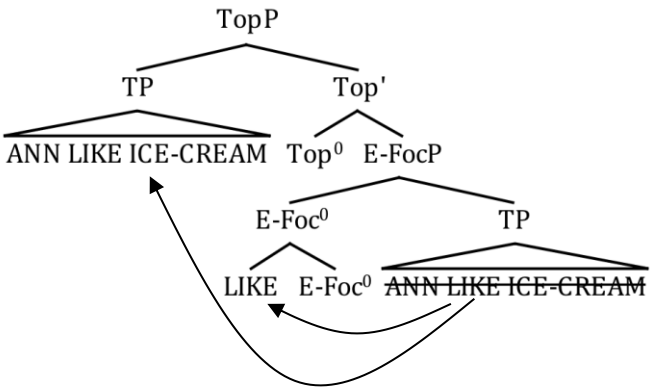
There are a number of reasons why this could be the case – for instance, the specific example involved alone might lead to the preference for *mātrai* 'only', or the use of NAI may be incompatible with the direct negation. However, interestingly, this context is much closer to the corrective focus cases seen in (24) and (26), and here it is not emphatic focus that is used, but a different construction, with both ASL/LSB and English making use of the strategy that we have described as simple focus above. As seen in (41, B'), this strategy is also marginally possible in Nepali in the corrective context given, so it may be simply that emphatic focus is used for assertive/negatory emphasis, but not for direct corrections of the sort above.

We therefore have fairly good reasons to suppose that Nepali NAI focus is semantically similar to focus doubling in ASL/LSB, in lieu of a series of tests being developed that specifically identifies emphatic focus. Syntactically, however, the two constructions are quite dissimilar. Nevertheless, we noted in 5.2 that a syntactic characteristic of NAI focus was its unusual behaviour with *wh*-items and with adjectives, and in the following subsection we shall see that *wh*-items also behave unexpectedly in ASL/LSB focus doubling.

6.2.3 Syntactic analysis.

We have already seen an analysis of ASL/LSB focus doubling in (ch.3:73), a derivation of (1):

(42)



(ASL, repeated from (ch.3:73))

This analysis is primarily developed in Nunes & Quadros (2005, 2008), though is also adopted by Lillo-Martin & Quadros (2005, 2008), Quadros & Lillo-Martin (2010). It combines aspects of the earlier doubling analyses of Petronio (1993), Petronio & Lillo-Martin (1997), and Quadros (1999), but updates them into a modern minimalist/cartographic framework, giving a more detailed explanation of the doubling involved. The analysis posits an E-Foc projection specifically associated with the emphatic doubling construction. Focused items are said to move to this position and incorporate, with the remnant TP fronting to TopP around E-FocP, as shown in (42).

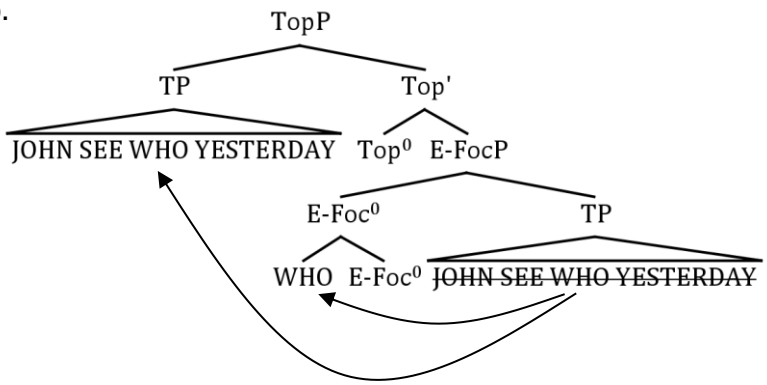
Kayne's (1994) linear correspondence axiom and Nunes' (1999, 2004) approach to linearization are additionally adopted. Under the latter of these, links in a movement chain are counted as nondistinct, leading to difficulties for antisymmetric linearization unless all but the highest copy is deleted. However, in some cases copies can become distinct, such as when they incorporate and undergo morphological fusion. The incorporation of *LIKE* into E-Foc in (42) therefore forms a *LIKE+E-Foc* complex which is distinct from other copies of *LIKE*, and so is not deleted as part of the linearization process, leading to the doubling seen.

As well as providing an elegant explanation for the doubling, this analysis also explains some other properties of the construction noted in 6.2.1 – the island sensitivity is explained as the structure is derived by movement, and the restriction of doubling to heads arises naturally, as only heads may incorporate. However, not all aspects of the analysis are quite so natural, such as the necessity of remnant TP movement to TopP to derive the correct word order, despite this TP not having clear topical properties. Lillo-Martin & Quadros (2008:171) do mention that this fronting occurs "perhaps for prosodic reasons," but it is unclear which reasons these would be, and why they would involve the TopP projection.

Nunes & Quadros (2005) concentrate largely on LSB in particular, and extend the analysis to *wh*-doubling. This is straightforward in many cases, as with the following two examples:

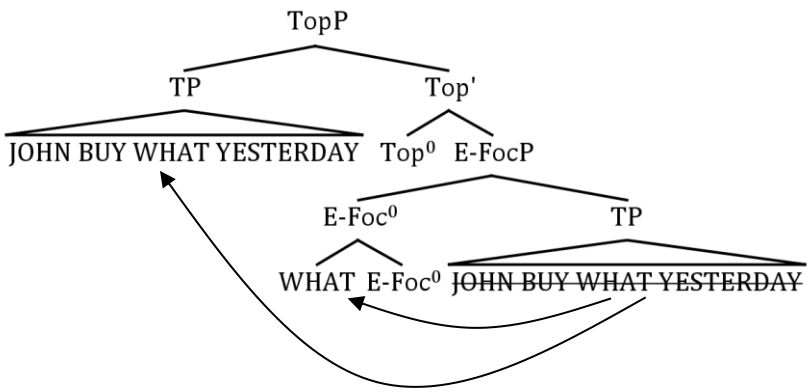
(43) a. JOHN SEE [WHO]$_{Foc}$ YESTERDAY [*WHO*]$_{Foc}$ (whq)
'Who exactly did John see yesterday?'

b.



(44) a. _____ whq ____ whq
JOHN BUY [WHAT]$_{Foc}$ YESTERDAY [*WHAT*]$_{Foc}$
'What exactly did John buy yesterday?'

b.



(LSB, adapted from Nunes & Quadros 2005:467)

However, the leftmost *wh*-sign does not always occur in the apparently *in-situ* position seen in (43-44):

(45) _____ whq ___ whq
[WHO]$_{Foc}$ JOHN SEE YESTERDAY [*WHO*]$_{Foc}$
'Who exactly did John see yesterday?'

(46) _____ whq ____ whq
[WHAT]$_{Foc}$ JOHN BUY YESTERDAY [*WHAT*]$_{Foc}$
'What exactly did John buy yesterday?'

(LSB, Nunes & Quadros 2005:468)

Such cases are described as occurring when "*wh*-duplication constructions also involve standard *wh*-movement to the left periphery," (Nunes & Quadros 2005:468). Quadros (1999:192) notes that "[i]n LSB, the WH phrases can either appear *in situ* [(47a)] or move [(47b)]."

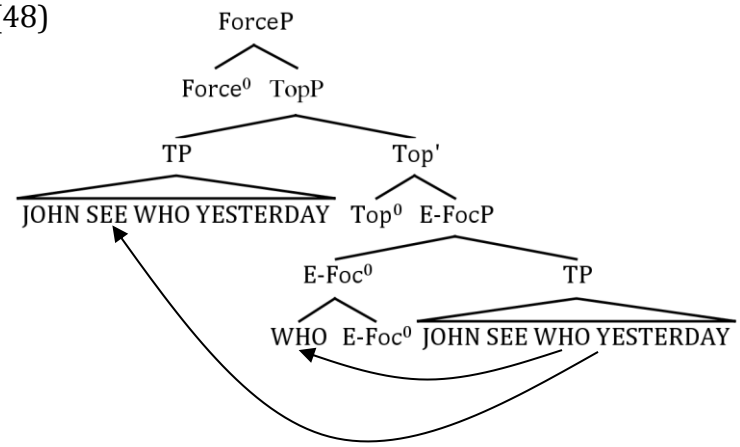
(47) a. _____ whq
INDEX$_{DET}$ JOHN LIKE WHO
'Who does John like?'

b. _____ whq
WHO INDEX$_{DET}$ JOHN LIKE
'Who does John like?

(LSB, Quadros 1999:192-193)

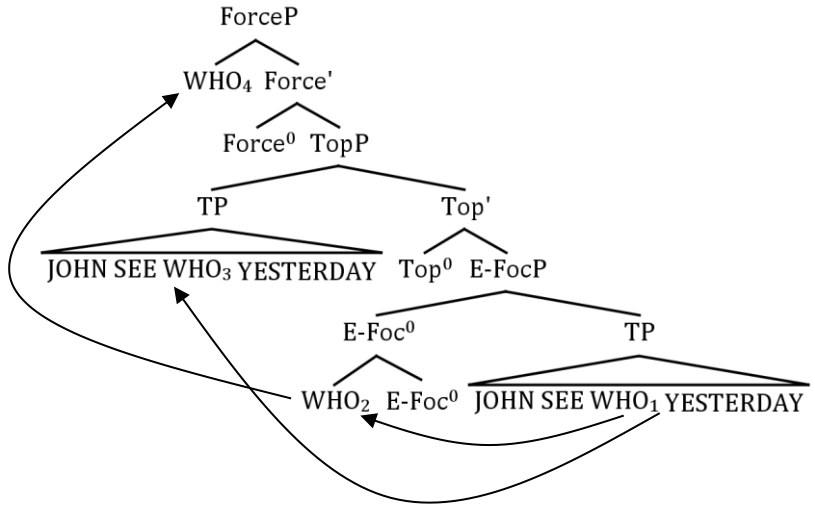
It therefore seems plausible that this optional movement may or may not be combined with doubling, resulting in the differences seen between (43-44) and (45-46). However, it is not clear how to account for this under the current analysis – if (45-46) have a derivation parallel to (43-44), as outlined in (48), then how and at what point are the *wh*-phrases fronted?

(48)



Nunes & Quadros (2005:468) propose that the left-peripheral *wh*-item is in the specifier of a higher ForceP phrase. However, they note that it is difficult to see which copy of *WHO* should be moved to this position – fronting the one in the higher TP would be a violation of a version of Ross' (1967) Left Branch Condition (LBC), or Huang's (1982) Condition on Extraction Domains (CED), and (among other reasons) the copy in the lower TP is intervened by the *WHO* attached to E-Foc. They therefore instead propose that this intervening *WHO* excorporates and moves to Spec,ForceP:

(49)



(LSB, Nunes & Quadros 2005:470)

After the formation of this structure, "a kind of parasitic gap construction is obtained with WHO_4 being able to form two 'forking' chains: CH_1 = (WHO_4, WHO_2, WHO_1) and CH2 = (WHO_4, WHO_3)," (Nunes & Quadros 2005:470). As the head of both of these chains, *WHO_4* is overt, as is *WHO_2* due to its morphological fusion with E-Foc, deriving (45). The incompatibility of non-*wh*-doubling structures with left-peripheral *wh*-expressions is viewed as evidence for this analysis:

(50) a. focus
JOHN [WILL]$_{Foc}$ BUY BOOK WHEN [*WILL*]$_{Foc}$
'When *will* John really buy the book?'

b. whq
* WHEN JOHN [WILL]$_{Foc}$ BUY BOOK [*WILL*]$_{Foc}$
'When in fact *will* John really buy the book?'

(LSB, repeated from (19))

In (49), *WHO* is emphatically focused, allowing *WHO_2* to occupy E-Foc, which provides a source for the movement to Spec,ForceP. By constrast, in (50a-b), *WILL* instead occupies E-Foc, and so there is no copy of *WHEN* that can be licitly moved to Spec,ForceP. Consequently, only (50a) is grammatical.

Structures involving the doubling of adnominal left-peripheral *wh*-elements, as in (51), are more difficult to derive:

(51) whq whq
[WHICH BOOK]$_{Foc}$ JOHN BUY YESTERDAY [*WHICH*]$_{Foc}$
'Which book exactly did John buy yesterday?'

(LSB, Nunes & Quadros 2005:473)

Nunes & Quadros (2005:473-475) argue that in such cases *WHICH* incorporates to E-Foc as usual, but the phrase *WHICH BOOK* also fronts from the lower TP, using the specifier of E-FocP as an escape hatch. Aside from being a rather complex solution, one difficulty with this approach is the conditions under which this phrasal movement is licensed, including why it is only available in the case of adnominal *wh*-phrases. While Nunes & Quadros (2005:475) argue that phrases must be emphatically focused to make use of this option, it is unclear why (51) permits two different movements to E-Foc. More generally, this account does not explain why the option of phrasal fronting rather than incorporation is not usually available.

Overall, this analysis provides a putative account of certain instances of *wh*-doubling in LSB that do not seem to follow the general case. In addition to the difficulties with adnominal cases discussed above, there are arguably some theoretical problems with the solution – for instance, the mechanics and restrictions behind the forking chain formation are not obvious, and it is unclear why *wh*-phrases are expected to front to ForceP rather than FocP, as is standard under cartographic approaches to *wh*-movement (see e.g. Rizzi 1997).

Finally, while the discussion of *wh*-behaviour in Nunes & Quadros (2008) concentrates on LSB, they note that "[s]uperficial differences aside, the analysis of *wh*-duplication developed here can arguably be extended to ASL, as well." (p.464, fn.4) Much like LSB, ASL exhibits apparently optional[8] *wh*-fronting:[9]

[8] Abner (2011a:13 fn. 3, 33-34) suggests that for some speakers at least, leftward *wh*-structures may in fact subtly differ semantically from those where the *wh*-expression is *in-situ*, though the full nature of this difference is unclear.
[9] This claim is disputed by Neidle et al. (2000), who posit that cases such as (52b) are ungrammatical, but this is in opposition to most researchers (e.g. Petronio 1993, Petronio & Lillo-Martin 1997, Abner 2011a, b), and so it seems to be the majority view that *wh*-fronting exists in ASL.

(52) a. _____ whq
JOHN BUY WHAT
'What did John buy?'

b. _____ whq
WHAT JOHN BUY
'What did John buy?'

(ASL, Petronio & Lillo-Martin 1997:26, 50)

Thus far ASL appears to behave like LSB. However, Abner (2011a:31-33) observes one significant difference: unlike in LSB, ASL *wh*-doubling structures are only grammatical with left-peripheral *wh*-phrases:[10]

(53) a. * JOHN SEE [WHO]$_{Foc}$ YESTERDAY [*WHO*]$_{Foc}$

b. [WHO]$_{Foc}$ JOHN SEE YESTERDAY [*WHO*]$_{Foc}$

(54) a. * JOHN BUY [WHICH BOOK]$_{Foc}$ YESTERDAY [*WHICH*]$_{Foc}$

b. [WHICH BOOK]$_{Foc}$ JOHN BUY YESTERDAY [*WHICH*]$_{Foc}$

(ASL, adapted from Abner 2011:32)

This is unexpected for Nunes & Quadros (2005), as if the derivation proceeds as in LSB, then there is nothing to rule out the *in-situ* structures. As well as being problematic for the Nunes & Quadros (2005) analysis in general, this also suggests that the structures in (53b, 54b) (and maybe even the LSB equivalents) may not be

[10] Not all ASL literature supports this claim, with Petronio (1993) and Lillo-Martin & Quadros (2005, 2008) giving four examples between them:

(i) ____ t _____ whq
TEST ANN FEEL [WHO]$_{Foc}$ PASS [*WHO*]$_{Foc}$
'As for the test, who does Ann think passed it?'

(ii) ___ t _____ whq
TEST TEACHER THINK [WHO]$_{Foc}$ PASS [*WHO*]$_{Foc}$
'As for the test, who does Ann think passed it?'

(iii) ____ t _____ whq
PARTY INDEX$_2$ FEEL [WHO]$_{Foc}$ SHOW-UP [*WHO*]$_{Foc}$
'As for the party, who do you think will show up?'

(iv) JOÃO BUY [WHAT]$_{Foc}$ YESTERDAY [*WHAT*]$_{Foc}$
'*What* was it that John bought?'

(ASL, (i-iii) Petronio 1993:129, 152, 162; (iv) Lillo-Martin & Quadros 2005:367, 2008: 168)

Though we might suppose these examples involve doubling within an emdedded clause, we saw in (10) above that ASL does not permit this option, and so (i-iv) seem to all involve *in-situ* doubling. However, the existence of such cases is likely due to dialectal variation, and so the varieties Abner (2011a) documents still pose the same problems for the Nunes & Quadros (2005) analysis.

as simple as a combination of *wh*-doubling and standard left-peripheral *wh*-fronting.

In conclusion, while Nunes & Quadros (2005, 2008) provide a satisfactory analysis for many of the ASL/LSB doubling cases, the remnant fronting to Spec,TopP seems fairly unmotivated. More problematically, many cases of *wh*-doubling in particular provide difficulties for consistent application of the analysis. While for LSB these are surmountable to some extent, the same solutions cannot be easily extended to ASL, suggesting that at least some *wh*-doubling structures may in fact require a different analysis altogether.

In the previous subsection it was argued that Nepali NAI focus is semantically comparable to ASL/LSB doubling; this subsection has demonstrated another similarity, unusual behaviour of *wh*-expressions. Nevertheless, NAI focus showed surprising behaviour with adjectives as well as *wh*-expressions, which we have not seen here, since neither ASL nor LSB appear to allow adjectival doubling. However, in the remaining sections of this chapter, I turn to BSL, which has a comparable doubling construction to ASL/LSB with even more unexpected *wh*-doubling behaviour, and additionally exhibits adjective doubling structures with unique properties.

6.3 Focus doubling in BSL – introduction.

The previous section considered focus doubling in ASL and LSB, but here I turn to BSL, which is in a distinct language family,[11] yet nonetheless exhibits a very similar doubling construction. This construction was originally identified by Woll (1981), who terms it "bracketing," and describes it as "the same sign appear[ing] both before and after a particular stretch of signs." (p. 142)

As with ASL and LSB, a wide range of elements can double, although this range is slightly different, appearing to include verbs (including when finite) (55), adverbials (56), nominals (57), pronouns (58a-b), *wh*-elements (59), and adjectives (60):

(55) [THINK]$_{Foc}$ p-o-p-e COME TO IRELAND [THINK]$_{Foc}$ INDEX$_2$
'Do you think the Pope will come to Ireland?'

(BSL$_1$, Woll p.c., Kyle & Woll 1985:160)

(56) [ONE-WEEK]$_{Foc}$ WORK BRISTOL [ONE-WEEK]$_{Foc}$
'(I) work in Bristol for one week.'

(BSL$_1$, Woll p.c., Woll 1981:143)

(57) [NUMBER]$_{Foc}$ TELEPHONE [NUMBER]$_{Foc}$ HAVE
'I have the telephone number.'

(BSL$_1$, Deuchar 1983:70)

(58) a. GIRL [INDEX$_3$]$_{Foc}$ RICH [INDEX$_3$]$_{Foc}$
'The girl's rich, she is.'

b. [INDEX$_1$]$_{Foc}$ DEAF [INDEX$_1$]$_{Foc}$
'I'm deaf, I am.'

(BSL$_1$, Sutton-Spence & Woll 1999:54)

(59) [WHEN]$_{Foc}$ GO HOLIDAY [WHEN]$_{Foc}$
'When will she go on holiday?'

(BSL$_1$, Woll 1981:143)

[11] ASL and LSB are often considered to both be members of the Langue des Signes Française (French Sign Language, LSF), but it is likely that in both cases LSF is only one of multiple sources (see e.g. Woodward 1978, Wittmann 1991:282, 284). Groce (1985) specifically suggests (a relation of) BSL as a source for ASL along with LSF. The relationship between ASL, LSB, and BSL is therefore not entirely clear, but none are closely related.

(60) [WHITE]$_{Foc}$ SHIRT [WHITE]$_{Foc}$
'White shirt.'

(BSL$_1$, Kyle & Woll 1985:158)

Unlike ASL/LSB, no examples of modal, quantifier, tense, or negation doubling occur in the literature, but the relatively small number of cases that have been described may mean the range could nonetheless be wider than that discussed above.

There is little discussion on the exact semantic nature of doubling in BSL, with Woll (1981:143) proposing that "the extent of the question marker [is] signalled by the bracketed 'wh-question' sign," and Kyle & Woll (1985:158) only suggesting that it "reveals the scope of the modifier" in adjectival cases. While Smith et al. (2011:67) claim that doubling is employed in *wh*-questions with "apparent free variation," Sutton-Spence & Woll (1999:69) state that *wh*-doubling "may […] occur for emphasis." They further suggest that index doubling, as in (58), is common when "the sentence is emphatic," (p. 54) which is also reflected in the glosses of (58a-b). It therefore does not seem unreasonable to hypothesise that, as in ASL/LSB, doubling leads to emphatic focus.

My own work to determine the properties of BSL doubling in more detail indicated significant dialectal variation, with my informant explicitly rejecting a number of the doubling structures described above.[12] This motivates the distinction of (at least) two varieties of BSL. I term the dialect discussed above BSL$_1$, and my informant's dialect BSL$_2$.

(61) * [THINK]$_{Foc}$ POPE COME BRISTOL [THINK]$_{Foc}$ INDEX$_2$
'Do you think the Pope will come to Bristol?'

(BSL$_2$, c.f. (55) – sign used rather than fingerspelling of 'Pope')

(62) * [ONE-WEEK]$_{Foc}$ WORK BRISTOL [ONE-WEEK]$_{Foc}$
'(I) work in Bristol for one week.'

(BSL$_2$, c.f. (56))

[12] My informant is a native bilingual BSL/English speaker of age 25-30 from Newcastle, who has participated in the St. Albans signing community for most of her adult life.

(63) * [INDEX$_1$]$_{Foc}$ LIKE ICE-CREAM [INDEX$_1$]$_{Foc}$
'I like ice-cream.'

(BSL$_2$, c.f. (58))

(64) * [WHITE]$_{Foc}$ SHIRT [WHITE]$_{Foc}$
'White shirt.'

(BSL$_2$, c.f. (145))

(65) * ANN [LIKE]$_{Foc}$ ICE-CREAM [LIKE]$_{Foc}$
'Ann likes ice cream.'

(BSL$_2$, c.f. ASL (1))

Some variants of (61) were a little more marginal, but also largely rejected:

(66) a. * [THINK]$_{Foc}$ POPE COME BRISTOL [THINK]$_{Foc}$
'Do you *think* the Pope will come to Bristol?'

b. ?? [THINK]$_{Foc}$ POPE COME BRISTOL [THINK]$_{Foc}$ YES
'I *think* the Pope will come to Bristol.'

c. ? [TRUE]$_{Foc}$ JOHN KNOW POPE COME BRISTOL [TRUE]$_{Foc}$
'John *knows* the Pope will come to Bristol.'

d. ? INDEX$_1$ GO BRISTOL [ONE-WEEK]$_{Foc}$ WORK [ONE-WEEK]$_{Foc}$
'I go to Bristol for work for *one week*.'

(BSL$_2$)

In fact, with one possible exception, the only grammatical cases of doubling found involved *wh*-doubling. Such cases are very much acceptable, and were described as being questions where the speaker really wants to know the answer, e.g. a gossip scenario, suggesting an emphatic reading:

(67) a. [WHO]$_{Foc}$ INDEX$_3$ BEEN MEET [*WHO*]$_{Foc}$[13]
'*Who* did he meet?'

b. [WHAT]$_{Foc}$ JOHN SAY [*WHAT*]$_{Foc}$
'*What* did John say?'

c. [WHO]$_{Foc}$ JOHN BEEN MEET [*WHO*]$_{Foc}$
'*Who* did John meet?'

(BSL$_2$)

The one other case of doubling I observed involved an exclusive focus particle which my informant glossed as *THAT'S-IT*, seen without doubling in (68a-b), and with doubling in (68c). This case is considered briefly in 7.3.5.

(68) a. JOHN BEEN EAT WHAT [APPLE]$_{Foc}$ **THAT'S-IT**
'Only *John* ate an apple.'

b. JOHN [APPLE]$_{Foc}$ **THAT'S-IT** MARY [PEAR]$_{Foc}$ **THAT'S-IT**
'John only ate *an apple*, and Mary only ate *a pear*.'

c. JOHN **THAT'S-IT** [APPLE]$_{Foc}$ **THAT'S-IT**
'John only ate *an apple*.'

(BSL$_2$)

Doubling being at least partially restricted to *wh*-cases is also discussed for ASL by Abner (2011a:28), who notes that "for the two speakers who accepted WH-Doubles as they are described by Petronio and Lillo-Martin [(1997)], focus doubling of other elements was not as described in either Petronio (1993) or Petronio and Lillo-Martin (1997), with these consultants rejecting doubled quantifiers, modals, and negation." All Abner's informants nonetheless described *wh*-doubles as a question where "*you really want to know the answer*" (p. 28, emphasis in the original), echoing the description of the BSL$_2$ questions in (67) above.

Despite checking with multiple speakers (all under the age of 40), my informant did not find anyone who exhibited non-*wh*-doubles as in BSL$_1$, but multiple older non-native speakers confirmed the existence of such doubles. When this is coupled

[13] The final *wh*-item appears to be commonly signed with greater muscle tension, and is also sometimes signed with a longer duration. This seems to be some kind of prosodic emphasis, comparable to that seen in ASL (see footnote 1) and so I gloss it with italics. It is unclear whether or not the BSL$_1$ doubling examples involve similar prosodic behaviour, and so I do not indicate it here.

with the fact that much of the discussion of BSL_1 doubles appears to be based on the literature of the 80s and 90s, one possible hypothesis seems to be that BSL_2 is a newer variety, originating from BSL_1. A similar argument might even be made for ASL, as Abner's (2011a, b) research is considerably later than some of the earliest ASL doubling work, although in this case multiple different varieties are clearly still extant. While much further research is necessary to establish the range of dialectal variation in both ASL and BSL, it is possible at least some dialects of both have undergone a diachronic change resulting in the restriction of doubling to *wh*-cases. The possibility of this comparable reanalysis in ASL and BSL can arguably be seen as further support that the doubling structures in both varieties are comparable in their syntax and semantics.

Nevertheless, to firmly establish that BSL doubling is the same category of focus as we argued for ASL/LSB doubling and Nepali NAI above, we would ideally want to apply the same range of tests that as for Nepali, or even develop a range of tests that specifically identify emphatic focus. However, my informant spoke only BSL_2, with doubling confined to *wh*-questions, where the same range of tests would not be appropriate. Coupled with the prevalence of BSL_1 today remaining unclear, the option of testing for emphatic focus was not readily available, though would be a fertile area for further research. Notwithstanding, we have already seen that BSL_2 has constructions such as (68a-b) that appear to be more complex than emphatic focus, as would presumably be the case for BSL_1.[14] This leaves two options for emphatic focus in BSL – either it is a distinct construction, as in ASL/LSB and Nepali, or it is merely a specific use of a more general simple ord = base focus construction, as in English. For the former of these to be true, we would expect there to be a simple focus construction distinct from doubling in BSL. The following section demonstrates that BSL_2 has precisely such a construction.

[14] Brien (1992:240-241) and e.g. Signstation (2011) give distinct signs for "only," neither of which my informant used. She recognised the latter sign, however, but viewed it as being unnatural and reminiscent of sign supported English. While this is indicative of significant lexical variation across BSL, it also makes it highly likely that BSL_1 also had an exclusive particle.

6.4 "Rhetorical question" focus in BSL_2.

In 6.2.2, we considered ASL "rhetorical question" constructions, which according to Petronio (1993) and Caponigro & Davidson (2011) can have an exhaustive reading. BSL exhibits a similar construction (69a-c), described by Sutton-Spence & Woll (1999:70-71). This is explicitly related to Wilbur's (1994a, 1996) analyses of ASL, and so the constructions are mostly glossed as pseudoclefts, but their precise semantics remains unclear.

(69) a. br
(SEE) KEYS WHERE [KITCHEN]$_{Foc}$
'Where the keys last were was in the kitchen.'

b. START WHEN [FOURTEEN YEARS-AGO]$_{Foc}$
'When it started was fourteen years ago.'

c. SAD ME WHY [RABBIT DIE]$_{Foc}$
'I'm sad because my rabbit died.'

(BSL_1, Sutton-Spence & Woll 1999:70-71, 90-91)

This construction also is extremely prevalent in BSL_2, with my informant using it in a wide variety of focusing environments. It is therefore a good candidate for the application of the focus diagnostics from the previous sections.

6.4.1 Question-answer correspondence. (QAC)

The "rhetorical question" (RQ) construction appears to be the default construction for focusing object *wh*-question replies. As will be discussed in 6.5 below, there are multiple structural possibilities for *wh*-questions, and RQ seems to be used as replies to all of these in BSL_2:

(70) a. A: GIRL BEEN EAT WHAT? (preferred)

A': EAT WHAT GIRL$_a$ INDEX$_a$?
'What did the girl eat?'

B: BEEN EAT WHAT [CAKE]$_{Foc}$
'(She) ate *cake*.'

b. A: VICTORIA BEEN MEET WHO? (preferred)

A': MEET WHO VICTORIA?
'Who did Victoria meet?'

B: BEEN MEET WHO [TREVOR]$_{Foc}$
'(She) met *Trevor*.'

RQ is also possible in reply to subject *wh*-questions, although in these cases it is slightly more marked, with response B being more common:

(71) A: BEEN EAT CAKE WHO?
'Who ate the cake?'

B: [SIMON]$_{Foc}$ BEEN (EAT)
'*Simon* ate it.'

B': BEEN EAT CAKE WHO [SIMON]$_{Foc}$ (used, but more marked)
'*Simon* ate the cake.'

This acceptability of RQ focus in reply to questions suggests that RQ focus is a fairly unmarked focus construction in BSL$_2$, and perhaps even of the simple ord = base type, although the behaviour of subjects is a little unusual.

6.4.2 "Out-of-the-blue" responses. (OOTB)

Some RQs are also acceptable in an "out-of-the-blue" context, as in (72), where the whole sentence appears to enter into the construction:

(72) A: HAPPEN WHAT?

A': WHAT HAPPEN?

A'': WHAT?
'What happened?'

B: BEEN WHAT [GIRL CAKE ALL-GONE]$_{Foc}$
'The girl ate the cake.'

However, specific parts of the sentence may also be RQ-focused in this context too, as in (73, B), although in these cases some accommodation of a more complex context may have been involved. (73, B'-B''') show that the RQ construction is not required in this context, with my informant describing response B' as a less formal equivalent of response B:

(73) A: HAPPEN WHAT?
'What happened?'

B: JOHN BEEN EAT WHAT [APPLE]$_{Foc}$
'John ate an apple.'

B': JOHN BEEN EAT APPLE (less formal)
'John ate an apple.'

B'': BEEN APPLE

B''': BEEN EAT

The viability of RQ in these contexts further supports it being an unmarked type of focus, as marked constructions are infelicitous in such environments, as we have seen above.

6.4.3 Correction of a statement. (CORR)

In corrective contexts, the RQ construction did not appear, with an apparent prosodic emphasis being used instead, although my informant noted that this emphasis would only be strong if exaggerating the correction in reply to a child.

(74) A: HE BEEN EAT APPLE
'He ate an apple.'

B: NO, BEEN EAT [*PEAR*]$_{Foc}$
'No, (he) ate *a pear*.'

6.4.4 Syntagmatic contrast. (SYNCON)

Items focused with RQ can readily enter into syntagmatic contrasts:

(75) JOHN EAT WHAT [APPLES]$_{Foc}$ NOT-EXIST PEARS
'John ate *apples*, and not pears.'

This is compatible with exclusivity, but can also be true of more unmarked focus types.

6.4.5 Contrast in a discourse. (DISCCON)

Paradigmatic contrasts are equally possible, with the RQ construction in the continuation of (76) focusing *JOHN*. This is usually only possible for very unmarked constructions, compounding with the results of the tests above.

(76) JOHN$_a$ SHOPPING WENT … BOUGHT HAT WHO [INDEX$_a$ JOHN$_a$]$_{Foc}$
'John went shopping … *John* bought a hat.'

6.4.6 Exactness of numerals. (NUMEXACT)

In contrast with the previous tests, which suggest RQ focus is simple, focusing of numerals does appear to make them exact, as the below exchange shows:

(77) A: JOHN BEEN EAT WHAT [SEVEN GRAPES]$_{Foc}$
'John ate seven grapes.'

B: NO, JOHN BEEN EAT WHAT [EIGHT GRAPES]$_{Foc}$
'No, John ate eight grapes.'

B': YES, JOHN BEEN EAT EIGHT GRAPES
'Yes, (in fact) John ate eight grapes.'

This effect is usually thought to be characteristic of exhaustive focus. However, as noted in 4.3.6, this test can be problematic to apply, as the implicatures associated with even simple focus constructions may similarly bring about an apparent exactness effect.

6.4.7 Compatability with even. (EVEN)

I was unable to elicit any particles or structures comparable to *even*, and so it was not possible to carry out this test.

6.4.8 Addition of a proposition. (ADD)

The set defined by an RQ focus can readily be extended with a further proposition, suggesting that RQ focus is not exhaustive:

(78) JOHN$_a$ LOVE WHO [MARY]$_{Foc}$ …. INDEX$_a$ SUE BOTH
'John loves *Mary* … and he loves Sue too.'

6.4.9 Addition of a more likely proposition. (ADDLIKELY)

The same is true when the additional proposition is more likely, again suggesting that RQ focus is unmarked:

(79) *Context:* There is a chicken in a barn which contains both corn and potatoes. The chicken is eating potatoes, which is unexpected and so you remark on it, but it is eating corn too.

CHICKEN$_a$ BEEN EAT WHAT [POTATOES]$_{Foc}$ … INDEX$_a$ CORN EAT BOTH
'The chicken ate potatoes … and it ate corn too.'

6.4.10 Entailment of a smaller set. (ENTAIL)

A coordinated RQ focused constituent also entails the equivalent sentence where one of the coordinands is dropped, which once again patterns away from exhaustivity:

(80) BEEN BUY TROUSERS WHO [JOHN MARY BOTH]$_{Foc}$
'*John and Mary* bought trousers.'

entails

BEEN BUY TROUSERS WHO [JOHN]$_{Foc}$
'*John* bought trousers.'

6.4.11 Correction of overcomplete statements. (OVERCOMP)

RQ focus is possible in reply to overcomplete statements, but somewhat marked, with (81, B') being the preferred response. RQ focus being the standard response here would suggest some degree of exhaustivity, but the markedness of this response here makes this more doubtful, suggesting that RQ focus is insufficiently distinct from A to be a valid correction.

(81) A: JOHN LOVES WHO [MARY SUE BOTH]$_{Foc}$
'John loves Mary and Sue.'

B: JOHN LOVE WHO [MARY]$_{Foc}$ (possible but marked)
'John loves *Mary*.'

B': JOHN ENAMOURED MARY NOT SUE (preferred)
'John's enamoured with Mary, not Sue.'

6.4.12 Choice of conjunction. (AND, BUT, YESAND, YESBUT, NO)

If we take null conjunction to be comparable to "and," the response paradigm of Onea & Beaver (2011) can be readily applied. As (82) shows, all three possibilities are equally felicitous both with (82a) and without (82b) RQ focus. The B and B' responses to (82) further suggest that RQ focus is compatible with both (null) AND and BUT in a discourse. All these results imply that RQ is comparable to simple focus.

(82) a. A: JOHN BEEN EAT WHAT [APPLES]$_{Foc}$
'John ate *apples*.'

B: YES PEARS (SAME)
'Yes, and pears too.'

B': YES BUT PEARS BOTH
'Yes, but pears too.'

B'': NO BEEN EAT PEARS BOTH
'No, (he) ate pears too.'

b. A: JOHN BEEN EAT APPLES
'John ate apples.'

B: YES PEARS (SAME)
'Yes, and pears too.'

B': YES BUT PEARS BOTH
'Yes, but pears too.'

B'': NO BEEN EAT PEARS BOTH
'No, (he) ate pears too.'

6.4.13 The category of RQ focus in BSL$_2$.

These results are summarised below:

	Eng. stress	**Nep. int.**	**BSL$_2$ RQ**	**Nep. NAI**	**Eng. cleft**	**Eng. *only***
QAC	yes	yes	yes (mrk. S)	yes (mrk.)	no	no
OOTB	?	-	yes	no	no	no
CORR	yes	?	no	?	yes	yes
SYNCON	yes	-	yes	yes	yes	yes
DISCCON	yes	-	yes	yes	no	no
NUMEXACT	no	no	yes	yes	yes	yes
EVEN	yes	yes	-	no	no	no
ADD	yes	yes	yes	yes	no	no
ADDLIKELY	yes	yes	yes	no	?	no
ENTAIL	yes	yes	yes	yes	no	no
OVERCOMP	?	no	yes (mrk.)	no	yes	yes
AND	yes	-	yes	yes	?	no
BUT	yes	-	yes	no	yes	no
YESAND	yes	yes	yes	yes	?	no
YESBUT	yes	yes	yes	yes	yes	no
NO	?	yes	yes	yes	yes	yes

Table 6.2: Focus tests applied to several English, Nepali, and BSL$_2$ focus constructions.

For the most part RQ constructions pattern strongly away from exhaustivity, aside from in the case of NUMEXACT, which as we have mentioned in several places above may easily result in a false positive due to implicatures of exhaustivity. Furthermore, RQ constructions pattern very closely with English and Nepali intonational focus, with the only substantial differences aside from NUMEXACT being for CORR and perhaps OVERCOMP, suggesting that BSL$_2$ may have a distinct construction for corrective focus. Another small difference is in replies to subject *wh*-questions, where use of RQ focus is marked, suggesting some subject-object asymmetries of focus marking may be involved in BSL$_2$, which is reminiscent of Fongbe (see 3.2.1 and 3.4.2). This does not invalidate the similarity of RQ focus to English and Nepali intonational focus, however. I therefore suppose that RQ focus is of the same category as these two forms of intonational focus, and is semantically simple, with an ord = base description.

Thus RQ focus in BSL$_2$ appears to be semantically unlike its equivalent in ASL, being far less marked. It is therefore unclear how exactly it should be analysed, with the ASL analyses discussed above all being rather complex. However, in 3.3.1 and 3.4.4 it was suggested that some semantically simple foci may exhibit syntactic

complexity when there is prosodic motivation, a hypothesis considered in further detail in 9.2. As a result, it may be that the BSL_2 RQ construction is in fact a strategy to place the focused item in final position, which frequently and perhaps always exhibits prosodic prominence. Prosodic properties of this type are not unusual for signed varieties, with Wilbur (1994b, 1997, 1999) claiming ASL has a fixed final prosodic prominence (see footnote 1). In chapter 10 this approach to BSL_2 RQ focus is explicitly assumed, with 10.3.5.1 using a phonologically-motivated version of Wilbur's (1996) pseudocleft analysis.

While the above diagnostics demonstrate that RQ involves only simple focus in BSL_2, it remains unclear whether the same is true for BSL_1. If this is indeed the case, then focus doubling would be semantically intermediate between RQ focus and more complex constructions such as exclusives, making it likely to be in the same category as ASL/LSB doubling and Nepali NAI focus. Though this remains to be shown, we have seen above that BSL doubling is specifically described as emphatic, and the following section shows that it exhibits syntactic restrictions characteristic of emphatic focus. As a result, even if the RQ construction does not encode simple focus in BSL_1, it seems likely that doubling is more semantically complex than an ord = base construction. However, the fact that RQ focus is simple in BSL_2 can nevertheless be seen as indirect evidence for BSL doubling encoding emphatic focus, if we suppose that BSL_1 and BSL_2 are similar in this respect.

6.5 Focus doubling in BSL – syntactic difficulties.[15]

We have seen a number of reasons so far to suppose that the BSL doubling construction is similar in nature to the doubling constructions we considered in ASL and LSB above. In this section, I investigate the syntactic side of this assertion in more detail, and attempt to apply the ASL/LSB analysis of Nunes & Quadros (2005, 2008) to BSL doubling.

Application of this analysis requires a better understanding of the basic word order in BSL, as the ASL/LSB analysis is based on an assumption of SVO word order in both languages (see e.g. Fischer 1975, Sandler & Lillo-Martin 2006:289-300 for ASL, and Quadros 1999, Quadros & Lillo-Martin 2010 for LSB). As with ASL and LSB, BSL shows highly variable word order:

(83) a. GIRL EAT CAKE SVO
'As for the girl, she ate the cake.'

b. CAKE GIRL EAT OSV
'As for the cake, the girl ate it.'

c. EAT CAKE GIRL VOS
'As for eating the cake, the girl did it.'

d. GIRL CAKE EAT SOV
(no translation given)

(BSL$_1$, Sutton-Spence & Woll 1999:58-61)

There is little literature on the subject of basic word order in BSL, with Deuchar (1983:76) arguing that "a topic-comment framework may provide more insights into syntactic structure," giving a number of examples where the order involves topics followed by comments:

[15] This section adapts and extends parts of Bazalgette (2011b).

(84) a.
	CLEAN	ALL
(S)	V	O
	T	C

'I cleaned everything.'

b.
TEN p	PUT-IN
O	V
T	C

'Put in 10p.'

c.
THAT b-e-e-r PINT		CHEAP
S	(V)	O
T		C

'That pint of beer is cheap.'

(BSL$_1$, Deuchar 1983:74)

However, more recent developments in the study of the grammatical encoding of information structure have shown that patterns such as (83-84) need not be in contradiction with a basic word order. In particular, the cartographic approach (Rizzi 1997 *et seq.*, discussed in 3.3.3 above) has demonstrated the efficacy of accounting for word order variation through movements to specific information-structural positions in the clause. Consequently, even languages with very flexible word order can be shown to have a "basic" underlying order, with deviations from this being due to information-structural movements. Analyses of exactly this type have been proposed for ASL and LSB, summarised in Quadros & Lillo-Martin (2010).

If this perspective is applied to (83a-c), it becomes clear that all three are consistent with a basic SVO order, since (83a) can be seen as left-peripheral topicalisation of the subject (S, VO), (83b) as topicalisation of the object (O, SV), and (83c) as topicalisation of the predicate (VO, S). Furthermore, the annotations in (84a-c) show that all three sentences are consistent with an SVO order, assuming object topicalisation in (84b). Moreover, in subclauses, where less information-structural influence on word order is expected, we also see an SVO order:

(85) a. THINK p-o-p-e COME [TO IRELAND] THINK INDEX$_2$
S V O
'Do you think the Pope will come to Ireland?'

b. THEN MICROPHONE ON WIRELESS [HIS NAME] WON IT
S V O
'It was announced over the wireless that he had won.'

c. WHEN [HER SISTER AND BROTHER] TRAVEL CAR-THERE
S V O
'When her sister and brother travel there by car.'

(BSL$_1$, (a) repeated from (55); (b) Kyle & Woll 1985:209-210; (c) Woll 1981:143)

The same is true of basic sentences with no apparent information-structural markedness, such as (86), which Deuchar (1983) argues has *WIFE* as its entire topic, making the final sentence unmarked:

(86) WIFE TALK SIGN f-n-y GOOD SHE MOCK [WELFARE WORKER]
S V O
'My wife talks and signs in a funny way. She's good. She makes fun of the welfare worker.'

(BSL$_1$, Deuchar 1983:71)

Thus it seems likely that SVO is the basic word order for BSL, with the only difficult cases remaining being SOV structures, such as (83d) and (87), as they cannot be derived simply by topicalisation:

(87) hn
DOG CAT CHASE
S O V
'It's the dog that chases the cat.'

(BSL$_1$, Sutton-Spence & Woll 1999:60)

Such cases could be potentially explained as involving two topicalisations, but there seems to be no semantic or non-manual evidence for this, and indeed the translation of (87) suggests, if anything, that focus may be involved. Additionally, the existence of examples such as (88a-b) are even more problematic for this hypothesis, with both being said to involve unmarked order:

(88) a. FOOD PACK
O V

b. MAKE CAKE
V O

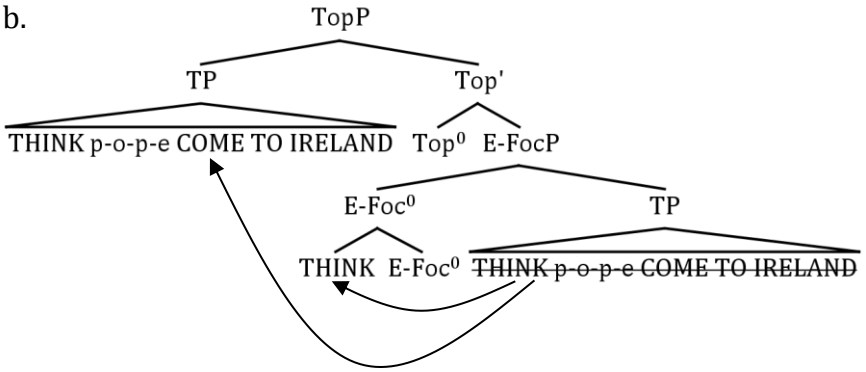
(BSL$_1$, Sutton-Spence & Woll 1999:54-55, no trans.)

While (88a) has the expected VO unmarked order, (88b) does not. Sutton-Spence & Woll (1999:54-55) account for these differences semantically, suggesting there is a distinction between effective verbs, which "make something exist," and affective verbs, which merely "act on something which already exists." The generalisation is that (in simple clauses at least) the object precedes affective verbs and follows effective verbs. The syntactic mechanisms underlying both these structures and those such as (87) are therefore unclear, and would be a good subject for further research. For instance, depending on the information-structural properties of the sentences involved, it may be that OV structures involve movement to a lower focus position (Belletti 2004), or alternatively the affective/effective distinction may be a rather different syntactic phenomenon. Whichever analysis is correct, there are clearly some operations in simple clauses that lead to (S)OV order, but this does not detract from an overall hypothesis of SVO order.

This conclusion allows us to return to the doubling cases of 6.3, and attempt to apply the ASL/LSB analysis. This works readily in many cases:

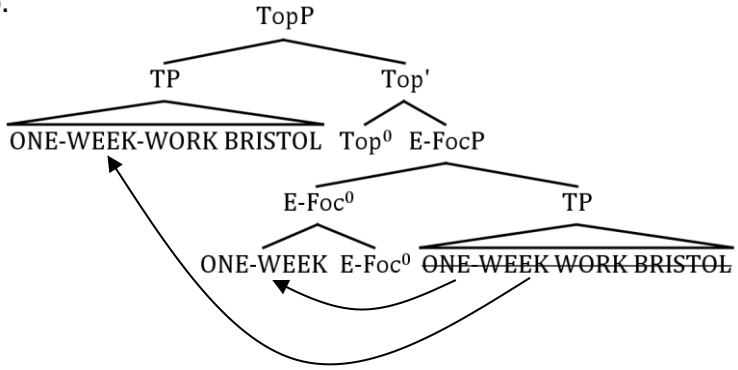
(89) a. [THINK]$_{Foc}$ p-o-p-e COME TO IRELAND [THINK]$_{Foc}$ INDEX$_2$[16]
'Do you think the Pope will come to Ireland?'
(BSL$_1$, repeated from (55))

b.



(90) a. [ONE-WEEK]$_{Foc}$ WORK BRISTOL [ONE-WEEK]$_{Foc}$
'(I) work in Bristol for one week.'
(BSL$_1$, repeated from (56))

b.

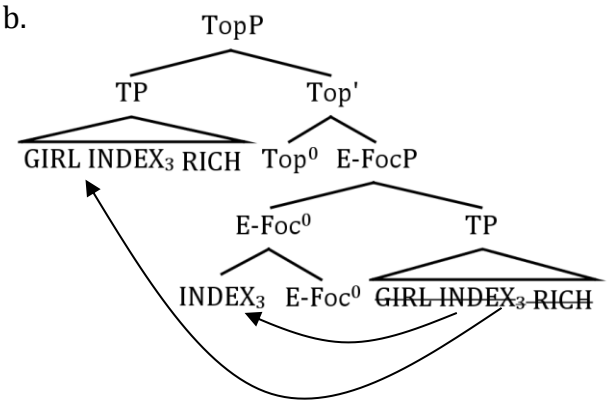


[16] Here the final index appears similar to the cases described in footnote 2 for ASL. Kyle & Woll (1985:160) seem to confirm this, noting that the index here is an "optional manual marker" serving as a "'turn-relinquishing' device, occurring at the end of an utterance," and is associated with the asking of yes-no questions. It is therefore plausible to analyse this as an extra-sentential tag, as in ASL, and so I exclude it from the tree in (89b).

(91) a. GIRL $[\text{INDEX}_3]_{\text{Foc}}$ RICH $[\text{INDEX}_3]_{\text{Foc}}$
'The girl's rich, she is.'

(BSL$_1$, repeated from (58a))

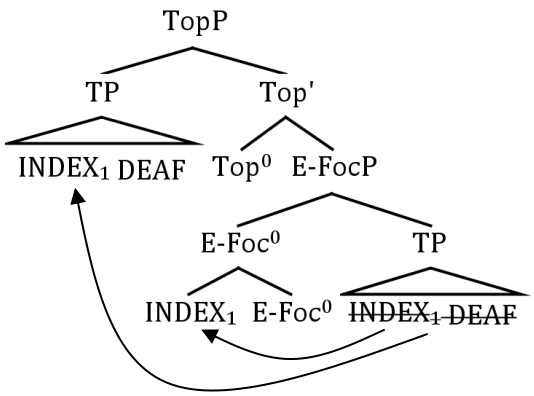
b.



(92) a. $[\text{INDEX}_1]_{\text{Foc}}$ DEAF $[\text{INDEX}_1]_{\text{Foc}}$
'I'm deaf, I am.'

(BSL$_1$, repeated from (58b))

b.



Since many of these cases do not involve signs medial to the sentence, one might wonder if the remnant TP fronting is necessary in addition to the incorporation to E-Foc. However, this fronting is clearly necessary for the derivation of (91), and (93) also shows another example that requires such a derivation:

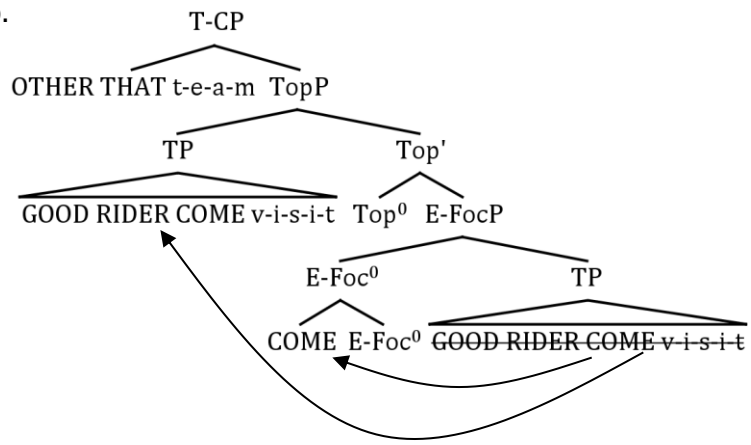
(93) a. OTHER THAT t-e-a-m GOOD RIDER [COME]$_{Foc}$ v-i-s-i-t [COME]$_{Foc}$

hn
GOOD t-e-a-m ALL SAME[17]

'The other teams that came to visit, are they good teams or all the same (as before)?'

(BSL$_1$, Deuchar 1983:73-74)

b.



It therefore makes most sense to apply the ASL/LSB analysis across the board to these cases, with its utility for BSL$_1$ giving further support to the hypothesis that LSB, ASL, and BSL$_1$ all involve a comparable emphatic focus doubling structure.

One instance of apparent doubling is problematic for this approach, however:

(94) [NUMBER]$_{Foc}$ TELEPHONE [NUMBER]$_{Foc}$ HAVE
'I have the telephone number.'

(BSL$_1$, repeated from (57))

[17] Deuchar (1983:73-74) suggests the first line of this example is a topic, and the second a comment. However, the first line itself appears to involve the base-generated topic *OTHER THAT t-e-a-m*, suggesting the two lines are best viewed as separate sentences, with the second commenting on the first. Smith et al. (2011:108) give an example of a non-doubling BSL$_1$ structure that also appears to involve a base-generated topic, confirming their existence in BSL$_1$:

(i) top hs
MY BIRTHDAY HUSBAND INDEX COOK NO
'As for my birthday, my husband didn't cook anything.'

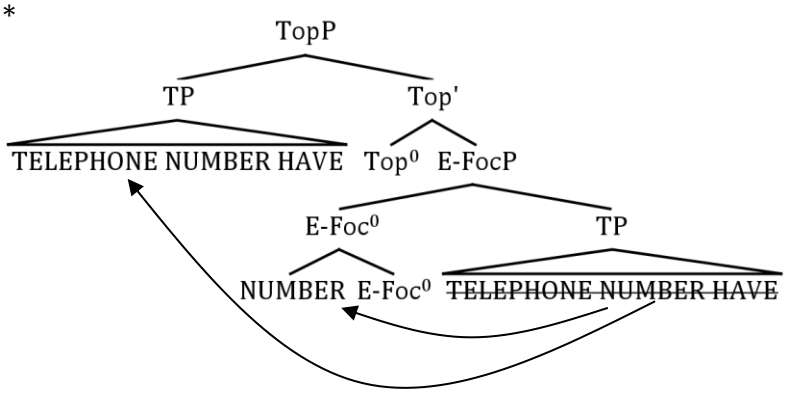
(BSL$_1$, Smith et al. 2011:108)

Consequently I place the topic of (93) in T-CP, following the ASL literature (see ch.3:fn.5 and e.g. Quadros & Lillo-Martin 2010), and treat the first line as a single sentence.

The second double here is not sentence-final, and following the ASL/LSB derivation used so far would yield (95):

(95) a. * TELEPHONE [NUMBER]$_{Foc}$ HAVE [NUMBER]$_{Foc}$

b. *



One possibility is that (94) involves doubling within the DP, but there are no other cases of this, and so it is possible that it is in fact a different phenomenon altogether. For instance, as Theresa Biberauer (p.c.) points out, it could involve two occupied topic positions, as in (96):

(96) [$_{T\text{-}CP}$ NUMBER [$_{TopP}$ TELEPHONE NUMBER [$_{TP}$ HAVE ~~TELEPHONE NUMBER~~]]]

The lack of other examples of this type make this case likely to be an isolated instance displaying roughly comparable word order to doubling constructions due to the specific combination of operations involved. Moreover, we shall see another case of nominal doubling in (111) below that does display the expected behaviour.

Nevertheless, there exist other cases that do not fit the ASL/LSB analysis, and cannot be dismissed as easily. The first of these is *wh*-doubling, of which there are many examples, and, like ASL, appears not to involve medial *wh*-elements:

(97) a. [WHAT]$_{Foc}$ WORK [WHAT]$_{Foc}$
'What work does he do?'

b. [WHO]$_{Foc}$ INDEX$_3$ SEE [WHO]$_{Foc}$
'Who will she see?'

c. [WHERE]$_{Foc}$ GO [WHERE]$_{Foc}$
'Where is she going?'

d. [WHERE]$_{Foc}$ CAT [WHERE]$_{Foc}$
'Where's the cat?'

e. [WHEN]$_{Foc}$ GO HOLIDAY [WHEN]$_{Foc}$
'When will she go on holiday?'

f. [WHEN]$_{Foc}$ PROFESSOR LECTURE [WHEN]$_{Foc}$
'When does the professor lecture?'

g. [WHY]$_{Foc}$ YOU GO AMERICA [WHY]$_{Foc}$
'Why did you go to America?'

h. [HOW-LONG]$_{Foc}$ HER SISTER STAY THERE [HOW-LONG]$_{Foc}$
'How long will her sister stay there?'

(BSL$_1$, (a-c, g) Woll 1981:143; (d) Sutton-Spence & Woll 2011:69, trans. added; (e) repeated from (59), (f) Smith et al. 2011:64, (h) Kyle & Woll 1985:159)

(98) a. [WHO]$_{Foc}$ INDEX$_3$ BEEN MEET [*WHO*]$_{Foc}$
'*Who* did he meet?'

b. [WHAT]$_{Foc}$ JOHN SAY [*WHAT*]$_{Foc}$
'*What* did John say?'

c. [WHO]$_{Foc}$ JOHN BEEN MEET [*WHO*]$_{Foc}$
'*Who* did John meet?'

(BSL$_2$, repeated from (67)

In ASL, we saw that the ban on medial *wh*-elements led to problems for application of the LSB analysis, as it was unclear why the analysis should only apply to elements that were left peripherally fronted. To extend similar reasoning to BSL, we first need a better understanding of the properties of its *wh*-questions when doubling does not occur.

Sutton-Spence & Woll (1999:54) state that "the question sign [*wh*-element] is usually at the end in BSL," with there being many *wh*-final examples that support this claim:

(99) a. HOSPITAL NAME WHAT
'What's the name of the hospital?'

b. TOM WHO
'Who's Tom?'

c. LINGUISTICS WHAT
'What is linguistics?'

d. TICKETS HOW-MANY
'How many tickets?'

e. TRAIN LEAVE WHAT-TIME
'What time does the train leave?'

f. KEYS WHERE
'Where are the keys?'

(BSL_1, (a) Woll 1981:143; (b-f) Sutton-Spence & Woll 1999:54)

Smith et al. (2011:64) go further, explicitly stating that the positions for *WHEN* in (100a-b) are ungrammatical, unlike the final position, shown in (100c) (see also (97f) above):

(100) a. * WHEN PROFESSOR LECTURE

b. * PROFESSOR WHEN LECTURE

c. PROFESSOR LECTURE WHEN
'When does the professor lecture?'

(BSL_1, Smith et al. 2011:64)

There nonetheless appear to be a few cases where the *wh*-sign does not occur in final position. However, these seem to be far less common, and are perhaps better analysed as being *in-situ* or the results of a more complex construction rather than involving explicit leftward movement:

(101) a. WHO GO WITH
'Who will she go with?

b. WHEN $INDEX_3$ GO THERE
'When will she go there?'

(BSL_1, Woll 1981:143)

A similar pattern appears to hold for BSL_2. In 6.4.1, we saw that there exist at least two structural possibilities for non-doubled *wh*-interrogatives in BSL_2, with the

final *wh*-element being preferred, and in fact two cases with initial signs were explicitly rejected by my informant:

(102) a. GIRL BEEN EAT WHAT (preferred)

b. EAT WHAT GIRL INDEX$_3$

c. * WHAT GIRL (BEEN) EAT
'What did the girl eat?'

(103) a. VICTORIA BEEN MEET WHO (preferred)

b. MEET WHO VICTORIA

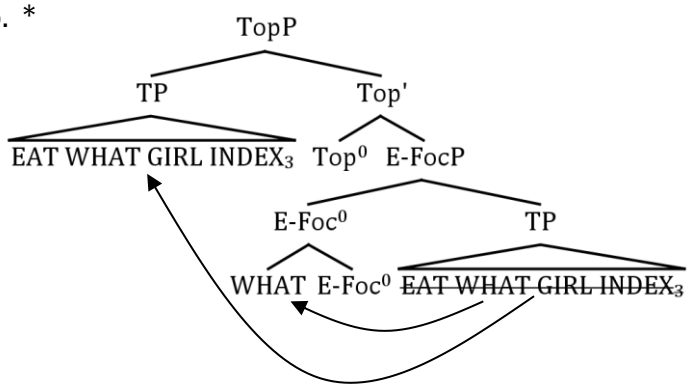
c. * WHO VICTORIA BEEN MEET
'Who did Victoria meet?'

(BSL$_2$, partially repeated from (70))

It therefore seems that there is no evidence for left-peripheral *wh*-movement in either BSL$_1$ or BSL$_2$, with the most unmarked interrogative structure involving a final *wh*-sign, but there also being a more marked structure involving a medial sign. This is the opposite of the pattern Abner (2011a, b) demonstrates for ASL, where the final *wh*-sign is more marked and semantically complex. While the semantic and syntactic nature of both these BSL *wh*-structures clearly require further research, the unavailability of left-peripheral *wh*-placement makes the LSB analysis even more problematic for BSL than ASL. Whether medial (104, adapting 102b) or final (105, adapting 99a) *wh*-constructions are used as a source, unattested structures are derived when the LSB analysis is applied:

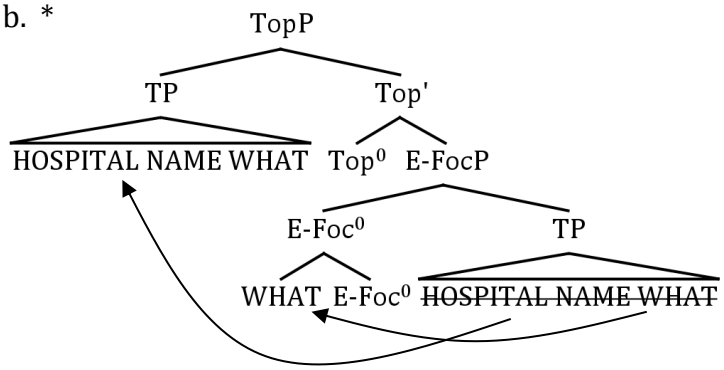
(104) a. * EAT [WHAT]$_{Foc}$ GIRL INDEX$_3$ [WHAT]$_{Foc}$

b. *



(105) a. * HOSPITAL NAME [WHAT]$_{Foc}$ [WHAT]$_{Foc}$

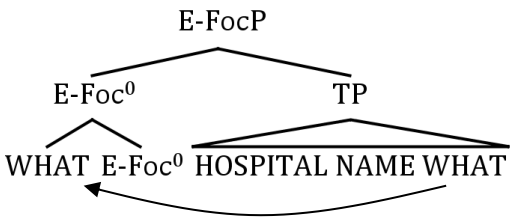
b. *



Nevertheless, there is one way the BSL doubling structures can be derived, and that is if we use final *wh*-structures as a source, but assume remnant TP fronting does not take place:

(106) a. [WHAT]$_{Foc}$ HOSPITAL NAME [WHAT]$_{Foc}$

b.



In (106b), incorporation still occurs, and so *WHAT* is distinct at linearization, leading to doubling, but the remnant TP does not front, deriving the correct order.[18] This still leaves us with the problem of why medial *wh*-structures cannot act as a source for doubling, but brings us significantly closer to deriving doubling structures in both BSL_1 and BSL_2. The major difficulty that remains, however, is why *wh*-doubles exhibit such differential behaviour from other doubles in BSL_1.

Furthermore, *wh*-elements are not the only heads that exhibit unusual doubling behaviour. As we saw in (60) above, adjectives may also double, as shown below, appearing either side of the noun they modify:

[18] If, as with their BSL_2 equivalents (67), these constructions exhibit final prosodic emphasis, then under this analysis the element incorporating into E-Foc is not the one receiving this emphasis. This is not necessarily a problem, however, as it is suggested above that, like ASL, BSL may have a fixed final prosodic stress (see 6.4.13 and footnote 1 above). As such, the final emphasis may be a reflection of this requirement rather than a strict phonological correlate of incorporation.

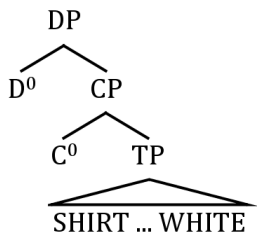
(107) a. [WHITE]$_{Foc}$ SHIRT [WHITE]$_{Foc}$
'White shirt.'

b. _____ br
NOW [GOOD]$_{Foc}$ RIDER [GOOD]$_{Foc}$ a-t READING
'Are there good riders now at Reading?'

(BSL$_1$, (a) repeated from (60), (b) Deuchar 1983:70)

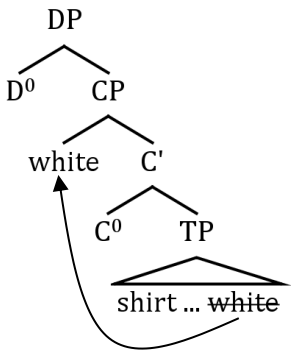
The fact that these doubled elements occur immediately next to the noun suggests that in this case, the doubling is restricted to the DP. This is not in itself problematic, as we may suppose a predicative analysis of adjectives following Kayne (1994:101), which would provide a functional clausal layer to derive the doubling. Since in undoubled cases, the adjective follows the noun (Sutton-Spence & Woll 1999:52), it presumably remains *in-situ* within the predicate (108a), unlike English adjectives (108b), which must front as they are adnominal:

(108) a.



(BSL$_1$)

b.

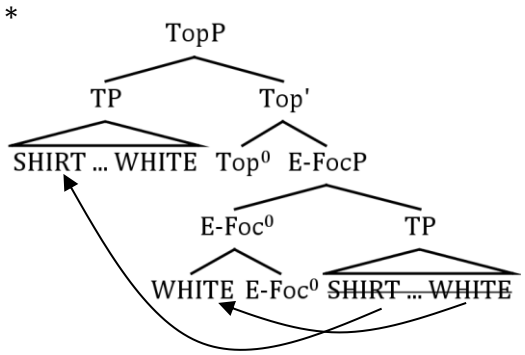


(English, adapting Kayne 1994:101)

However, when we try to derive the doubling structures, the same problems arise as in the *wh*-cases:

(109) a. * SHIRT [WHITE]$_{Foc}$ [WHITE]$_{Foc}$

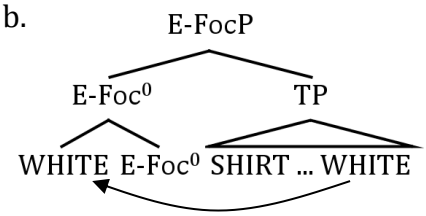
b. *



Once again, the grammatical order can only be derived by supposing that the TP does not remnant front:

(110) a. [WHITE]$_{Foc}$ SHIRT [WHITE]$_{Foc}$

b.

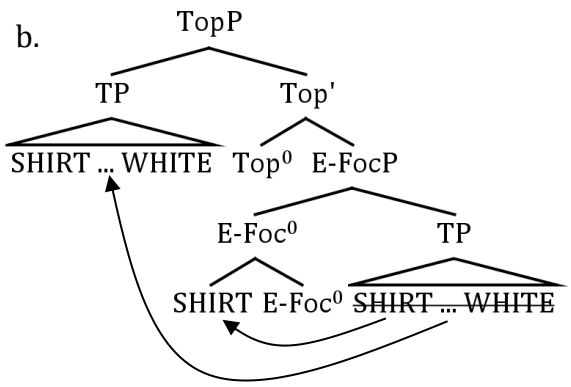


To demonstrate that this behaviour of adjectives is genuinely exceptional, (109) ideally needs to be compared to another case of doubling within a relative clause. This can be shown with the following case of nominal doubling, which forms a minimal pair with (110), yet requires remnant fronting as well as incorporation:

(111) a. [SHIRT]$_{Foc}$ WHITE [SHIRT]$_{Foc}$

(BSL$_1$, Woll 1981:143)

b.



In conclusion, this section has attempted to apply the ASL/LSB analysis to BSL, and while the analysis appears to work in many cases, two specific difficulties have been uncovered. In particular, *wh*-items and adjectives do not fit the analysis, with the partial solutions we arrived at suggesting that the derivation of doubling structures is different in these cases. This unusual behaviour with *wh*-elements and adjectives is reminiscent of Nepali NAI focus, and alongside the semantic similarities and diachronic evidence that discussed above, it seems reasonable to suppose that as with ASL/LSB doubling and Nepali NAI focus, BSL doubling is an emphatic focus construction.

6.6 Summary.

In this chapter, we have considered focus doubling in four varieties: LSB, ASL, BSL_1, and BSL_2. In all four cases, this construction appears to have the semantic role of emphasis. Moreover, all constructions exhibit unusual syntactic properties with *wh*-elements, and, in the case of BSL_1, adjectives. This pattern of behaviour is comparable to Nepali NAI focus, and so I have argued that all five constructions encode emphatic focus. Despite these similarities, there remains considerable variation between constructions, with the properties of each variety being as follows:

	LSB doub.	**ASL[19] doub.**	**BSL_1 doub.**	**BSL_2 doub.**	**Nepali NAI**
normal derivation	incorporation + remnant fronting	incorporation + remnant fronting	incorporation + remnant fronting	-	emphatic particle
***wh*-properties**	incorporation + remnant fronting	incorporation + remnant fronting	incorporation	incorporation	FCI
medial *wh*-doubles?	yes	no	no	no	-
adjective properties	-	-	incorporation	-	optional "weak" reading

Table 6.3: Properties of emphatic focus constructions in LSB, ASL, $BSL_{1\text{-}2}$, and Nepali.

We are therefore left with two questions: what are the precise semantic properties of emphatic focus, and why does it show these syntactic similarities and differences in its realisation? These questions are the subject of the following chapter, which presents a compositional account of emphatic focus in all five varieties in table 6.3.

[19] ASL clearly exhibits significant dialectal variation with respect to this phenomenon (see 6.2.2, 6.2.3, especially footnote 10, 6.3). As a result, ASL here refers to the main variety documented in Abner (2011a, b), as the majority of attested evidence seems to fit this description, and it is most dissimilar from LSB and both BSL varieties.

7. Emphatic Focus: A Compositional Approach.

7.1 Introduction.

The previous chapters have shown that a number of languages appear to have specific constructions for the expression of emphatic focus. In addition to having unusual syntactic behaviour with *wh*-phrases and, in some cases, adjectives, we have seen that such constructions are more marked than simple focus, yet do not behave like exhaustive and exclusive structures. However, this apparent intermediacy is not in itself a definition, and so in this chapter, emphatic focus is given a possible description. This allows for the development of compositional analyses of emphasis in all five varieties of chapters 5-6, which together provide an explanation for many of the syntactic properties of emphatic focus.

Section 7.2 introduces a possible semantic description for emphatic focus, which leads to a denotation of Nepali NAI for non-adjectival and *wh*-cases. Section 7.3 then applies this description to the syntactic analysis of BSL, splitting the emphatic description across multiple heads, resulting in an explanation of the differential behaviour of adjectives and *wh*-phrases. This is followed by an extension of the analysis to ASL and LSB (section 7.4). Section 7.5 concludes, summarising the c-selectional-properties of the key heads involved in the doubling analyses.

7.2 The meaning of emphatic focus.

In addition to the intermediacy between simple and exclusive/exhaustive focus, demonstrated above, the previous chapters have relied on qualitative and ostensive descriptions of emphatic focus. For instance, ASL doubling has been described as having "a stronger more emphatic interpretation than […] neutral [, …] call[ing] attention to the doubled sign and mak[ing it] the focus of the sentence," (Petronio 1993:131), and both ASL and LSB doubling are argued "to emphasize or make more prominent the final/doubled element," and "negate or affirm information previously presented," (Lillo-Martin & Quadros 2008:167, 164). Moreover, Lillo-Martin & Quadros (2005, 2008) take the following cases of English stress focus to be similar in meaning to ASL/LSB doubling:

(1) a. A: Someone lied to you.
B: *Nobody* lied to me.

b. A: I think Mary lied to you.
B: You are right; Mary *did* lie to me.

c. A: You read both books?
B: Yes, I read *both* books.

d. Put the book *under* the table.

e. *Those* students passed the test.

f. We will *af*firm our rights and *con*firm our goals.

(English, repeated from (ch.6:21))

However, though they have been useful in the above discussion, these definitions do not constitute a full description. Furthermore, this thesis posits that, unlike ASL/LSB doubling, the focus construction in (1) does not *encode* emphasis, and so would not have an equivalent description. As a result, in this section I propose a description particular to emphatic focus, which may be readily applied to Nepali, and provides a basis for the compositional analyses of the following sections.

7.2.1 What is (and isn't) emphatic focus?

In addition to Lillo-Martin & Quadros' (2005, 2008) use of the term "emphatic focus," which follows Zubizarreta's (1998:44-45), various other constructions have been described as emphatic in the literature. For instance, Zimmermann (2008:348) notes that the "use [of] additional grammatical marking [as a] way for the speaker to direct the hearer's attention […] is often called **emphatic** marking in descriptive and typological accounts of non-European languages." He argues that such marking should be seen as encoding "contrastive" focus, roughly equivalent to É. Kiss' (1998) category of identificational focus. This notion is clearly too broad for the category under investigation in this thesis, which has specific semantic and syntactic properties.

The term is also sometimes used to describe constructions such as (2), which assert the truth of a proposition, and are variously termed "polarity emphasis," "emphatic polarity," "verum focus," and "auxiliary focus," (see e.g. Hyman & Watters 1984, Höhle 1992, Gutzmann & Castroviejo 2011, Danckaert & Haegeman 2012, Kandybowicz 2013 *inter alia*).

(2) Musa gí kinkere ni
Musa eat scorpion NI
"(I assure you) Musa *did* eat the scorpion."

(Nupe (Benue-Congo), Kandybowicz 2013:52)

While the translation of (2) is comparable to (1b), the other examples of (1) involve emphases that are more specific than the entire proposition, and we have seen above that the same is also often true of focus doubling and Nepali NAI:

(3) a. [*Rameś*]$_{\text{Foc}}$-**ai** laḍyo
Ramesh-**NAI** fell
'*Ramesh* fell.'

b. E-foc
INDEX$_1$ HAVE [TWO]$_{\text{Foc}}$ CAR [*TWO*]$_{\text{Foc}}$
'It's *two* cars that I have.'

c. [ONE-WEEK]$_{\text{Foc}}$ WORK BRISTOL [ONE-WEEK]$_{\text{Foc}}$
'(I) work in Bristol for one week.'

d. [WHO]$_{\text{Foc}}$ JOHN BEEN MEET [*WHO*]$_{\text{Foc}}$
'*Who* did John meet?'

((a) Nepali, repeated from (ch.5:1); (b) ASL/LSB, repeated from (ch.6:4); (c) BSL$_1$, repeated from (ch.6:52); (d) BSL$_2$, repeated from (ch.6:67c))

As a result, emphatic focus appears to be a distinct phenomenon to polarity emphasis.

Another focus type that appears potentially similar to emphasis is mirative focus, which highlights information as being unexpected or surprising. (see e.g. Delancey 1997, 2001, Brunetti 2009, Paoli 2009, Cruschina 2011, Bianchi et al. 2013, 2014, Jiménez-Fernández 2015 *inter alia*). This is realised in Sicilian by a fronting construction, which unlike non-mirative focus fronting cannot occur in subclauses and must be V-adjacent:

(4) A: Chi successi?
What happen.PST.3SG
'What happened?'

B: [*A machina*]$_{\text{Foc}}$ m'=arrubbaru
The car 1SG.POSS=steal.PST.3PL
'*My car* was stolen!'

(Sicilian, Cruschina 2011:17, trans. Bianchi et al. 2014:2)

However, it is possible to emphasise information without that information being unexpected. For instance, in the case of bright red sports car, it is possible to emphasise that it is red (with BSL$_1$ likely employing a construction such as *RED CAR RED*), even though this is hardly surprising. As a result, emphasis is not quite the same as mirativity, and when coupled with the fact that mirative focus does not

seem to display the same patterns of unusual syntactic behaviour, it seems likely that it is distinct from emphatic focus.

As a result, emphatic focus needs its own definition, and to this end, I propose the description in (5). Here '|x|' indicates degree-marking, returning an object of the form "d of x," where d is a pragmatically-specified degree:

(5) ord = base & ∀x∈ALT, |base| ≥ |x|

In other words, in addition to asserting the equivalent constituent without a focus, an emphatically focused construction also asserts that the degree of the asserted constituent is greater than or equal to the degree of any of its alternatives.

However, though (5) arguably captures an intuitive notion of emphasis, there is some reason to suppose it is too strong, since it makes this emphasis part of the truth-conditional content. One reason to doubt this is that there is some evidence that emphasis can project over negation:

(6) [*Rameś ra Lakṣmi-le*]$_{\text{Foc}}$-**nai** curoṭ kʰã̃-dai-na, …
Ramesh and Laksmi-ERG-**NAI** cigarette eat-HAB-NEG
'*Ramesh and Laksmi* don't smoke, …'

(Nepali, partially repeated from (ch.5:44a))

In (6), the proposition "Ramesh and Laksmi smoke" is negated, but this does not negate the emphasis that the subject receives. This projecting behaviour is characteristic of presuppositions (Langendoen & Savin 1971), and though further research is necessary, it is likely that it is generally exhibited by emphatic focus. As a result, I suppose that emphasis is instead a presupposition,[1] leading to the following revision of (5):

[1] Another possibility is that emphasis is encoded as a conventional implicature. Following Grice (1975), these differ from conversational implicatures in that they are associated with particular lexical items, and cannot be cancelled. Potts (2005 *et seq.*) develops an explicit semantic theory of conventional implicatures, arguing they differ from presuppositions in being speaker-oriented and having freer projection properties. Bianchi et al. (2014) give mirative focus an explicit analysis using this framework. However, the distinction between presuppositions and conventional implicatures is controversial, with Karttunen & Peters (1979), Karttunen & Zaenen (2005) viewing presuppositions as types of conventional implicatures, and Bach (1999) arguing that they do not

(7) ord = base & pres. $\forall x \in ALT, |base| \geq |x|$

This provides a notion of emphatic focus that can be directly applied below.

7.2.2 Applying the description to Nepali.

Since Nepali appears to encode emphatic focus on a single morpheme, NAI, it is the ideal starting point for compositional implementation of the definition in (7). Following Heim & Kratzer (1998:73-82), the presupposition in this description can be modelled as a condition on a partial function, such that the function is defined only if that condition is met. This is notated by stating a condition after a colon, and before the output of the function. The simple function in (8) demonstrates this notation, which involves an existential presupposition:

(8) $\lambda x: \exists x \,.\, p(x)$

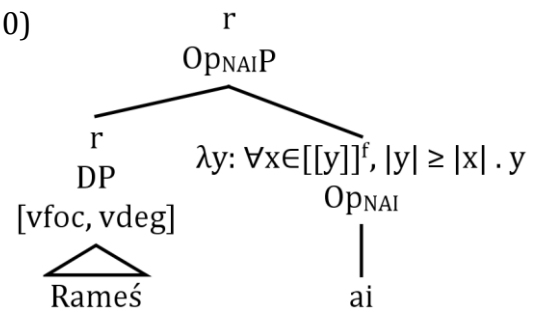
This function combines with an item x, and returns the predicate p() applied to that item, but is only defined if the item exists. Using this formalisation of presuppositions, I take NAI to be a focus association operator with the denotation in (9), which encodes (7) in a function:

(9) $[[Op_{NAI}]]^o = \lambda y: \forall x \in [[y]]^f, |y| \geq |x| \,.\, y$

This function combines with an item and returns it, but only if the degree of that item is greater than or equal to the degree of all alternatives to that item. As a result, (9) is a partial identity function, defined only when a presupposition of emphatic focus is met. A specific application of this function can be seen in (10), which combines NAI with the focused DP *Rameś*:

exist.. Consequently, I make use of a presuppositional analysis here, pending further research into emphatic focus and into conventional implicatures more generally.

(10)



For Op_{NAI} to combine with this DP, the following condition must hold:

(11) $\forall x \in [[r]]^f, |r| \geq |x|$

Since *Rameś* is focused, its focus semantic value is the set of alternatives to Ramesh, and so (11) holds iff the degree of Ramesh is greater than or equal to the degree of every individual in the discourse universe. Consequently, Op_{NAI} can combine with *Rameś* only when the emphatic presupposition holds, forming the structure in (10), which has the same overall denotation of a DP that is not combined with Op_{NAI}.

There are a few syntactic features of (10) worth remarking on. Firstly, since emphatic focus involves degree as well as focus, I have supposed that emphatically focused constituents are marked with [vdeg] as well as [vfoc], a feature that will be important below. As with focus, degree is presumably a feature that can be optionally applied to items, and so I assume that [vdeg] is introduced on a Deg_{feat} head, directly comparable to Foc_{feat} (see 3.4.2). Secondly, for NAI-marked constituents to have the same c-selectional behaviour as those that are not marked, it is necessary for Op_{NAI} to be invisible to c-selection in the sense discussed in 2.4.2.

In conclusion, the definition of Op_{NAI} in (9) yields the usual meaning of NAI marking, by encoding the description of emphatic focus in (7) in a partial function. However, this does not account for the unusual behaviour of *wh*-phrases and adjectives, which is a hallmark of emphatic focus, as we have seen in the above chapters. Nevertheless, before this can be explained for Nepali, it is necessary to consider a more syntactically complex emphatic focus construction: BSL doubling. This is the

subject of the following section, and the resulting analysis provides a general explanation for the unusual behaviour in these cases.

7.3 Focus doubling in BSL.

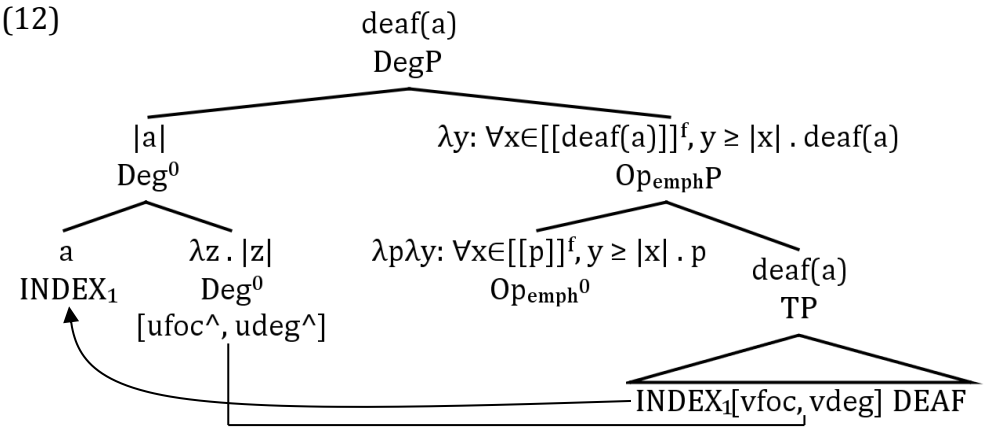
Application of the analysis of the previous section to BSL doubling is not so straightforward. As a number of movements and apparent covert structural positions are involved, it is not sufficient to simply define a focus operator that yields the right meaning. However, under a compositional perspective, these movements and structural positions in fact present an opportunity: by considering the necessary structure, and integrating it with a semantic description, it is possible to arrive at a more explanatory syntactic analysis. This is the task of the remainder of this chapter, beginning with the usual cases of doubling in BSL_1, before expanding the analysis to the other varieties.

*7.3.1 BSL_1 doubling in non-adjectival/non-*wh *cases.*

A key component of the ASL/LSB analysis of Nunes & Quadros (2005, 2008) is the incorporation of emphatically focused heads into E-FocP, which derives the doubling. However, aside from the fact that this head is dedicated to the emphatic focus construction, no clear motivation is given for this movement, and it is also unclear why it should involve incorporation in particular.

The introduction of the semantic description of emphasis in (7) invites more grounded speculation as to why this incorporation might occur. Since this description takes emphatic focus to essentially combine focus with degree marking, one possibility is that incorporation occurs to mark the focused item for degree. A possible implementation of this approach is given in (12), which divides the description in (7) across Op_{emph}, a focus association operator, and an additional head Deg, which marks items for degree. As in Nepali, I suppose that the focused item bears both [vfoc] and [vdeg], but unlike in Nepali, the Deg head bears [ufoc^] and [udeg^]. The focused item therefore agrees with and moves to Deg, with the incorporation presumably being a requirement of the degree-marking:

(12)



(BSL_1, partial analysis of (ch.6:58b))

Here the TP has the denotation 'deaf(a),' where 'a' denotes the speaker. This is selected by Op_{emph}, which merges and applies, with the TP's denotation satisfying the 'p' variable, resulting in the denotation shown for $Op_{emph}P$. This phrase is then c-selected by Deg, whose syntactic features require it to enter into an Agree relation with *INDEX₁*, triggering movement of *INDEX₁* to Deg. Deg additionally requires incorporation of *INDEX₁* to degree-mark it, and this occurs, yielding '|a|.' The denotation of $Op_{emph}P$ then applies, with '|a|' satisfying the 'y' variable. This leads to the following presupposition condition:

(13) $\forall x \in [[deaf(a)]]^f, |a| \geq |x|$

In other words, if the degree of "I" is greater than or equal to the degree of any sentences of the form "y is deaf", where 'y' ranges over alternatives to "I," then the function is defined, and returns 'deaf(a).'

This analysis thus derives the emphatic reading, while also explaining why the focused item must move and specifically incorporate. However, it has two difficulties. The first is that the comparison between the degree of 'a' and the degree of members of '$[[deaf(a)]]^f$' is not ideal, since the former is an entity and the latter are propositions. The second problem is more pressing: there is no explanation for why the TP undergoes remnant fronting, with the current analysis yielding the incorrect word order.

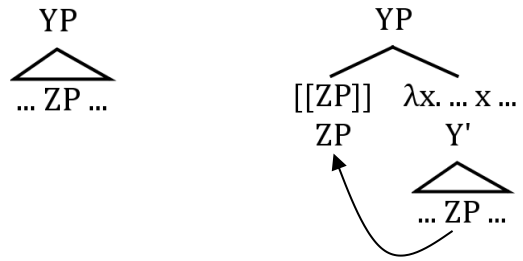
The first of these problems can be addressed via the following slightly altered presupposition condition:

(14) $\forall x \in [[a]]^f, \forall y \in [[deaf(a)]]^f, |a| \text{ in } deaf(a) \geq |x| \text{ in } y$

This makes a similar assertion to (13), but uses "in," which relativises the degree-marked head to a specific proposition. (14) therefore states that the degree of "I" in the sentence "I am deaf" is greater than or equal to the degree of any alternative to "I" in any other sentences of the form "y is deaf," where 'y' ranges over the alternatives to "I." As such, (14) does not suffer from the same comparison difficulties of (13).

Nevertheless, it is still not clear why TP fronting should take place. While it would be possible to simply define a head that the TP fronts to, this would still raise the question of why this phrase in particular is targeted for movement, since it is not itself marked for focus. However, it does define the complete proposition in which the emphasis occurs, and as a result its denotation appears multiple times in (14). I therefore suggest that this movement occurs not for syntactic reasons, but for semantic ones, contributing to parts of the presupposition condition in (14). The below diagrams demonstrate why such semantically-driven movement may occur:

(15) a. λx. ... x ... b. ... [[ZP]] ...

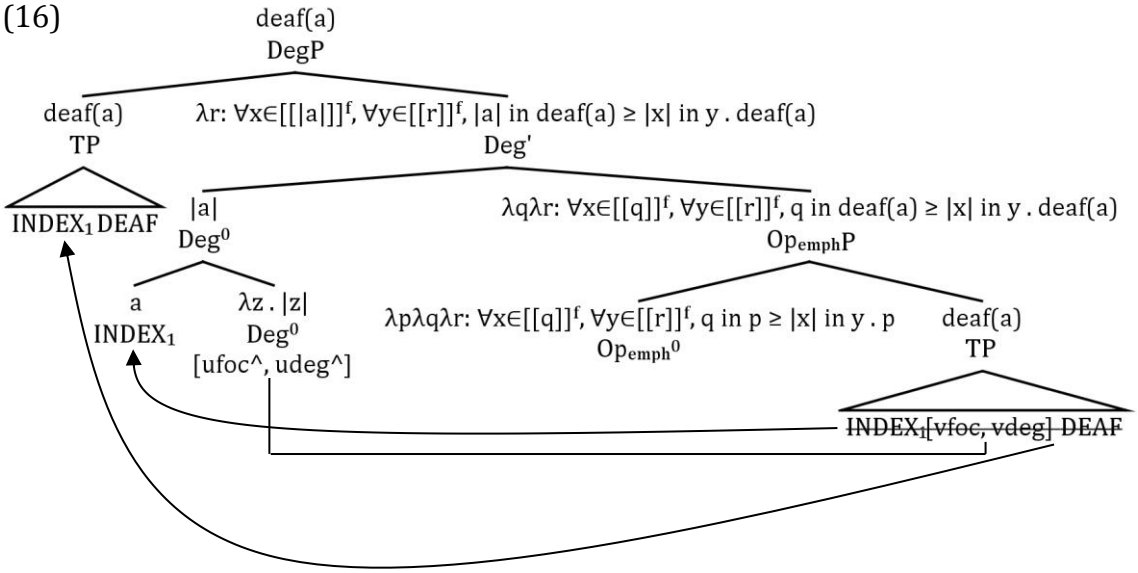


The tree in (15a) has a function as its denotation, which takes the variable 'x' and outputting a statement involving 'x.' Usually, this variable would be satisfied by merge of an external head. However, consider a situation where for the output of this function to be meaningful, 'x' must be satisfied by the denotation of ZP, which is already a component of the tree. I posit that in such a situation, ZP may move to satisfy this function, as in (15b). Since ZP does not c-select YP, and it is (the

denotation of) YP driving the movement, I further suppose that Y rather than Z projects. This provides a possible mechanism for semantically-driven movement.

This mechanism can be combined with the presupposition condition in (14), yielding an analysis that motivates the TP fronting, while also involving more reasonable semantic comparisons:

(16)



(BSL_1, analysis of (ch.6:58b))

This analysis is similar to (12), but has one key difference – the semantic definition of Op_{emph} has now been modified to fit the "|a| in p" form used in (14). The derivation therefore begins as in (12), but after Deg combines with $Op_{emph}P$, the denotation of the presupposition is still incomplete, with 'λr' remaining unsatisfied. As a result, the TP fronts for semantic reasons, leading to the desired presupposition condition in (14).[2]

Though not completely formalised, this analysis of focus doubling in BSL_1 syntactically fits the original ASL/LSB analysis, as both incorporation and remnant fronting take place. However, it additionally addresses the identity and denotation of each of the heads involved, and, through a combination of syntactic features and

[2] It is additionally necessary to assume that $[[|a|]]^f = [[a]]^f$; i.e. that the alternatives to a degree-marked denotation are the same as the alternatives to a bare denotation.

unresolved semantic variables, justifies why the movements involved take place, and accounts for the emphatic reading.

Nonetheless, *wh*- and adjective doubling have yet to be addressed, where as we saw above, the remnant fronting does not seem to occur. On the surface this appears to be an unusual natural class, as it is not clear what both should have in common. However, I argue that it is not their commonalities that yield this exceptionality, but the way in which their specific syntactic and semantic properties interact with emphatic focus. In particular, emphatic focus has been taken to involve both focus and degree. Consequently, viewing adjectives as inherently degree based and *wh*-elements as inherently focal provides a possible explanation for their unusual behaviour.

7.3.2 BSL_1 adjective doubling.

It is uncontroversial that adjectives are commonly involved in degree-based constructions, such as comparatives. Nevertheless, two categories of adjectives are commonly distinguished – those that are gradable, such as *tall*, *happy*, *rich* etc., and those that are not, e.g. *unique*, *American*, *fake*, with many approaches since Cresswell (1976) taking only the former class to involve degree semantics. It is nevertheless the case that non-gradable adjectives may readily receive gradable readings, which is normally viewed as resulting from coercion:

(17) a. That's the most unique plant I've ever seen.

b. That food was really American.

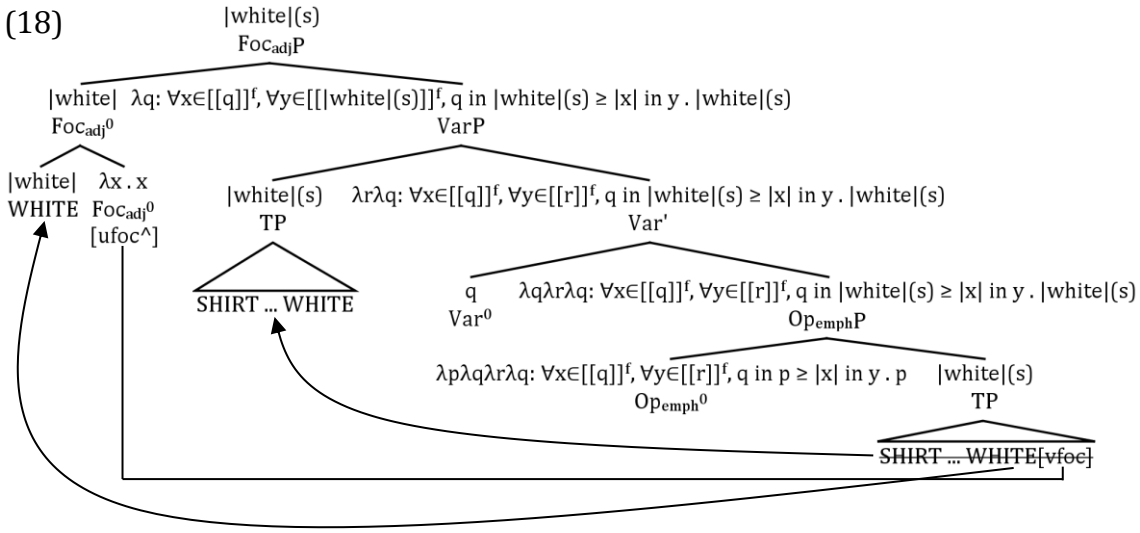
c. I'm pretty sure my watch is more fake than yours is.

Instead of viewing such cases as fringe uses, I instead take them to reflect the underlying gradable nature of *all* adjectives. As such, I suppose that adjectives necessarily involve degrees, with e.g. something "unique" being above a certain uniqueness threshold. As a result, degree-marking can be seen as an inherent property of adjectives, with e.g. *tall* having the denotation '|tall|.' This has an important consequence for adjectives that are emphatically focused: since they are

already inherently degree-marked, they need not be assigned [vdeg], but only [vfoc].

Consequently, the Deg head, which bears the feature [udeg^] as well as [ufoc^], cannot agree with emphatically focused adjectives, since they are only marked with [vfoc] and so cannot agree with [udeg^]. I therefore suppose that adjectives instead agree with a head Foc_{adj}, which bears the syntactic feature [ufoc^], and is an identity function. This means that a distinct head is involved in adjectival cases, providing an avenue for the explanation of the differential behaviour of adjectives in doubling constructions. For instance, if Foc_{adj} merges after TP fronting, in contrast to Deg, which merges before, then the correct order arises. This is exactly the analysis proposed below:

(18)



(BSL_1, analysis of (ch.6:60))

Here the TP combines with Op_{emph} as usual, but its definition has been slightly updated to allow the q variable to be resolved both before and after the 'r' variable. In this case, the adjective combines after the TP is fronted, and so it is necessary for the first 'λq' to be satisfied without removing the variable from the presupposition condition. This is accomplished by merging Var with $Op_{emph}P$, which simply reintroduces a variable. However, the existence of this new projection also provides a potential explanation for the distinct position of Foc_{adj} compared to Deg: whereas Deg c-selects $Op_{emph}P$, Foc_{adj} c-selects VarP, and so for adjectives only the

structure in (18) is possible. This has the consequence of the TP fronting before the incorporation of the adjective, to satisfy the 'r' variable, and only then is Foc merged, yielding the different structure.

On the surface, there appear to be two possible sources for the incorporated *WHITE* – the higher TP, and its lower copy. However, as we saw for LSB in 6.2.3, extraction from the higher TP would arguably be a violation of the LBC or CED. Unlike in the LSB case, though, in (18) there are no interveners to prevent movement from the lower copy of TP, and so this is where I assume the highest *WHITE* originates,[3] with the application of the Foc_{adj} identity function once again leading to incorporation. As it is already inherently degree-marked, it does not require any further degree-marking, and the following presupposition condition results:[4]

(19) $\forall x \in [[\text{white}]]^f, \forall y \in [[|\text{white}|(s)]]^f, |\text{white}| \text{ in } |\text{white}|(s) \geq |x| \text{ in } y$

This is the adjectival equivalent of (14), stating that the degree of "white" in "white shirt" must be greater than or equal to the degree of any alternative to "white" in any sentence of the form "y shirt," where y ranges over alternatives to "white."As a

[3] Nunes & Quadros (2005:469) further argue on the basis of example (i) that movement from the lower copies of fronted phrases may be problematic:

(i) * Who was a picture of taken?

(ii) $[_{TP}$ [a picture of who]$_i$ $[_{T'}$ was $[_{VP}$ taken [a picture of who]$_i$]]]

(English, Nunes & Quadros 2005:469)

Fronting of *who* from Spec,TP is taken to be illicit due to a violation of the LBC or CED, resulting in the ungrammaticality of (i). However, Nunes & Quadros (2005:469) note that "for this analysis to go through, it must be assumed that the [lower] copy of *who* […] is not accessible to the computational system; otherwise, *wh*-movement could proceed from this position." However, the grammaticality of sentences such as (iii) make this reasoning problematic: more investigation into these structures is clearly required.

(iii) Of whom was a picture taken?

(English)

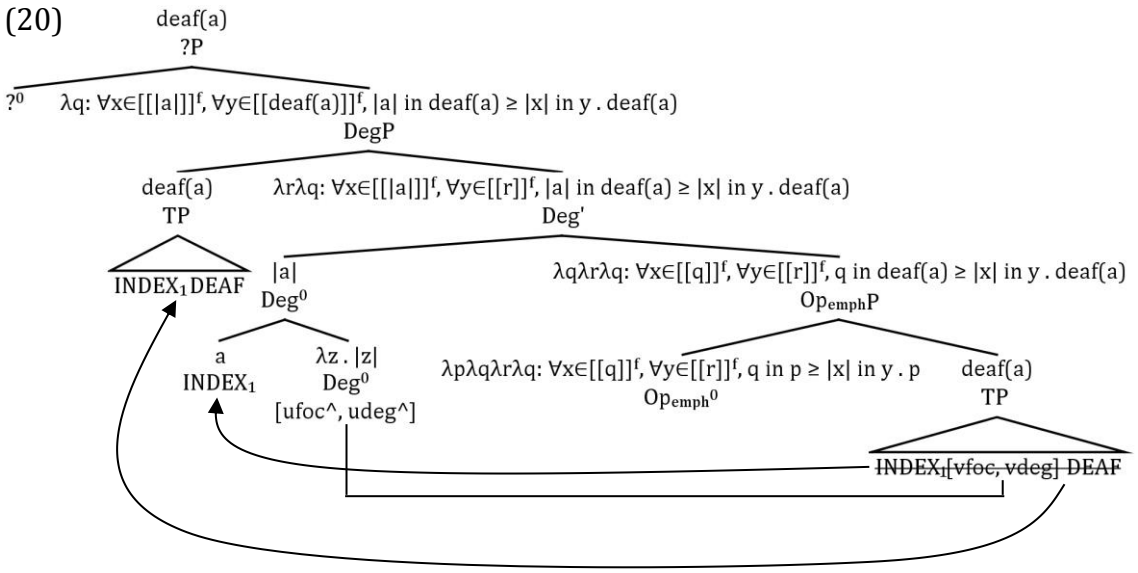
As a result, I suppose that this difficulty is specific to these cases, and in (18) I assume fronting from the lower copy of TP for concreteness. Fronting from the higher copy would also derive the correct order, albeit with potential freezing difficulties, but it seems likely that one of these two positions is a plausible source.

[4] As assumed in footnote 2 above, $[[|a|]]^f = [[a]]^f$, and so the degree marking is stripped from 'white' in the first alternative set in (19), but reapplied for comparisons by |x|.

result, although the syntactic and semantic properties of adjectives cause the derivation and heads involved to differ, the same emphatic reading results.

Nevertheless, both (16) and (18) make use of Op_{emph}, and in the analysis of (18), the definition of Op_{emph} was slightly updated. Consequently, for Op_{emph} to have a consistent denotation in both cases, it is necessary to introduce a minor revision to (16):

(20)



(BSL_1, revised analysis of (ch.6:60))

This almost entirely retains (16), but updates the denotation of Op_{emph} to that of (18), meaning that the remaining 'λq' must be satisfied at the end of the derivation. Since the denotation of DegP does not involve any instances of the q variable, it is a constant function, returning the correct denotation whatever it is combined with. As a result, I suppose an additional phrase is combined with DegP, which is essentially a wildcard, and so I represent it as '?.' It is likely, however, that '?' is an element that is invisible to c-selection, since we would expect higher heads to select for DegP, and one possibility is a defective C.

Overall, the analysis outlined allows the differential behaviour of adjectives to be explained through their inherent properites, while retaining the same operator in all constructions. Both Deg and Var may c-select $Op_{emph}P$, but Foc_{adj} only c-selects VarP. As the syntactic features of adjectives mean that they are compatible with

Foc_{adj} and not Deg, the only licit doubling structure for adjectives is (18). By contrast, the Var and Foc_{adj} heads result in semantically ill-formed derivations for normal cases of doubling, and so instead we see the derivation in (20).

7.3.3 BSL$_1$ wh-*doubling.*

This leaves *wh*-doubling. With respect to emphatic focus, *wh*-elements are essentially the opposite of adjectives. They are inherently focal, being a core component of question-answer correspondences, and with cartographic work typically assuming they front to focus projections (e.g. Rizzi 1997), but are not inherently degree marked. I therefore suppose that emphatically focused *wh*-elements need only be marked with [vdeg], and not [vfoc]. This means Deg cannot agree with them, since its [ufoc^] feature cannot be valued.

We have already seen in 3.4.3 that questions, including *wh*-questions, can be denoted as sets of answers (e.g. Hamblin 1973, Karttunen 1977, Groenendijk & Stokhof 1984). We further considered how Beaver & Clark (2008) apply this approach to focus semantics, explicitly relating these sets to Roothian alternatives, which explains the close correspondence between *wh*-phrases and focused constituents. While this correspondence is not immediately relevant here, I assume that *wh*-questions are denoted as a set of answers, which is similar, if not identical, to the equivalent alternative set. *Where* can therefore be assigned the following denotation:

(21) $[[\text{where}]]^{o} = \{z \mid \text{place}(z)\}$

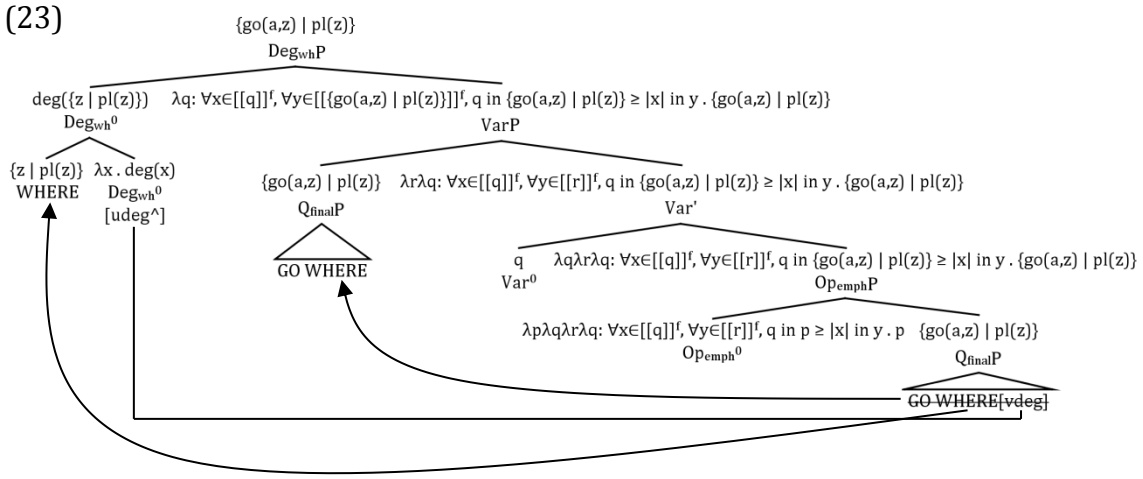
i.e. the set ranging over all possible “place” elements. This can be extended to more complex sentences, as in (22), where ‘a’ designates *she*:

(22) $[[\text{where did she go}]]^{o} = \{\text{go}(a, z) \mid \text{place}(z)\}$

These set-based denotations can enter into derivations as usual, with focused *wh*-phrases simply having the same alternative denotation as their ordinary reading, with this lack of contrast potentially explained why *wh*-phrases cannot simply be focused without some additional meaning such as emphasis being added. However,

one aspect of the derivations we are considering is problematic. Thus far, degree modification has been applied to items via the Deg head, but in addition to the syntactic incompatibility of this head with *wh*-elements, it is not so clear that *wh*-sets can be modified in the same way, as each element may have a different degree. I therefore introduce a *wh*-specific degree head, Deg_{wh}, which applies a more compatible degree function to sets such as (21), written as 'deg(X),' and has the syntactic feature [udeg^]. If we further assume that Deg_{wh}, like Foc_{adj}, c-selects VarP, then the derivation may proceed as below:

(23)



(BSL_1, analysis of (ch.6:97c))

This derivation is very similar syntactically to the adjective doubling tree in (18), with the key difference being the presence of the Deg_{wh} rather than the Foc_{adj}, allowing *wh*-elements to incorporate after the remnant movement takes place. The semantics are also very similar, until the combination of the degree-marked *wh*-element with VarP. This results in the following presupposition condition:

(24) $\forall x \in [[deg(\{z \mid pl(z)\})]]^f, \forall y \in [[\{go(a,z) \mid z\}]]^f, deg(\{z \mid pl(z)\})$ in $\{go(a,z) \mid z\} \geq |x|$ in y

If we assume, as with '|.|'-marked items above (see footnote 2), that $[[deg(X)]]^f = [[X]]^f$, and also apply the above assumption that *wh*-phrases have the same ordinary and alternative denotations, this can be simplified to the following statement:

(25) $\forall x \in \{z \mid pl(z)\}, \forall y \in \{go(a,z) \mid z\}, deg(\{z \mid pl(z)\})$ in $\{go(a,z) \mid z\} \geq |x|$ in y

i.e. the degree of "where" in "where did she go" is greater than or equal to the degree of any specific place 'z' in sentences of the form "she went to z." This could be seen as the question itself being more important than any possible answer, potentially explaining the gossip-like reading of *wh*-doubles. (25) therefore represents the *wh*-equivalent of emphasis for focus doubling.

Notwithstanding, one aspect of (23) has yet to be addressed: the use of $Q_{final}P$ rather than TP. As we saw in 6.5, BSL_1 typically shows final *wh*-expressions (26a), but occasionally also allows them in a medial/*in-situ* position (26b):

(26) a. TOM WHO
'Who's Tom?'

b. WHO GO WITH
'Who will she go with?

(BSL_1, (a) repeated from (ch.6:99b); (b) repeated from (ch.6:101a))

However, it is only possible to consistently derive the doubling structures using the final *wh*-constructions as a source. Nevertheless, the structures of (26a-b) are very much unclear, with further investigation being necessary. Yet it is highly likely that they both involve additional functional structure above the TP, even if this structure itself has yet to be determined. I therefore abbreviate these structures as $Q_{final}P$ and $Q_{medial}P$ respectively, giving them extremely tentative analyses in chapter 10. This additional structure means that $Q_{final}Ps$ and $Q_{medial}Ps$ may have distinct c-selectional properties, and so $Q_{medial}Ps$ may be excluded from focus doubling if Op_{emph} can c-select $Q_{final}P$ (as well as TP), but not $Q_{medial}P$.

These three subsections therefore combine to form a compositional approach to BSL_1 focus doubling, which accounts for both the standard cases and the differential behaviour of *wh*-elements and adjectives. This behaviour results from the interaction of the specific syntactic and semantic properties of these elements with the system of heads present, with different derivations being necessary to arrive at the same overall meaning. However, this is the opposite of the behaviour we encountered for Nepali NAI, where combination with adjectives and *wh*-

elements in fact leads to entirely different readings. I therefore briefly consider these cases below, before pursuing an analysis of doubling in BSL_2.

7.3.4 Aside: combination of Nepali NAI with adjectives and wh*-elements.*

We observed in 5.2 that combination of NAI with adjectives allows for a weakened reading as well as the usual emphatic one (27a), and combination with *wh*-phrases produces an FCI (27b):

(27) a. John ***aglai*** c^{h}a
John tall.**NAI** COP
'John's (kind of/very) tall.'

b. kas-**ai**-lāi die hunc^{h}a
who-**NAI**-DAT give.INF be.ok
'It's okay to give that to **anyone**.'

(Nepali, (a) repeated from (ch.5:25b); (b) repeated from (ch.5:29))

As a result, in contrast to the distinct syntactic structure we saw for BSL_1, in Nepali these cases instead display different semantic behaviour. However, in BSL_1, these different structures are also ultimately motivated by the semantics of the elements involved, since the same emphatic reading can only arise through a different combination of heads. This possibility is available in BSL_1 precisely because the emphatic focus construction is distributed across a number of heads. The same is not true for Nepali, with it being supposed in 7.2.2 that the emphatic reading results from the single head Op_{NAI}:

(28) $[[Op_{NAI}]]^o = \lambda y: \forall x \in [[y]]^f, |y| \geq |x| \,.\, y$

(repeated from (9))

When this is applied to adjectives, which 7.3.2 took to be underlyingly degree-marked, and *wh*-elements, which 7.3.2 took to be sets of possible answers, the following problematic presupposition conditions result:

(29) a. $?\, \forall x \in [[|tall|]]^f, ||tall|| \geq |x|$

b. $*\, \forall x \in [[\{z \mid human(z)\}]]^f, |\{z \mid human(z)\}| \geq |x|$

In (29a), 'tall' is degree-marked twice, and in (29b) the set denotation of *who* is degree-marked with '|.|' rather than 'deg(),' with the former being taken to be incompatible with *wh*-denotations in 7.3.3. As such, both presupposition conditions are potentially ill-formed, but unlike in BSL_1, the option of a different structure is not possible, since all emphatic reading is encoded on NAI. I therefore suppose that the unusual semantic behaviour of NAI in combination with *wh*-phrases and adjectives results from attempts to interpret the denotations in (29) so that they are well-formed.

For instance, in the case of adjectives, it is not immediately clear what it should mean to take the degree of an element twice. One possibility is simply that this is the same as taking its degree once, and this is presumably the interpretation under which the usual emphatic reading results. However, it is also possible to interpret it as the degree of a degree, with e.g. '||tall||' meaning something like "the degree to which the property of being a specific height is the case." While the exact semantics remain unclear, it may be that comparison with this "meta-degree" leads to a weaker reading.

In the case of *wh*-elements, the usual emphatic reading is not possible, since '|.|' cannot apply to a *wh*-set. It is therefore possible that it is instead interpreted as applying to any specific element of this set, leading to a presupposition condition such as the following:

(30) $\forall x \in [[\{z \mid human(z)\}]]^f, \forall y \in \{z \mid human(z)\}, |y| \geq |x|$

Since the alternative set of a *wh*-element is the same as its ordinary reading, this states that "the degree of any person is greater than equal to the degree of any other person," i.e. that all people are equal in degree, and so any is equivalent to any other. This provides a potential route to the explanation of the free choice effect.

While these accounts of the altered meanings of NAI are extremely speculative, it is clear that the usual emphatic reading is incompatible with the semantics of

adjectives and *wh*-phrases.[5] Since there is no possibility of altering the syntactic structure to attain the correct reading, the semantic interpretation must be adjusted.

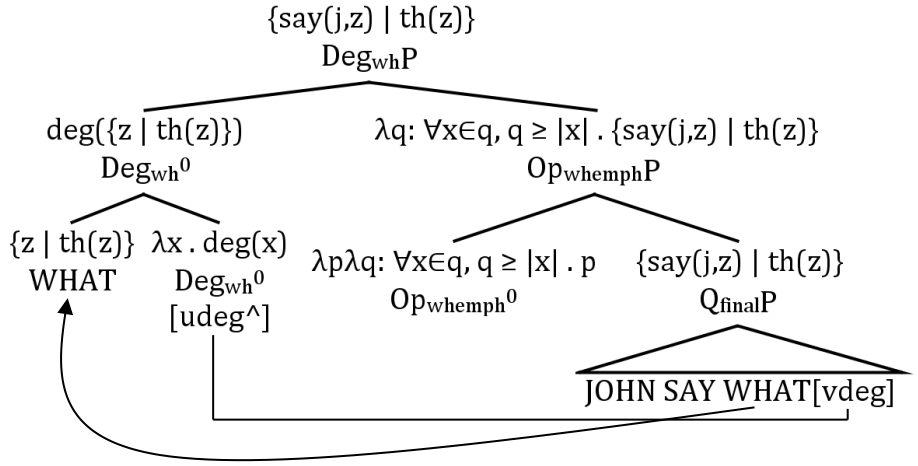
7.3.5 BSL_2 wh-*doubling.*

We have now arrived at a compositional understanding of emphatic focus in Nepali and BSL_1, but not BSL_2. As documented in 6.3, the standard focus doubling construction appears to have been lost in this variety, with doubling only being possible for *wh*-elements. If this indeed represents a diachronic change for BSL_1 to BSL_2, then it is necessary to determine exactly what kind of reanalysis took place.

The approach to BSL_1 above proposed that emphatically focused items are usually marked with both [vfoc] and [vdeg], but that adjectives are marked with just [vfoc], and *wh*-phrases with just [vdeg]. It is therefore only *wh*-phrases that do not involve an explicit focus marker, and so given that BSL_2 focus doubling is restricted to these cases, I consider the hypothesis that in this variety, the focal component of emphatic doubling has been lost. This would mean that any operators involved in the construction would be unable to build denotations based on alternative sets, since for phrases not containing foci, these would all be singleton sets. For most elements, this restriction would make it extremely difficult to set up the comparison necessary for emphasis. However, *wh*-elements are semantically interesting in this result, since they already offer a set that may be referred to. By additionally supposing that remnant movement has been lost from the derivation, since it is entirely string-vacuous in *wh*-cases, we can construct an analysis as follows:

[5] As noted in ch.5, footnote 4, *how*-words behave differently when combined with NAI, resulting in exclamatives. As such, it appears that they may be more compatible with the usual emphatic interpretation, perhaps because they do not have set-based denotations.

(31)



(BSL$_2$, analysis of (ch.6:67b)

As a result of the simpler structure, the denotation of the operator is considerably simplified. This combines with $Q_{final}P$ as usual, and is once again selected for by Deg_{wh}, which attracts, degree-marks, and incorporates *WHAT*, although no remnant movement occurs. This degree-marked structure then combines with $Op_{whemph}P$, yielding the presupposition condition in (32a). By further supposing that universally quantifying over a set marked with 'deg()' picks out the members of that set, this may be simplified to (32b):

(32) a. $\forall x \in deg(\{z \mid th(z)\}), deg(\{z \mid th(z)\}) \geq |x|$

b. $\forall x \in \{z \mid th(z)\}, deg(\{z \mid th(z)\}) \geq |x|$

This condition states that for all items that are things, the degree of "what" is greater than the degree of any of them – essentially that the question is more emphatic than any possible answer. This complements the definition of emphatic *wh*-doubling for BSL$_1$ above, but does not involve focus, and so is achievable only through the set-based nature of *wh*-denotations.

The only unambiguous non-*wh*-case of doubling we saw in BSL$_2$ was the following:

(33) JOHN **THAT'S-IT** [APPLE]$_{Foc}$ **THAT'S-IT**
'John only ate *an apple*.'

(BSL$_2$, repeated from (ch.6:68c))

Although the exact structure of this sentence is unclear, it is possible that in this case too doubling is possible only because of the inherently focal nature of the association operator *THAT'S-IT*, with a similar derivation to (31) being possible if the operator occurs within the DP. Though the properties of this construction must be left to further research, it can be seen as some additional evidence that doubling in BSL_2 is confined to elements that are inherently focal.

This is a departure from the the complex system of emphatic focus doubling of BSL_1, with three possible derivations depending on the type of element involved. Instead, BSL_2 appears to have reanalysed this focus and degree-based structure into a simpler one involving only degree, resulting in a restriction of doubling to *wh*-cases alone. In 6.3, we additionally saw some evidence from Abner (2011a) that some dialects of ASL may have undergone a similar change. It is possible that the BSL_1 and ASL doubling cases themselves emerged from simpler constructions marking only focus, but used for emphatic purposes, such as the instances we have seen for English above. This suggests a historical pathway for emphatic focus as follows:

(34) focus > focus + degree > degree

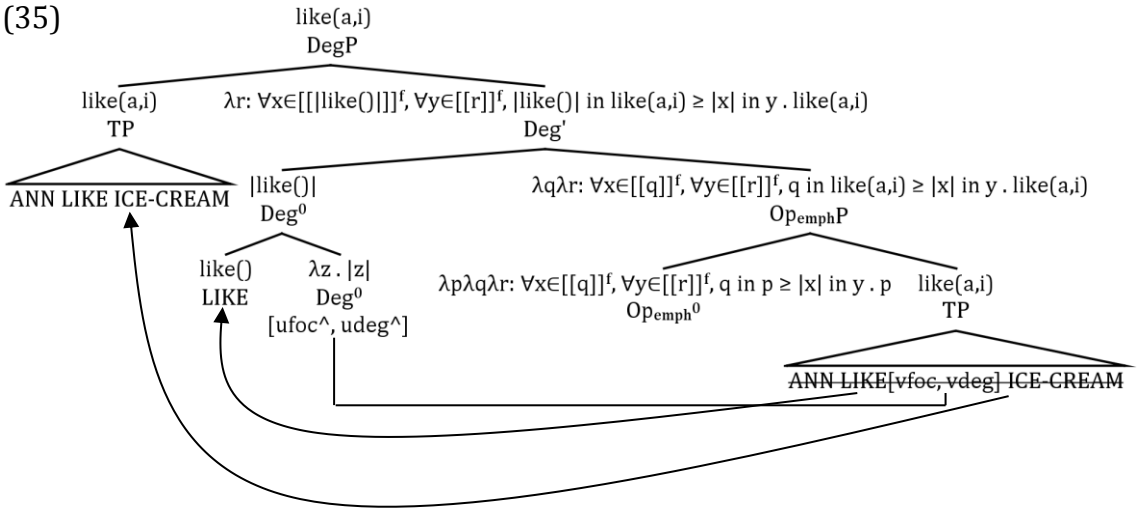
Such speculations aside, in this chapter I have thus far introduced compositional analyses for Nepali and two varieties of BSL that were possible only by consideration of emphatic focus in detail from a semantic perspective, ultimately allowing for the development of superior syntactic analyses. There nonetheless remain two varieties exhibiting focus doubling that I have yet to consider in this light, and so I turn to these in the following section.

7.4 Focus doubling in LSB and ASL.

As we saw in 6.2.3, LSB doubling behaves like BSL_1 doubling in the majority of cases, with incorporation followed by remnant fronting. Moreover, adjectives cannot double at all, and while the *wh*-cases are somewhat difficult to analyse, they also appear to display both these operations. ASL shows similar behaviour, but additionally does not allow medial *wh*-doubles. In this section I briefly demonstrate how the BSL_1 analysis above can be adapted to explain these data.

Since the usual cases behave as in BSL_1, the analysis is largely unchanged in these instances, with (35) showing a derivation of non-*wh*-doubling for ASL, which equally applies to LSB:

(35)



(ASL, analysis of (ch.3:34))

I now turn to *wh*-doubling. Recall that both ASL and LSB exhibit initial (36), medial (37), and final (38) *wh*-structures:

(36) a. <u>whq</u>
WHAT JOHN BUY
'What did John buy?'

b. <u>whq</u>
WHO $INDEX_{DET}$ JOHN LIKE
'Who does John like?

((a) ASL, repeated from (ch.6:52b); (b) LSB, repeated from (ch.6:47b))

(37) a. ____ whq
JOHN BUY WHAT
'What did John buy?'

b. ____ whq
INDEX$_{DET}$ JOHN LIKE WHO
'Who does John like?'

((a) ASL, repeated from (ch.6:52a); (b) LSB, repeated from (ch.6:47a))

(38) a. ____ whq
WIN WHO
'Who is it that won?'

b. ____ whq
LIKE MARY WHO
'Who likes Mary?'

((a) ASL, repeated from (ch.6:32a); (b) LSB, repeated from (ch.6:fn.7))

Unlike BSL, it appears that the final construction is the most marked, with perhaps the medial structures being the least so. Nevertheless, it is plausible that all three involve additional functional structure above the TP, and so in a manner comparable to BSL, I abbreviate this structure as $Q_{initial}P$, $Q_{medial}P$, and $Q_{final}P$ respectively, again giving very tentative analyses in chapter 10. This allows a direct explanation for the ungrammaticality of medial *wh*-doubles in ASL: whereas LSB allows doubling to be derived from $Q_{initial}$Ps and Q_{medial}Ps, ASL allows only $Q_{initial}$Ps.

Moreover, the fact that ASL/LSB *wh*-doubling still shows remnant movement means that the analysis is simpler for such constructions, with Deg_{wh} occurring in the same position as Deg, and allowing for the removal of one 'λq' from the denotion of Op_{emph} in all cases. LSB can therefore be analysed as below, with (39) using $Q_{initial}P$, and (40) $Q_{medial}P$:[6]

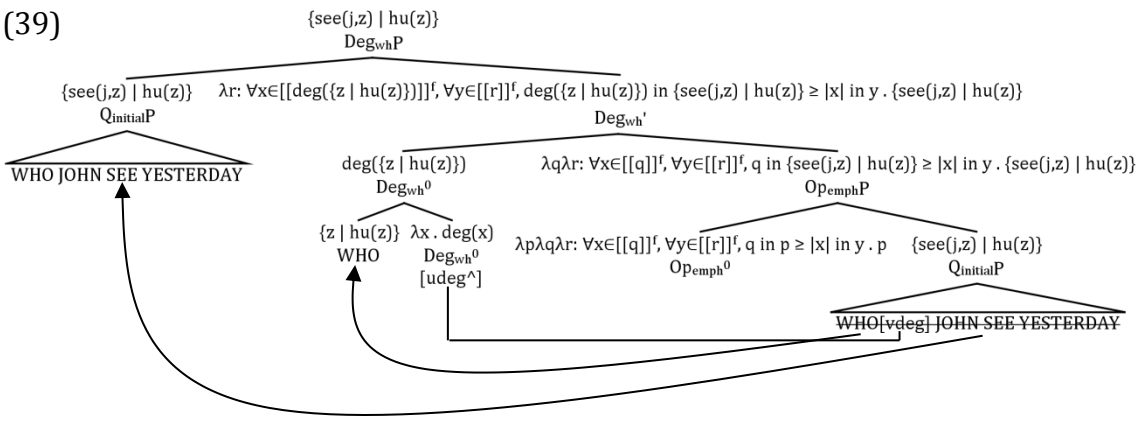
[6] This approach works equally well for adnominal cases, as *WHICH* is incorporated, but the $Q_{initial}P$ remnant fronts around it:

(i) ____ wh ____ wh
[WHICH BOOK]$_{Foc}$ JOHN BUY YESTERDAY [*WHICH*]$_{Foc}$
'Which book exactly did John buy yesterday?'

(LSB, repeated from (ch.6:51))

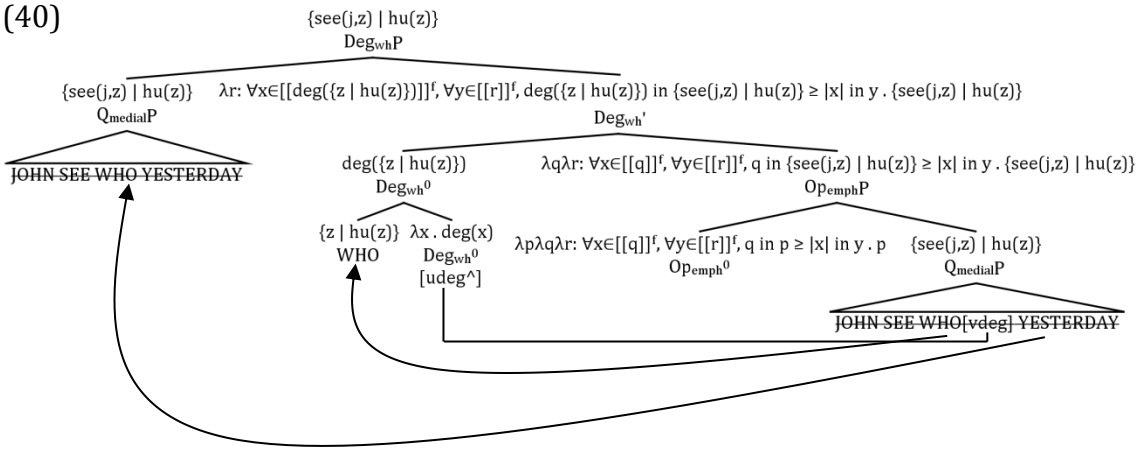
This presents a question for the BSL analyses: do adnominal *wh*-expressions behave differently here? I have not come across any such structures and therefore do not consider them here, but it is

(39)



(ASL/LSB, analysis of (ch.6:45) and (ch.6:53b))

(40)



(LSB, analysis of (ch.6:43a); c.f. ASL (ch.6:53a))

By contrast, in ASL only the derivation in (39) is grammatical. As in BSL_1, this can be derived through c-selection, with Op_{emph} selecting only TP and $Q_{initial}P$ in ASL, but also $Q_{medial}P$ in LSB.

One further complication is the ungrammaticality in LSB of non-*wh*-doubling with initial, but not medial, *wh*-questions:

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worth noting that BSL_1 at least exhibits unusual *WHICH* constructions with a final *wh*-sign in alternative questions (ii). It may therefore be that such constructions are the source of adnominal *wh*-doubles in BSL, if they exist. Adnominal *WHICH* is also present, however (iii).

(ii) LIKE TEA COFFEE MILK WHICH
'Which (would you) like out of tea, coffee, and milk?'

(iii) TODAY SANDWICHES, WHICH FILLING
'Which filling (do you want) in today's sandwiches?'

(BSL_1, Sutton-Spence & Woll 1999:69)

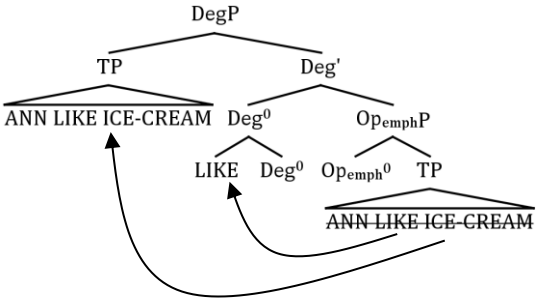
(41) a. focus
JOHN [WILL]$_{Foc}$ BUY BOOK WHEN [*WILL*]$_{Foc}$
'When *will* John really buy the book?'

b. whq
* WHEN JOHN [WILL]$_{Foc}$ BUY BOOK [*WILL*]$_{Foc}$
'When in fact *will* John really buy the book?'

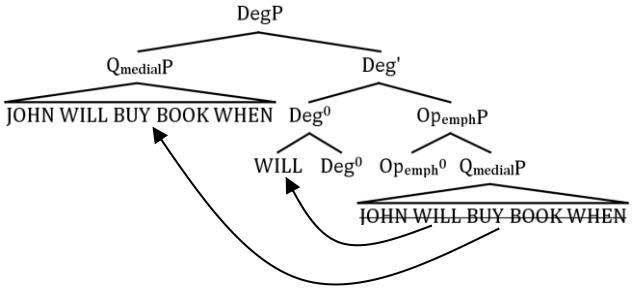
(LSB, repeated from (ch.6:19))

Since Deg$_{wh}$ and Deg both take Op$_{emph}$P as a complement, this fact can only be derived by supposing Op$_{emph}$ is invisible to c-selection, with Deg selecting through it for TP and Q$_{medial}$P, but not Q$_{initial}$P, as demonstrated in (42). By contrast, Deg$_{wh}$ presumably only selects for QPs.

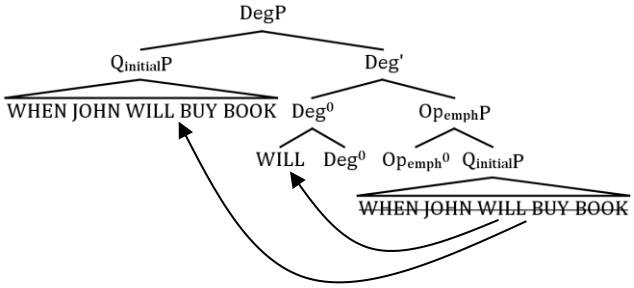
(42) a. Deg c-selects TP:



b. Deg c-selects Q$_{medial}$P:



c. * Deg c-selects Q$_{initial}$P



ASL also shows the restriction of *wh*-doubles to *wh*-questions, with Petronio (1993:135) appearing to claim that this applies to all kinds of *wh*-questions, but the only example given is ambiguous between $Q_{initial}$ and Q_{medial}:

(43) a. whq
[WHO]$_{Foc}$ WILL BUY HOUSE [*WHO*]$_{Foc}$
'Who will buy a house?'

b. whq
* WHO [WILL]$_{Foc}$ BUY HOUSE [*WILL*]$_{Foc}$

(ASL, repeated from (ch.6:7))

Nevertheless, if we do take this restriction to hold over all *wh*-questions, then this behaviour can easily be accounted for: Deg c-selects only TP, and Deg_{wh} only $Q_{initial}P$, restricting *wh*-doubling to (initial) *wh*-questions. These explanations are achievable only through the separation of *wh*-doubling from other doubling cases.

There is one final aspect of ASL/LSB to explain – the lack of adjective doubling. In BSL_1, this was associated with a specific head Foc_{adj}, which was necessary to agree with the [vfoc] feature present on adjectival heads. The simplest explanation for the absence of such constructions in ASL/LSB is therefore that these varieties lack this head altogether. This completes the analysis of ASL/LSB doubling, though further differences between the varieties are considered in chapter 10.

7.5 Conclusion.

This chapter began with a proposed description of emphatic focus, which relates the ordinary value to the alternatives by comparing them in degree. As a result, emphatic focus is claimed to involve both focus and degree. This description allows for an explanation of the unusual behaviour of emphatically focused adjectives and *wh*-phrases, since adjectives are taken to be inherently degree-based, and *wh*-phrases to be inherently focal. Moreover, the fact that this differential behaviour is semantic in Nepali but syntactic in the doubling varieties can be explained through the range of heads that encode the description. In the doubling varieties, emphasis is distributed across many heads, allowing for different derivations that result in the same overall reading. By contrast, Nepali encodes emphasis on a single head, meaning that NAI-marking of *wh*-phrases and adjectives must result in different readings.

Finally, the specific differences between the doubling constructions in ASL, LSB, and $BSL_{1\text{-}2}$ can largely be accounted for through the range of heads involved, and their c-selectional properties. These are summarised in table 7.1, which assumes for simplicity that $Op_{(wh)emph}$ is invisible to c-selection in all four varieties. Chapter 10 returns to these properties, where they are parameterised within a wider linguistic context.

	BSL_1	**BSL_2**	**ASL**	**LSB**
?	Deg	-	-	-
Deg	TP	-	TP	$Q_{medial}P$, TP
Deg_{wh}	VarP	$Q_{final}P$	$Q_{initial}P$	$Q_{initial}P$, $Q_{medial}P$
Foc_{adj}	VarP	-	-	-
Var	$Q_{final}P$, TP	-	-	-
Op_{emph}	$Q_{final}P$, TP	-	$Q_{initial}P$, TP	$Q_{initial}P$, $Q_{medial}P$, TP
Op_{whemph}	-	$Q_{final}P$	-	-

Table 7.1: C-selectional properties of heads in BSL_1, BSL_2, ASL, and LSB.

Overall, the use a heuristic of compositionality in this chapter allowed for re-examination of the syntactic properties of emphatic focus in each variety. This ultimately yielded compositional syntactic analyses that not only have plausible meanings, but also provide possible explanations of the syntactic data seen. These

analyses can therefore be seen as an extended demonstration of the value of this heuristic. This demonstration is continued in the following chapter, which turns to a focus construction in English, with the assumption of compositionality once again being fundamental to its analysis.

8. Contrastive Reduplication as Extensional Focus.

8.1 Introduction.

So far, we have considered a number of focus constructions in several varieties. Many of these were varied in both their syntax and semantics, but they were all amenable to analysis in terms of Roothian alternatives. In this subsection, I turn to an English focus construction where the applicability of this approach is not so clear, but ultimately argue that maintaining it once again leads to a compositional analysis that better deals with the syntactic facts.

The construction in question is shown in (1-2), and is present in a wide variety of English dialects. It is characterised by reduplication of the focused element, with the first duplicate bearing a prosodic stress.

(1) I'll make the tuna salad, and you make the [*salad*-salad]$_{\text{Foc}}$.

(Ghomeshi et al. 2004:308)

(2) I'm not sure what kind of dog to get – I like Chihuahuas, but in a way I'd rather get a [*dog*-dog]$_{\text{Foc}}$.

This construction was first discussed by Dray (1987) and Horn (1993), with Ghomeshi et al. (2004) carrying out the most detailed analysis to date, terming it contrastive reduplication (CR). They describe it as "focus[ing] the denotation of the reduplicated element on a more sharply delimited, more specialized range," (p. 308) which leads to a "prototypical/contrastive focus meaning." (p.310) For instance, (1) refers specifically to green salad as opposed to any less prototypical kind, and (2) refers to a dog that has canonical dog-like properties.

This chapter first reviews the syntactic behaviour of CR before considering its semantics, which highlights a problem when analysing it using the Roothian approach to focus that we have been taking so far (section 8.2). In section 8.3 I suggest that this difficulty can be resolved by postulating the syntactic presence of an index within the DP, with this analysis being expanded to explain the syntactic doubling as well as further semantic properties that characterise the construction.

Section 8.4 extends the analysis further, considering the hierarchical position of the focus association operator involved, crosslinguistic counterparts of CR, and non-nominal and phrasal CR. Section 8.6 concludes.

8.2 Properties of the CR construction.

8.2.1 Syntactic properties.

As Ghomeshi et al. (2004) document, CR may apply to a wide range of elements. We have already seen in (1-2) that this class includes nominal heads; similarly adjectives (3), prepositions (4), predicates (5), and idiomatic phrases (6) may undergo CR:

(3) Is he French or [*French*-French]$_{\text{Foc}}$?

(4) I'm up, I'm just not [*up*-up]$_{\text{Foc}}$.

(5) I know you like him, but do you [*like-him*-like him]$_{\text{Foc}}$?

(6) Oh, we're not [*living-together*-living-together]$_{\text{Foc}}$.

(Ghomeshi et al. 2004:308)

Despite this wide range of application, Ghomeshi et al. (2004:329) argue that it is restricted to "include a full lexical item, to whose meaning the semantic effect of CR is applied." Thus functional items may not usually be doubled alone (7); idioms, which are taken to be lexically listed, must be doubled entirely (8a-b); non-idiomatic phrases may not be doubled (9); and derivational morphology must double (10a-b).

(7) * I [*will*-will]$_{\text{Foc}}$ do that.

(8) a. [*out-of-her-mind*-out-of-her-mind]$_{\text{Foc}}$

b. * out of her [*mind*-mind]$_{\text{Foc}}$

(Ghomeshi et al. 2004:321)

(9) * I didn't put it [*over-the-stove*-over-the-stove]$_{\text{Foc}}$.

(Ghomeshi et al. 2004:321)

(10) a. I'm not in a [*relationship*-relationship]$_{Foc}$.

b. * I'm not in a [*relation*-relationship]$_{Foc}$.

(adapted from Ghomeshi et al. 2004:324)

By contrast, inflectional morphology must double if irregular (11), but only optionally doubles if regular (12):

(11) a. I don't just herd geese, I herd [*geese*-geese]$_{Foc}$.

b. * I don't just herd geese, I herd [*goose*-geese]$_{Foc}$.

(adapted from Ghomeshi et al. 2004:323)

(12) a. I don't just read books, I read [*books*-books]$_{Foc}$.

b. I don't just read books, I read [*book*-books]$_{Foc}$.

Finally, determiners may not duplicate along with focused nouns:

(13) a. I wouldn't date a [*linguist*-linguist]$_{Foc}$.

b. * I wouldn't date [*a-linguist*-a-linguist]$_{Foc}$.

(adapted from Ghomeshi et al. 2004:327)

CR therefore appears to apply to many (but not all) categories, with Ghomeshi et al. (2004) suggesting it targets either X^0- or X'-level constituents, provided they contain one full lexical item, and no others. I consider the range of CR application in more detail below, but first turn to its semantics, which provides a starting point for analysis.

8.2.2 Semantic properties.

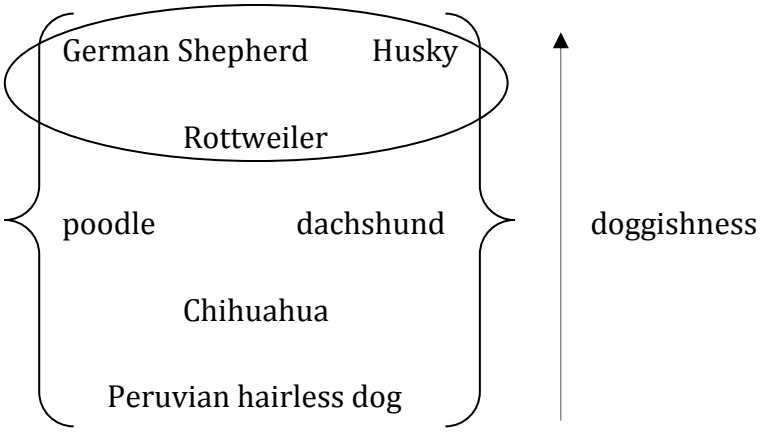
As noted above, CR has distinct semantic properties from standard English intonational focus, with CR-focused items bearing an apparently prototypical reading. (14a) therefore contrasts with (14b) below in that the former simply focuses the word *dog*, whereas the latter specifies a dog that has properties of being dog-like over and above many dogs.

(14) a. I didn't buy a cat, I bought a [*dog*]$_{\text{Foc}}$.

b. I didn't buy a Chihuahua, I bought a [*dog*-dog]$_{\text{Foc}}$.

The CR in (14b) therefore orders types of dogs for some property such as prototypicality, and selects a maximum subset of these:

(15) *dog*-dog (as in (2) and (14b))



Most previous work on the semantics of CR has concentrated on the nature and determination of this ordering relation (e.g. Whitton 2006, Song & Lee 2011), but for simplicity I suppose that it has a description as in (16), though this will be revised below.

(16) ord = base & base∈max(prototype.order(ALT))

Taking this definition, let us consider the denotations of the focused elements in (14a-b) in more detail. The first of these involves simple ord = base focus, with ordinary and alternative denotations as in (17):

(17) a. $[[dog]]^{o}$ in (14a) = dog

b. $[[dog]]^{f}$ in (14a) = {dog, cat, mouse, giraffe, elephant, …}

While the ordinary denotation in (17a) is simply "dog," the alternative set ranges over all individuals of the same type as this denotation, such as the animals in (17b). This much is unsurprising, with (14a) behaving just as in other cases of simple focus. We now consider (269b):

(18) a. $[[\textit{dog}\text{-dog}]]^{o}$ in (14b): $[[\text{dog}]]^{o}$ & $[[\text{dog}]]^{o} \in \max([[\text{dog}]]^{f})$

b. $[[\text{dog}]]^{f}$ in (14b) = {Rottweiler, German Shepard, poodle, …}

While use of the description in (16) has yielded roughly the right semantics, a very unusual assumption is introduced in (18b) – the alternative set for *dog* here ranges not over all individuals of the same type as [[dog]], but instead over specific breeds of dog. The same assumption was made in (15) above, with the alternatives being as in (18b). As Horn (1993:48) notes, "the reduplicated modifier singles out a member or subset of the extension of the noun," and so we appear to be forced to accept alternative sets that are extensional.

We therefore have arrived at an unexpected discrepancy between (17b) and (18b) – while they both appear to involve the same element being focused, they make use of different alternative sets. It is therefore difficult to see how we can derive these extensional sets via alternative semantics, and so a number of options remain:

(i) The alternative set is pragmatically restricted to the extension of the reduplicand.

(ii) The Roothian approach to focus semantics is inappropriate for the focus involved in CR.

(iii) The construction should not be analysed as involving focus at all.

(iv) The interpretation is achieved by some element other than the reduplicand itself being focused.

The first of these is the approach taken by Lee & Lee (2007), which is problematic as it predicts there should be contexts where alternative sets wider than the extension of the reduplicand are used (e.g. where *cat* is a potential alternative to *DOG-dog*), which does not appear to be the case. Option (ii) does not help significantly, as all other leading theories of semantic focus also involve some near-equivalent of alternative sets (see e.g. Krifka 1991, Bonomi & Caslegno 1993, Herburger 2000, and additionally Beaver & Clark 2008:91-94 for a discussion of the similarity of these theories). Option (iii) brings us even further from an

understanding of CR, and makes it difficult to understand why the construction otherwise has otherwise focus-like semantics.

For this reason, in this chapter I pursue option (iv), and attempt to consistently apply a Roothian approach to focus, which results in interesting consequences for the structure of the DP.

8.3 A Roothian approach to CR.

8.3.1 Indices as the source of extensional alternative sets.

Roothian alternative sets can be thought of as being derived by substituting the focused item for a variable – for instance, when *dog* is prosodically focused, the alternative set varies over all entities of the same type in the discourse universe. As the alternative sets involved in CR constructions are (equivalent to) extensions, it seems that it is not the noun itself that varies but potential referents of the noun, and so, following the above reasoning, I suggest it is a constituent somehow equivalent to this that is targeted by focus in CR.

Williams (1980, 1981) argues that reference is covertly encoded syntactically as the external argument of the noun. In (19), the NP has both an internal actor and a theme, yet no external argument, and so Williams suggests that this argument is in fact the noun's reference, which he terms R.

(19) [$_{\text{NP}}$ destruction [of the city]$_{\text{THEME}}$ [by evil forces]$_{\text{ACTOR}}$]

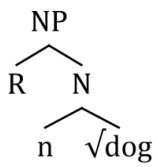
He further suggests this may be used both predicatively and referentially, with R of *fool* being *John* in (20a) and the variable 'x' in (20b):

(20) a. John is a fool. fool (John)

b. The fool left. $\exists!x$ (fool(x) & left(x))

Roberts (forthcoming) updates this approach from a minimalist perspective, analysing R as being first merged in Spec,nP, by parallel with the external argument of the vP. I combine a version of this approach with the framework of distributed morphology (see e.g. Halle and Marantz 1993), which makes use of categorising heads such as n and v which merge with acategorial roots and constituents to specify them for category, leading to a basic nominal substructure along the following lines:

(21)

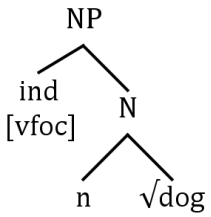


In (21), the nP subshell is omitted for simplicity, as under the present analysis, it is only necessary for R to be in a specifier position low in the nominal structure; I remain agnostic about N/V parallels.

Furthermore, it is at best unclear how the notion of reference should be encoded syntactically or semantically, and so I suggest instead that this element is better viewed as an index, abbreviated 'ind,' which uniquely (or at least partially) specifies the referent, without itself being the reference – it can thus be thought of as roughly comparable to the traditional indices of binding theory, and it is crucially structurally represented. I take this index to link encyclopedic information from the nominal root to the particular usage of the noun by specifying a referent (or set of possible referents) from its extension.

This results in the following substructure for CR:

(22)



The suggestion is that focusing the index of *dog* (rather than the NP itself) should allow the alternative set to vary not over elements with the same semantic type as [$_{NP}$ dog], but instead over possible members of the extension of this element. Postulation of a null index within the DP therefore provides a target for the focus.

However, in order for the right alternative set to be arrived at in this situation, a correct formalisation of indices must be used. One approach would be to define a distinct semantic type for the index of each noun, thus restricting the possible substitutes only to those which are members of the extension of this noun. But this perhaps leads to a slightly ungainly semantics, and is a little stipulative. A more

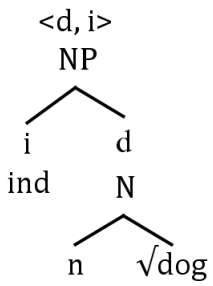
natural approach would be to simply define one semantic type for all indices, and define compositional rules so that indices combine with nouns to restrict their extension.

Let us consider how this latter approach would look for a specific case. Take the following sentence:

(23) Fido$_i$ is a dog$_i$.

Here, both *Fido* and *dog* share an index 'i,' and so the proposal is that that *dog* in (23) must have a substructure along the following lines:

(24)



The N constituent has the denotation 'd(og),' and the index has the denotation 'i,' as this is the index of *dog* in this instance. These combine to form a more complex denotation for the NP, specifying that 'i' is the index of 'd,' which is here represented as an ordered pair.

Now consider (25), which substitutes (23) for an equivalent sentence making use of the CR construction:

(25) Fido$_i$ is a [*dog*-dog$_i$]$_{Foc}$.

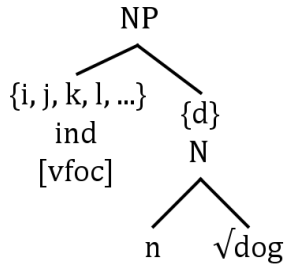
Both DPs still bear the index 'i,' and the NP part of the substructure is as in (24), but with one difference – we are now supposing that the index is focused, as in (22). As a result, we can consider focus denotations of (25) in addition to their ordinary readings. Since there are no foci within the N, this has a focus denotation consisting simply of the singleton set containing 'd,' as in (26). However, the index is focused, and so here its focus denotation is a set of different indices (27), each of which could be referring to any specific thing or set of things.

(26) $[[\ [_{N}[n\ \sqrt{dog}]]\ ]]^{f} = \{d\}$

(27) $[[\ ind_{[vfoc]}\ ]]^{f} = \{i, j, k, l, \ldots\}$

Thus far, then, the indices do not yet range specifically over the extension of *dog*. However, we have yet to consider the combination of the two denotations in (26) and (27). In (24), the index present was placed it in an ordered pair with 'd.' One way of adapting this to a set of indices is as in (28), where the nodes are labelled for alternative, rather than ordinary, readings. Combination of the set of indices with the singleton set '{d}' forms a set of ordered pairs, each of which associates a different index with 'd':

(28) {<d, i>, <d, j>, <d, k>, <d, l>, ...}



Each index now must refer to a specific thing or set of things that may be described as *dog* – for instance, each of 'i,' 'j,' 'k,' and 'l' might identify sets that correspond to dog breeds, or specific dogs, and so on. As a result, we now have a perspective from which focusing the index of a noun might arrive at its extension. While a complete account of this would require further formalisation, I leave the details of this aside, and concentrate instead on the broad characterisation of this approach, which as we will see yields desirable consequences.

8.3.2 Partial ordering and the incorporation of doubles.

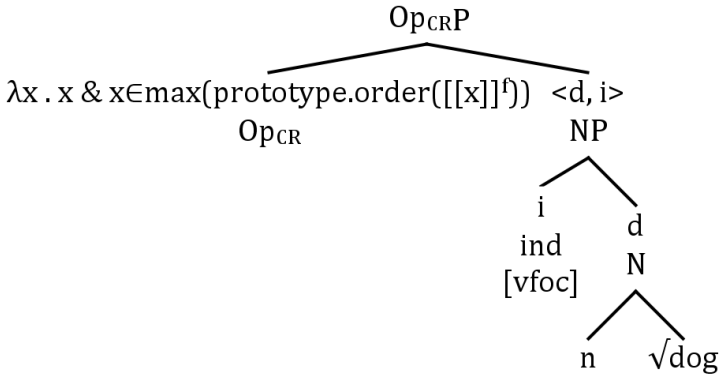
While the previous subjection outlined an approach for deriving the correct alternative set for CR, most aspects of the construction still remain unclear –the focus association, the doubling, and even the location of the stress have all yet to be explained. I begin with the first of these problems, which in turn provides some insight into the other two.

We have already seen in 8.2.2 that CR involves focus association of some kind – specifically, the extension of the noun is ordered, and some maximal subset of the resulting partially ordered set is selected. Since there is no clear focus-association particle involved, I suppose that this is carried out by a null focus association operator Op_{CR}. We can give this the preliminary definition in (29), following (16) above:

(29) $[[Op_{CR}]]^{o} = \lambda x . x \,\&\, x \in max(prototype.order([[x]]^{f}))$

If we suppose that Op_{CR} selects for NP, then we can apply this denotation to the construction in (28), yielding the desired meaning:

(30) <d, i> & <d, i>∈max(prototype.order({<d, i>, <d, j>, <d, k>, <d, l>, ...}))



The dog or set of dogs indexed with 'i' is asserted, and it is additionally stated that this (set of) dog(s) is in a high subset of the alternative reading of NP, when this latter set is ordered for prototypicality. Furthermore, this alternative set consists of indices applied to different (sets of) dogs, so (30) asserts that the dog or set of dogs indexed with 'i' is more prototypical than (sets of) dogs bearing other indices.

While this is a possible semantic description of CR, it does not derive the reduplication itself. Moreover, it was noted in 8.2.2 that this ordering relation is not in fact as simple as has been assumed so far, and so the semantic definition in (29) also requires revision. Similarly to the sign language cases in the previous chapter, I argue below that resolving the second of these problems provides an account of the first.

Thus far the ordering relation involved in CR has been described in terms of prototypicality, but Whitton (2006) demonstrates that the scale involved can in fact differ radically depending on context:

(31) a. You said in an earlier article that if you must have a [*drink*-drink]$_{Foc}$, go with the hard liquor. Why is hard liquor better than beer?

b. "Do you want a bottle of wine?" Mac asks. "I think I'll have a [*drink*-drink]$_{Foc}$," I say, and when the waiter comes I order a martini.

c. Around 3 euros a shot and 8 euros a [*drink*-drink]$_{Foc}$.

d. *Context:* Two people at a fast food restaurant sharing a meal deal.
A: What do you wanna get?
B: I'll probably just get water, so if you want a [*drink*-drink]$_{Foc}$, get whatever you want.

e. A: I am on my own with the BBQ! Come on girls I need some drink ideas please.
B: Are you looking for alcohol? Or just a [*drink*-drink]$_{Foc}$?

(Whitton 2006)

(31a) orders for alcoholic strength, (31b) for cocktails over other drinks, (31c) for mixed drinks over shots, (31d) for soft drinks over water, and (31e) for soft drinks over alcoholic ones, and thus it is clear that distinct and partially contextually-specified scales are involved in each case.

Thus ordering for prototypicality is overly simplistic, and we must admit some degree of pragmatic specification into the operation of Op_{CR}. Song & Lee (2011) further investigate this ordering, arguing it falls into three different types. However, what is important for the current purposes is that the ordering is nonetheless constrained by the reduplicated element; interpretations such as (32) are impossible:

(32) # I love cats, but have severe allergies, although it's okay because I bought a [*dog*-dog]$_{Foc}$, which is nearly as good. (interpreted as ordering for cattishness)

The ordering component of Op_{CR} must therefore be specified not only pragmatically, but also by the reduplicated element. We can therefore revise the analysis in (29) as follows:

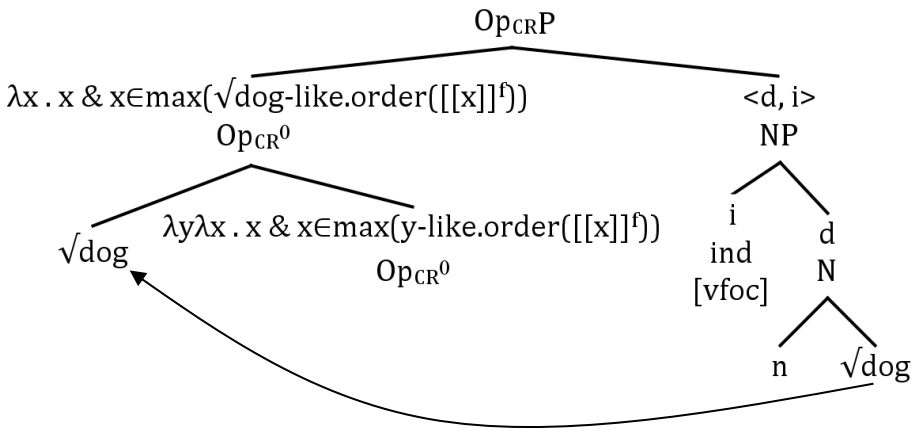
(33) $[[Op_{CR}]]^{o} = \lambda y \lambda x . x \,\&\, x \in max(y\text{-like.order}([[x]]^{f}))$

In other words, Op_{CR} requires not only the denotation of the NP, but also the denotation of the specific root involved in order to determine the type of ordering that occurs. For instance, (22) would have a denotation as follows, with '√dog-like' being interpreted in various ways depending on the context:

(34) $\langle d, i\rangle \,\&\, \langle d, i\rangle \in max(\sqrt{dog}\text{-like.order}(\{\langle d, i\rangle, \langle d, j\rangle, \langle d, k\rangle, \langle d, l\rangle, \ldots\}))$

However, for such a denotation to be derived, √*dog* would need to combine with Op_{CR} as well as NP, and so I propose that the root in fact moves to Op_{CR}, to satisfy the 'λy' term in (34):

(35) $\langle d, i\rangle \,\&\, \langle d, i\rangle \in max(\sqrt{dog}\text{-like.order}(\{\langle d, i\rangle, \langle d, j\rangle, \langle d, k\rangle, \langle d, l\rangle, \ldots\}))$



As with the remnant TP movement in the sign language varieties of the previous chapter, I suppose that √*dog* moves for semantic reasons, and that as with the degree-marked heads in these constructions, √*dog* must incorporate to form the

ordering reading. Consquently, $\sqrt{dog}$ undergoes head movement to Op_{CR} and incorporates.[1]

In the sign language varieties, we saw one further consequence of incorporation, which was the incorporated element being distinct at linearization, following Nunes' (1999, 2004) accounts. Since $\sqrt{dog}$ is also incorporated then it too is distinct from the lower copy, and so both are spelled out, explaining the reduplication. One final difficulty is the location of the stress, which occurs on the higher rather than the lower element. Since neither instance of *dog* is actually focused, with the focus instead being on the null index, we might expect it not to emerge. However, it is possible that the prosodic marking occurs to indicate the presence of focus, and is forced to mark the higher copy, as focus on the lower copy would instead suggest simple ord = base focus.

[1] It appears, however, that more than just the lower root may attach to the operator. For instance, in (32) an ordering for cattishness can arise, but only with a related construction:

(i) *Context:* A and B both like cats and hate dogs, and are dismayed to find their mutual friend C has bought a dog.

A: Did you hear that C bought a dog? It's such a pity.

B: Well, it's not so bad – after all, some dogs are a lot like cats.

A: No, he didn't buy a [*cat*-dog]$_{Foc}$, he bought a [*dog*-dog]$_{Foc}$!

The construction cat-*dog* appears to be semantically similar to dog-*dog*, only with "cat" constraining the operator, resulting in an ordering for cattishness. This is a simple instance of the construction that Ghomeshi et al. (2004) term the "you-can-put-anything-you-want-before-the-head" construction, and suggests that in addition to head movement of the lower noun to the operator, constituents may also productively adjoin to the operator to constrain it.

8.4 Extending the syntactic analysis.

8.4.1 The position of Op_{CR} within the nominal hierarchy.

The above discussion has taken Op_{CR} to occur immediately above NP in the phrasal hierarchy, but in fact we have yet to consider its distribution within the DP more generally. The first piece of evidence relevant to this enquiry is that determiners may not double along with their noun:

(36) a. I wouldn't date a [*linguist*-linguist]$_{Foc}$.

b. * I wouldn't date [*a-linguist*-a-linguist]$_{Foc}$.

(repeated from (13))

The ungrammaticality of (36b) suggests that doubling must take place below the determiner, and so seems to be fairly strong evidence that Op_{CR} must occur below D. I therefore suppose that it is always somewhere below DP and above NP. However, where does it stand in relation to other nominal projections, such as φ-featural heads? The following contrast between irregular (37) and regular (38) inflectional morphology can shed some light on this question:

(37) a. I don't just herd geese, I herd [*geese*-geese]$_{Foc}$.

b. * I don't just herd geese, I herd [*goose*-geese]$_{Foc}$.

(repeated from (11))

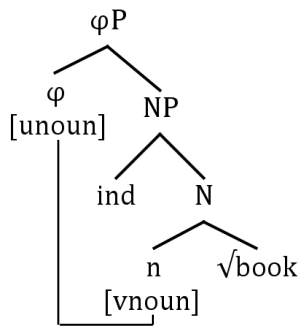
(38) a. I don't just read books, I read [*books*-books]$_{Foc}$.

b. I don't just read books, I read [*book*-books]$_{Foc}$.

(repeated from (12))

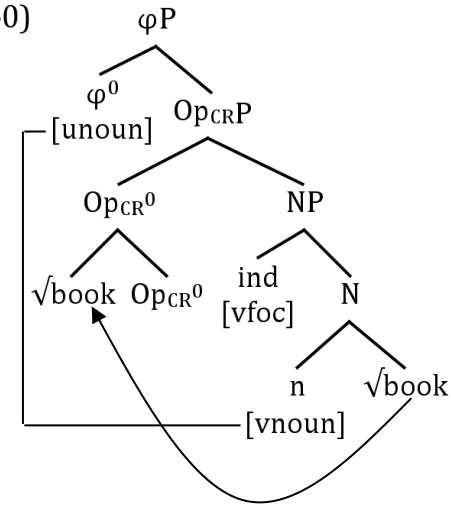
As noted in 8.2.1, while regular inflectional morphology may optionally double, irregular inflection must double. Let us leave aside the irregular cases for now, and consider the regular ones. In non-doubling cases, I suppose that agreement results due to φP probing n, along the following lines:

(39)



The [unoun] feature of φP causes it to probe the n, leading to agreement of between the heads, allowing N to be spelt out as *books*.[2] This can now be combined with the derivation of CR. First, assume Op_{CR} occurs below φ:

(40)

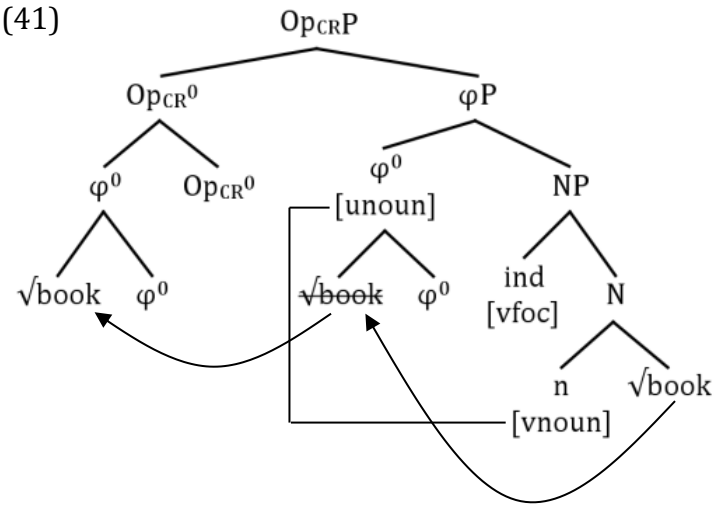


Here the bare root incorporates into Op_{CR}, after which φ is merged with $Op_{CR}P$, which agrees with n. The noun is therefore spelt out as *books*, whereas the higher incorporated root remains as *book*, leading to book-*books*, as in (38b).

[2] This could be modelled by φ bearing [unoun, vnum] and n bearing [vnoun, unum], with agreement leading to valuation of both features. However, this does not fit into the simplified feature typology introduced in 2.4.1, where only probes bear unvalued features, and so I suppose that the matching that values [unoun] also leads to number agreement on n.

Let us now suppose instead that Op_{CR} occurs above φP:

(41)

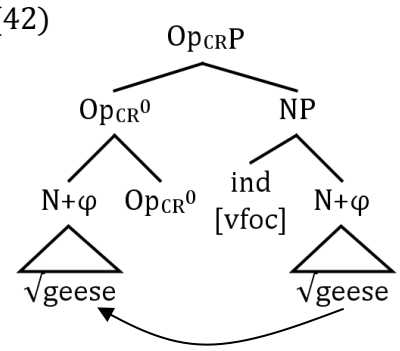


Once again, the agreement with φP leads to the noun being spelt out as *books*. However, this time, φP intervenes between Op_{CR} and NP, and so following the head movement constraint of Travis (1984), √*book* must first move through this position, before incorporating in Op_{CR}.[3] This higher root therefore now also has the plural aspects of φP as part of its complex head, and so it is spelt out as *books* as well. If we suppose that the intermediate complex head is too similar to the higher complex head at linearization to be viewed as distinct, then this intermediate head will be deleted. This results in the overall spell out of books-*books*, as in (38a).The analyses in (40) and (41) therefore suggest that in the case of regular morphology at least, Op_{CR} may occur both above and below φP.

We may now turn to the irregular cases, where I suppose that φP is either indistinct from the noun, or must be adjacent to it to combine via an operation such as morphological fusion (see e.g. Halle & Marantz 1993). Both these proposals seem plausible, and coming more and less lexicalist perspectives respectively. This leaves only one option for Op_{CR}, and so only (37a) is grammatical:

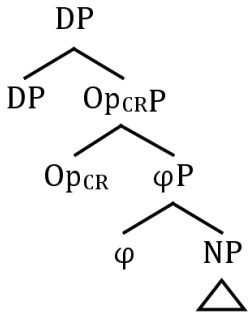
[3] It is unclear whether √*book* should also move through n and ind, though this does not significantly alter the final analysis. However, ind is a specifier rather than a head, and n is a categoriser rather than a head, as well as being the sister of √*book*. I therefore assume that the only intermediate position for √*book* to move to is φ.

(42)

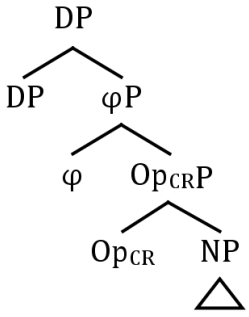


These analyses provide an angle for explanation of the data in (37-38), but also show us that in addition to occurring above NP and below DP, Op_{CR} may occur either side of φP. The following options are therefore available:

(43) a.



b.



This is parallel to the situation discussed in 2.4.2 (ch.2:112), and so the most straightforward way to account for it is by supposing that Op_{CR} is invisible to c-selection, and may select either φP or NP. I further review these restrictions in chapter 10.

8.4.2 Crosslinguistic counterparts of Op_{CR}.

The above analysis makes a case for Op_{CR} being phonologically null in English. Nevertheless, some of the semantically comparable constructions from other languages, identified by previous researchers of CR, appear to use an overt operator. I first consider the following Japanese examples, demonstrating the use of the prefix *ma-*:

(44)	a.	mae	'front'	maNmae	'right in front'
		fuyu	'winter'	mafuyu	'dead of winter'
		siro	'white'	massiro	'snow white'
		kita	'north'	makita	'due north'
		aka	'red'	makka	'deep red'
	b.	kamo	'wild duck'	magamo	'mallard'
		azi	'horse mackerel'	maazi	'the horse mackerel *T. trachurus*'
		koti	'flathead'	magoti	'the common flathead'

(Japanese, Poser 1991:449-450, via Ghomeshi et al. 2004:319-320)

In (44a), attaching the *ma-* prefix denotes more absolute states, whereas in (44b) it denotes more common/prototypical members of a class. Both these cases are reminiscent of the ordering effect of English CR, and so we might suppose that *ma-* is an overt Japanese counterpart of the operator we are proposing for English. However, such a claim would require further research, and the data of Poser (1991) appear to lack the pragmatic variation in ordering found in English CR, with derived compounds having only a single, context-invariant reading. This could suggest that the ordering of *ma-* is purely semantically specified, or alternatively the data seen in (44) may be a relic of a more pragmatically specified *ma-* which has since undergone lexicalisation.

The Japanese data are nonetheless partially comparable to CR, and Lee & Lee (2007) further note that the Korean prefixes *han-*, *cham-*, and *cin-* behave in a similar manner:

(45)	yerum	'summer'	hanyerum	'the peak of summer'
	mosup	'appearance'	chammosup	'the true look of one's appearance'
	bemin	'culprit'	cinbemin	'the real culprit'

(Korean, Lee & Lee 2007:263)

So far, I have taken CR to be canonically nominal, by relating it to an index and the structure of the NP. One arguable piece of crosslinguistic evidence for this being the case is that both the Japanese and Korean examples seem mostly restricted to

nouns – Japanese, in particular, is noted by Poser (1991:449) to be "restricted to nouns, and perhaps adverbs and adjectives," giving numerous nominal examples and noting that "the adverbs and adjective stems to which *MA* attaches are arguably nouns in Japanese." (p.457) Kinande additionally has an apparently comparable structure to CR which is entirely restricted to nouns:

(46) o.ku-gulu 'leg' o.ku-gulu-gulu 'a real leg'

(Kinande (Bantu), Mutaka & Hyman 1990, via Ghomeshi et al. 2004:319)

Each of these cases (along with other instances of CR-like structures in crosslinguistically[4]) requires further investigation, and likely differs from English CR in several respects. Notwithstanding, the fact that several varieties exist that restrict CR-type semantics to nominals lend some support to the hypothesis that CR is tied to the structure of the DP. But, as we saw in section 8.2.1, this nominal restriction does not in fact hold for English, with a great many cases being phrasal and non-nominal, and it is these that I now turn to.

8.4.3 Categorisation and renumeration of non-nominal and phrasal reduplications.

There remain several cases which initially seem problematic for the above analysis:

(47) a. I like him, but I don't [*like*-like]$_{\text{Foc}}$ him.

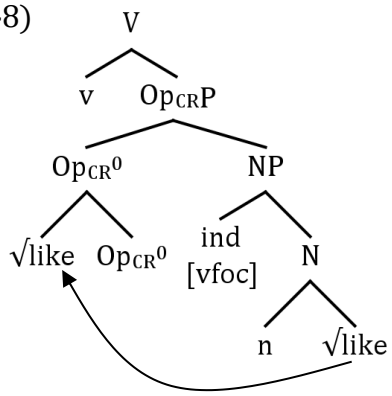
b. Did you just live there for a while, or are you [*from*-from]$_{\text{Foc}}$ Liverpool?[5]

Both examples in (47) are clearly not nominal, yet CR nonetheless appears to be possible. Here the distributed morphological framework becomes useful, allowing for the following analysis:

[4] In addition to those discussed here, Ghomeshi et al. (2004:317-319) suggest possible equivalents in Italian, Spanish, Russian, and Persian, though the details of these cases are unclear.

[5] Thanks to Alison Biggs for this example, who notes that prepositional doubling is particularly prominent in New Zealand English, potentially suggesting some dialectal variation in CR constructions.

(48)



The verbal root is first nominalised, allowing the index to be added. Op_{CR} then selects for this structure, and *√like* incorporates into it, for the same semantic reasons as before. The entire structure is then converted into a verb with the v categoriser, which then allows "*like*-like" to continue the derivation as a verb.[6] I suggest that this step of nominalisation and indexing is necessary to access the set of possible meanings of *√like* which need to be contrasted, which also has the effect of adding a more encyclopedic and idiomatic nature to the meaning of the word undergoing CR. Indeed, this goes some way to explaining the ban on CR of purely functional items:

(49) * I [*will*-will]$_{Foc}$ do that.

(repeated from (7))

Such items are not associated with idiomatic content, and so cannot be nominalised to undergo CR – similarly, prepositions can undergo CR more readily the more lexical they are:

(50) a. No, he's [*under*-under]$_{Foc}$ the table.

b. Are you [*from*-from]$_{Foc}$ Liverpool?

c. ?? Are you going [*to*-to]$_{Foc}$ the cinema?

d. * She's a student [*of*-of]$_{Foc}$ literature.

[6] It is unclear to what extent inflectional morphology can double on non-nominal heads, with cases such as "*likes*-likes" potentially requiring further recategorisation, or renumeration, as with the phrasal cases below.

This provides a new perspective on Ghomeshi et al.'s (2004) observation that CR must include a full lexical item, although further semantic formalisation of the role indices play in this process is clearly necessary.

Finally, phrasal cases of CR still remain unexplained:

(51) a. I know you like him, but do you [*like-him*-like-him]$_{\text{Foc}}$?

b. Oh, we're not [*living-together*-living-together]$_{\text{Foc}}$.

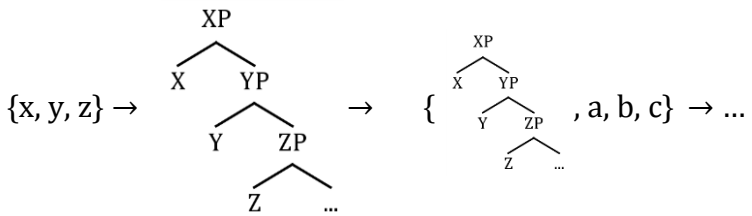
c. [*out-of-her-mind*-out-of-her-mind]$_{\text{Foc}}$

d. After we changed it on Facebook, we were [*in-a-relationship*-in-a-relationship]$_{\text{Foc}}$.

((a) repeated from (5), (b) from (6), (c) from (8a))

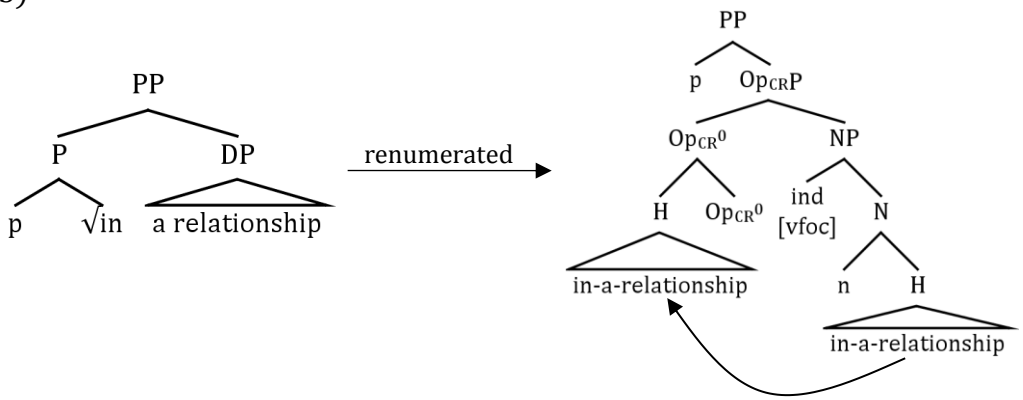
In order to account for such cases, I make use of the notion of a layered derivation (Uriagereka 1999, Johnson 2002, Zwart 2009a,b, 2010), whereby structures may be formed by the narrow syntax, then renumerated and once again inserted into a derivation as syntactic atoms:

(52)



This allows for the formation of structures which can then be essentially converted into heads (see Fowlie 2013 for discussion of such "atomisation"), allowing us to maintain a head-movement analysis even of phrasal CR. Thus for instance (51d) may be analysed as follows:

(53)



This provides a potential explanation for the restriction of phrasal CR to idiomatic compounds, and the necessity of idiomatic CR to involve complete copying:

(54) a. [*out-of-her-mind*-out-of-her-mind]$_{Foc}$

b. * out of her [*mind*-mind]$_{Foc}$

c. * [*over-the-stove*-over-the-stove]$_{Foc}$

((a-b) repeated from (8), (c) from (9))

In order to access the idiomatic reading, compounds must be renumerated, so that they may be indexed, which leads to their non-compositional reading. Thus for this index to be added, the phrase must be idiomatic, and must be complete, and so (54b-c) are ruled out, though it is worth noting that when construed in a sufficiently idiomatic manner, even cases such as (54c) become grammatical, supporting the analysis.

This perspective further explains the ban on partial doubling of derivational compounds:

(55) a. I'm not in a [*relationship*-relationship]$_{Foc}$.

b. * I'm not in a [*relation*-relationship]$_{Foc}$.

(repeated from (10))

Once again, an index must be assigned to give the derivational reading, and so the renumeration necessary blocks CR applying to *relation* alone.

One final prediction is made by this analysis, suggested by Laurie Bauer (p.c.), which is that idioms with initial determiners should be allowed to reduplicate (compare with (56), where the determiner is not part of the idiom):

(56) a. I wouldn't date a [*linguist*-linguist]$_{\text{Foc}}$.

b. * I wouldn't date [*a-linguist*-a-linguist]$_{\text{Foc}}$.

(repeated from (13))

(57) *Context:* You're at a restaurant with a menu item entitled "the works," and order it only to be dismayed that only a single rasher of bacon arrived.

This isn't really [*the-works*-the-works]$_{\text{Foc}}$, is it?

In (56b), the determiner is not part of the constituent that receives an index, and so doubling of the determiner along with the noun is blocked. By contrast, in (57), the determiner is in fact part of the idiom involved, and so is renumerated and marked with an index. Though Bauer rejects this example, the majority of speakers I consulted found it to be felicitous with the appropriate context, supporting the analysis of idioms in this section.

At this point it is worth speculating why English in particular shows this productivity in CR across categories and even phrases, whereas, as we saw in the previous subsection, many other varieties seem to mostly restrict equivalent constructions to nominal (and certainly non-phrasal) cases. The distributed morphological approach taken here provides the beginnings of a potential explanation – since the structure proposed for non-nominal and phrasal cases involve significant recategorisation, we might expect this to show up morphologically. Absence of overt morphology, though, is a feature of English, which very productively allows zero-derivation, and it may be that this is why English allows CR with such a broad range of structures.[7]

[7] This in fact predicts that we should be able to find languages that allow a similar range of CR constructions but with overt morphology, and to this end detailed investigation of the varieties mentioned in footnote 4 above may prove productive.

8.5 Conclusion.

In this section, we have seen that though CR appears to involve focus, a standard Roothian analysis derives the incorrect alternative set. Nevertheless, the postulation of a null index within the DP allowed a consistent approach to focus to be maintained, as focusing this index produces the extensional set required. Furthermore, adding an operator to yield the focus association necessary additionally provided a site for incorporation of the double, explaining why both copies are spelled out. Moreover, in 8.4.3 I outlined a method for extending this analysis to more complex cases of CR, including non-nominal and phrasal reduplication, and here in particular the postulation of an index within the NP presented an angle for explanation of many of the restrictions.

This analysis remains incomplete in places, and doubtless requires further research and formalisation. Nevertheless, this chapter has once again been investigation of a focus construction from a semantic perspective, and constructed a compositional analysis that sheds light on the syntactic as well as the semantic facts. This therefore adds to the above analyses of Nepali, ASL, LSB, BSL_1 and BSL_2, lending more credence to the assertion at the start of this part that compositionality is a useful heuristic in the investigation of focus. However, there remain constructions where this compositionality does not appear to hold, and the following chapter begins with such cases, before situating them within the wider typology of focus.

9. A Preliminary Typology of Focus.

9.1 Introduction.

The past four chapters have reviewed a number of focus constructions that appear to exhibit compositionality: their additional structure is best accounted for in terms of the meaning it contributes. However, in 3.4.4 it was recognised that a class of constructions exist that cannot be analysed in these terms, and it was tentatively suggested that they may instead involve phonologically-motived structure. Nevertheless, there was little consideration of how such constructions should be analysed syntactically, and so this chapter begins with an outline of an approach to such non-compositional cases.

This discussion completes the general conception of focus variation used in this thesis, and allows for a return to the question that began this part: how can focus constructions be compared? While the preceding chapters demonstrate that a full understanding of any particular construction can only be attained through detailed syntactic and semantic analysis, constructions may nevertheless be broadly compared based on their semantic and syntactic complexity. To this end I motivate two categorial scales of complexity, and apply them to every focus construction considered so far. This provides a rough, yet structured, picture of the range of variation seen, and exhibits an interesting typological gap.

Section 9.2 considers non-compositional phonologically-motivated focus constructions, concentrating in particular on a number of Romance cases, before expanding in scope and considering the limitations of the current perspective on focus. Section 9.3 introduces the scales of syntactic and semantic complexity, and in section 9.4 a wide range of focus constructions are tentatively situated on these scales. Section 9.5 concludes, tabulating the variation seen, and briefly discussing its structure and implications.

9.2 Phonologically-motivated focus and the limits of compositionality.

The previous chapters have considered a number of cases where a compositional analysis of focus yields desirable syntactic results. All of these cases fall, broadly speaking, under the following description:

(1) syntactic complexity ≤ semantic complexity

(repeated from (ch.3:107))

Nevertheless, it was noted in 3.3.4 that not all focus constructions fit this category, with there being some instances of simple ord = base constructions that nonetheless display considerable syntactic structure. One such case is Spanish final focus:

(2) a. A: Qué pasó?
what happened
'What happened?'

B: Juan compró ayer el *periódico*.
Juan bought yesterday the newspaper
'Juan bought the newspaper yesterday.'

b. A: Quién compró el periódico ayer?
who bought the newspaper yesterday
'Who bought the newspaper yesterday?'

B: Ayer compró el periódico [*Juan*]$_{\text{Foc}}$.
yesterday bought the newspaper Juan
'*Juan* bought the newspaper yesterday.'

(Spanish, repeated from (ch.3:24))

The contrast between (2a) and (2b) strongly suggests that the focus construction is derived by at least one movement to at least one structural position. Yet we see no semantic complexity to reflect this, with final foci being unmarked in question-answer correspondences, and being translated as equivalent to English stress foci. This therefore poses a question for the compositional approach taken so far: how are such non-compositional cases accounted for? I outline a potential solution to this problem in the following subsection, before going on to briefly consider the limitations of the current approach more generally.

9.2.1 Phonologically-motivated movement in Romance and beyond.

Section 3.3.1 introduced the hypothesis that phonological differences between languages may condition crosslinguistic variation in focus expression, adopted in various forms by many authors (e.g. Vallduví 1991, Cinque 1993, Reinhart 1995, Zubizarreta 1998, Schwarzschild 1999, van Valin 1999, Szendrői 2003, Samek-Lodovici 2005, Büring 2010, Féry 2013). While many languages have a phonological system that allows foci to be distinguished prosodically, as in the case of English stress placement, in some this is not available. For instance, Spanish has a fixed final nuclear stress, and so this can be said to lead to the placement of final items at the end of the sentence, as in (2b). In 3.3.1 this view was characterised as the suggestion that the "phonotype" of a language might determine its manner of focus expression, along the following simplified lines:

(3)	Stress-timed	→	stress focus (e.g. English)
	Prosodic/tone sandhi	→	prosodic focus (e.g. Yixing Chinese)
	Fixed final nuclear stress	→	final focus (e.g. Spanish)

(repeated from (ch.3:61))

While this hypothesis is in principle testable, assuming the codification of each kind of phonological system and the expected focus type that results, there remain two key difficulties. One, alluded to in 3.3.1, is that individual varieties can exhibit a wide array of focus constructions with differing syntactic and semantic properties, and it seems unlikely that simply the phonotype could determine the full array of structures seen. The second difficulty is one of compositionality: unlike the cases we have considered in detail above, where syntactic structure was taken to reflect semantic complexity, phonologically-driven structure would presumably add no additional meaning.

By making one additional assumption, these difficulties become easier to navigate, and the "phonotype" hypothesis is brought closer to falsifiability: I suppose that phonotypes condition only simple ord = base types of focus. This suggestion was briefly made in 3.4.4, and is in line with many of the phonological approaches cited

above, since most are principally concerned with the foci that enter into question-answer correspondences. Furthermore, this is in fact in line with the hypothesis of compositionality in the more complex cases: whereas simple foci are constrained to appear in particular ways depending on the properties of the language, complex foci are instead limited only by the licit combinations of semantically-specified focal heads in that language.

Notwithstanding, cases such as (2b), where apparent syntactic structure adds no meaning to the construction, still require an explanation. Should this really be analysed as syntactic structure, and if so, why does it lack in meaning? To this end, I briefly consider how final foci in Romance might be approached. Such structures are present in Italian as well as Spanish, which also has the same fixed final nuclear stress position:

(4) a. A: What happened?
B: Gianni ha *riso*
John has laughed
'John has laughed.'

b. A: Who has laughed?
B: Ha riso [*Gianni*]$_{\text{Foc}}$
has laughed John
'*John* has laughed.'

(Italian, Samek-Lodovici 2005:688)

One potential solution might be to propose that the apparent movement in such cases is a purely phonological one, with a post-syntactic operation placing the subject in final position to satisfy the requirements of the phonotype. Zubizarreta (1998:145-146) argues against this perspective by providing the Italian paradigm in (5), which demonstrates that postverbal negative phrases require overt negative morphemes, whereas preverbal ones do not:

(5) a. Nessuno è arrivato
nobody has arrived

b. Non è arrivato nessuno
not has arrived nobody

(Italian, Zubizarreta 1998:145-146)

She suggests that the contrast in (6) provides evidence for the syntactic nature of final focus, as in (6b) it must feed the licensing of negative polarity items, which is assumed to take place at LF:[1]

(6) a. Nessuno ha mangiato la mela
nobody has eaten the apple

b. *(Non) ha mangiato la mela [*nessuno*]$_{\text{Foc}}$
not has eaten the apple nobody

(Italian, Zubizarreta 1998:145-146)

Moreover, the final movement structures appear to display considerable syntactic sensitivity, with apparent island violations being extremely unacceptable in both Spanish (7) and Italian (8):

(7) a. * [Juan y ~~Maria~~] compraron el periodico [*Maria*]$_{\text{Foc}}$
Juan and bought the newspaper Maria
'Juan and *Maria* bought the newspaper.'

b. * [El hombre que conoció a ~~Juan~~] compró el periódico [*Juan*]$_{\text{Foc}}$
the man that knew A bought the newspaper Juan
'The man that knew *Juan* bought the newspaper.

(Spanish, Roberto B. Sileo p.c.)

(8) a. * [Gianni e ~~Maria~~] ha riso [*Maria*]$_{\text{Foc}}$
Gianni and have laughed Mary
'Gianni and *Maria* have laughed.'

b. * [L' uomo che conosce ~~Gianni~~] ha riso [*Gianni*]$_{\text{Foc}}$
the man who knows has laughed Gianni
'The man who knows *Gianni* has laughed.'

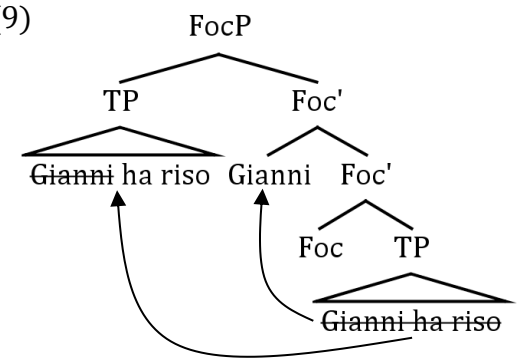
(Italian, Ian Roberts p.c.)

It therefore seems that despite the phonologically-motivated nature of these structures, it makes most sense to account for them in the narrow syntax rather than merely as post-syntactic operations. This is essentially the approach taken by Zubizarreta (1998), who explicitly places phonological consttraints in the syntax,

[1] Though Zubizarreta (1998) assumes a distinct architecture of the grammar from the standard minimalist approach, this argument appears to hold under both perspectives, and additionally obtains if the licensing is syntactic (see e.g. Zeijlstra 2004 for such an approach).

leading to derivation of sentences such as (4b) by subject extraction followed by TP adjunction to a focus phrase, leaving the subject in final position:[2]

(9)

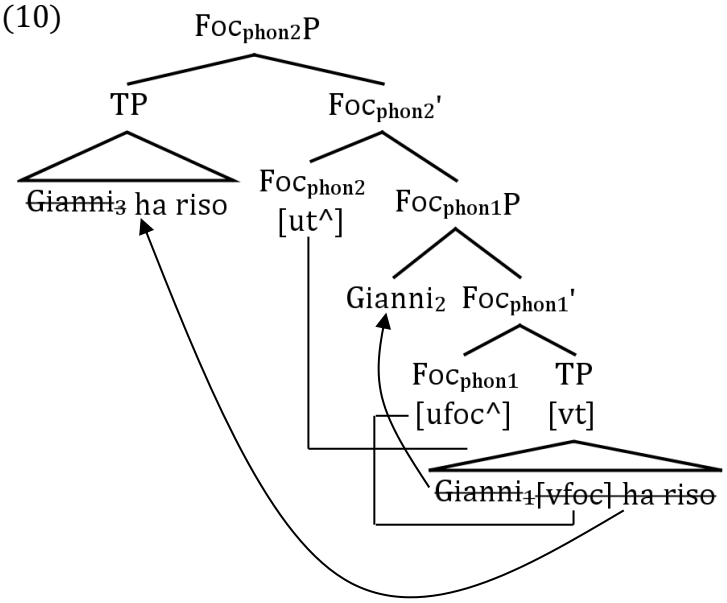


(Italian, adapting Zubizarreta 1998:135-138)

While this derives the correct order, it is not entirely desirable to insert phonological constraints into the narrow syntax, but without these, it is unclear why all the movements should take place. For instance, while *Gianni* in (9) likely moves because it is marked with a focus feature, it is unclear why the TP should front. It is not obviously a topic, and in fact itself contains a focus, so it is unlikely to be fronting to a distinct information-structural position. Furthermore, unlike the TP in the sign language doubling analyses of chapter 7, it does not appear to contribute anything to the meaning of the focus construction, and so semantically-driven movement does not appear to be an option. Thus unless phonology is allowed into the syntax, the conclusion is that this movement is entirely arbitrary, yet conspires to derive structures that accord with the phonological requirements. Consequently, if this grammatical architecture is correct, when faced with examples such as (4b), the learner is forced to postulate a structure such as the following:

[2] Spanish is treated similarly, but involves significantly more complex derivations, and so I concentrate on Italian here. This is by no means the only possible analysis of this construction, with for instance Belletti (2004) suggesting it involves focus movement to a low left-periphery and remnant fronting of the vP. However, it suffices to demonstrate the difficulties surrounding the syntactic analysis of apparently phonologically-motivated focus.

(10)



(Italian, update of (9))

This largely retains the analysis in (9), but provides heads that are featurally-specified so that the correct structure is derived – Foc$_{phon1}$ probes the [vfoc] features, leading to fronting of *Gianni*, and Foc$_{phon2}$ probes the [vt] feature of T, leading to fronting of the TP.[3] Furthermore, since neither head appears to play a semantic role in the derivation, they presumably have only the identity function (λx.x) as their denotation, allowing the simple ord = base semantics to be derived. One outstanding difficulty with the analysis in (10) is how Foc$_{phon1}$ and Foc$_{phon2}$ can be restricted to occur together, especially since the latter involves no focus-specific features. However, if Foc$_{phon2}$ can c-select only Foc$_{phon1}$P, and the next highest necessary head, e.g. C, can c-select Foc$_{phon2}$P but not Foc$_{phon1}$, then these heads must occur together, in the configuration in (10). This allows the apparent construction-like nature of the configuration to be explained simply in terms of the properties of individual heads.

Phonologically-motivated syntactic constructions can therefore potentially be viewed as those where semantically inactive heads target [vfoc] rather than semantically active ones. This approach may appear stipulative, and this is because

[3] Note that the correct copies are still spelled out under the Nunes (1999, 2004) approach to copy deletion used thus far, since *Gianni$_1$* and *Gianni$_3$* form a chain whose lower element (*Gianni$_1$*) is c-commanded by *Gianni$_2$*, and neither element of this chain c-commands *Gianni$_2$*. As a result, *Gianni$_2$* is ordered before *Gianni$_1$* and *Gianni$_3$*, and so only it is the only copy to be spelled out.

from an acquisitional perspective it is – the learner observes that simple foci must obey certain phonological requirements, and where these requirements can only be met by additional syntactic structure, they are forced to stipulate heads that derive the correct result. However, since such instances are (by hypothesis) confined to simple foci, the approach outlined here remains testable in principle. Finally, we shall see in 9.5 that the syntactic expression of simple foci appears to be restricted to a limited range of structures, suggesting that some constraints of acquisitional difficulty may be involved.

Romance is by no means the only domain where simple focus constructions have some degree of syntactic structure. However, identifying these cases is not always straightforward, as is demonstrated for Yucatec Maya in the following discussion. We encountered the Yucatec Maya pre-predicate construction in 3.2.6, and again in 4.3.9, in the discussion of the ADDLIKELY test. Further data from this test applied to Yucatec Maya is shown below:

(11) *Context:* In the house there are beans, corn, and potatoes.

a. Deysi=e' k=u hàant-ik bu'l
Deysi=TOP IPFV=A3 eat:TRANS-INCOMPL.B3SG bean
'Deysi is eating beans.' (but maybe other things too)

b. [bu'l]$_{Foc}$ k=u hàant-ik Deysi
bean IPFV=A3 eat:TRANS-INCMPL.B3SG Deysi
'Deysi is eating *beans*.' (and nothing else)

(Yucatec Maya, Skopeteas & Verhoeven 2015:19-20)

The contrast in (11a-b) suggests that the pre-predicate construction is semantically complex, possibly having exhaustive properties. However, when we consider (12), it becomes clear that this meaning is not always associated with the construction:

(12) [bu'l]$_{Foc}$ k=u hàant-ik le úulum=o'
bean IPFV=A3 eat:TRR-INCOMPL.B3SG DEF turkey=DIST
'The turkey is eating *beans*.' (but maybe other things too)

(Yucatec Maya, repeated from (ch.4:17))

By contrast, when a cleft construction is used, only the exhaustive interpretation is possible:

(13) [bu'l]$_{Foc}$ le k=u hàant-ik Deysi=e' / le úulum=o'
bean DEF IPFV=A3 eat:TRANS-INCOMPL.B3SG Deysi=TOP DEF turkey=DIST
'Beans is what Deysi/the turkey is eating.' (and nothing else)

(Yucatec Maya, Skopeteas & Verhoeven 2015:21)

Skopeteas & Verhoeven (2015) therefore point out that while the exhaustiveness of the pre-predicate position is affected by context, the exhaustiveness of the cleft is not. They therefore argue that the interpretation in (11b) results from a conversational implicature – since it is stated that Deysi is eating beans, and *beans* is focused, it is assumed that this is all he is eating. By contrast, in (12), it is much more surprising that the turkey is eating beans, and so no implicature of exhaustivity is made, since it is assumed that the speaker is using focus to point out the unexpected thing that the turkey is eating. This leaves open the possibility that less surprising things like corn are being eaten too.

Therefore out of the two Yucatec Maya constructions we have considered, there is actually only evidence that the cleft has complex semantics, despite the superficial appearance of complexity of pre-predicate focus in (11b). Pre-predicate focus is therefore likely to be of the simple ord = base type, and a semantically inactive Foc_{phon} head in the pre-predicate position may readily be postulated to account for this structure. This further predicts that this position should in some way be prominent for the focused item, and this is exactly what Skopeteas & Verhoeven (2015:36) find – pre-predicate constituents "exactly occupy the maximally prominent part of [the core clausal] prosodic domain." This case therefore once again demonstrates that detailed investigation is necessary for proper treatment of focus constructions, with individual tests or examples commonly showing anomalous properties.

The cases examined thus far have been comparatively simple syntactically, but may also extend to those where considerably more syntactic structure is involved.

For instance, in 3.2.7 we saw that Gungbe makes use of the following doubling structure for simple focus:

(14) [Ðù]$_{\text{Foc}}$ (%**wɛ̀**) Sɛ́ná [ɖù]$_{\text{Foc}}$ blɛ́ɖì lɔ́
eat **FOC** Sena eat bread DET
'Sena *ate* the bread.'
(Gungbe (Kwa), repeated from (ch.3:43))

Though further research into the semantics of this construction is clearly required, the glosses and discussion in Aboh (2004), Aboh & Dyakonova (2009) suggest that it encodes simple focus. It may therefore be the case that the doubling in (14) is another strategy used to ensure prosodic prominence, perhaps when other possibilities such as movement or change in intonation are not available. More generally, certain inaccessible constituents, such as Vs, may require complex syntactic structures to focus them in particular phonotypes.

So far, each language considered in this subsection has appeared to have only a single simple focus construction for each type of constituent, which is as predicted if this is determined by the phonotype. However, I now return to Italian, which in fact exhibits fronting constructions alongside the final cases discussed above. For instance, as Frascarelli (2000:178-179) observes, the question in (15) has two possible answers:

(15) A: Dove hai messo i libri?
where have.2SG put.PST.PTCP the books
'Where have you put the books?'

B: Li ho messi [*sullo scaffale*]$_{\text{Foc}}$.
them have.1SG put.PST.PTCP.PL on.the shelf
'I have put them *on the shelf*.'

B': [*sullo scaffale*]$_{\text{Foc}}$ li ho messi.
on.the shelf them have.1SG put.PST.PTCP.PL
'It is on the shelf that I have put them.'
(Italian, Frascarelli 2000:178-179)

While the B response once again shows final focus (albeit with a different structure to the cases given above, given an object PP is focused rather than a subject), the B' response instead involves fronting. However, this response is glossed as a cleft,

and focus fronting is typically described as being explicitly contrastive (see e.g. Benincà 1988, Cinque 1990, Rizzi 1997, É. Kiss 1998, Frascarelli 2000, Belletti 2004, Benincà & Poletto 2004 among many others). One might therefore be tempted to analyse the construction in B' as simply being a more marked structure with additional semantic complexity, but there are several facts that lead us away from this analysis.

Firstly, both the fronting and final constructions appear to be felicitous in response to a *wh*-question, which is not characteristic of more complex, exhaustive foci (see e.g. table 6.2 above). Secondly, Frascarelli (2000:178-179) states that "Italian Focus does not entail exhaustiveness (in either location)." This then suggests that fronting should be analysed as encoding some notion of contrast, rather than exhaustivity. However, even this approach is problematic, as both Brunetti (2004) and Lonzi (2004) cast doubt on the one-to-one mapping between contrastiveness and fronting, with apparently contrastive foci appearing finally (15), and (in certain restricted contexts) apparently simple foci being fronted (16):

(15) A: Is that the boy who saw your sister?

B: No, l'ha vista [*Carlo*]$_{\text{Foc}}$.
No her=has seen Carlo
'No, *Carlo* saw her.'

(Italian, Brunetti 2004:7)

(16) A: Has somebody/anybody called me?

B: [*Maria*]$_{\text{Foc}}$ ti ha chimato. (Tu chi aspettavi?)
Maria you.ACC has.3SG.PRS called.PST.PTCP you.NOM who wait.2SG.IPFV
'*Maria* called you. (Whom were you waiting for?)'

(Italian, Lonzi 2004:132; gloss Ian Roberts p.c.)

It therefore seems that Italian in fact has two apparently simple focus constructions, one of which is preferentially used in contrastive contexts, and one of which is not. This seems somewhat unexpected under the approach outlined here, as we would imagine the phonotype of Italian would lead to one specific simple focus construction.

By contrast, as discussed in 3.4.3 above, English may make use of the same simple focus construction in multiple different pragmatic roles. Following Beaver & Clark's (2008) update of Roberts (1996), this is possible in part because distinct intonation profiles are available for the same construction, each of which leads to the accommodation of different implicit questions and in turn different implicatures. The difference between informative and contrastive uses of English could therefore be roughly characterised as follows:

(17) <u>profile 1</u>
I met [*John*]$_{\text{Foc}}$.
↓
Who did you meet?

(18) <u>profile 2</u>
I met [*John*]$_{\text{Foc}}$.
↓
Which of Paul and John did you meet?

In each case, the syntactic structure is the same, but the intonation profile varies. This leads to the accommodation of different implicit (sub)questions, and so (17) is interpreted as informative whereas (18) is interpreted as contrastive.

However, as we have seen above, Italian instead uses two distinct constructions for the contrast in (17-18), leaving us with the question of why Italian cannot vary intonation profiles as in English. However, it was noted above that the Italian phonotype was rigid, with a fixed final nuclear stress, unlike English. This therefore provides a possible explanation for the necessity of two constructions in Italian – the constrained intonation possibilities offered by the phonotype mean it is easier to associate a focused constituent with a different intonation profile by placing it in a different syntactic position. This suggestion is given partial support by research into the intonational properties of Italian contrastive foci, which have a distinct stress with a higher peak (see e.g. Zubizarreta 1998, Donati & Nespor 2003 *inter alia*).

While this argument is clearly preliminary and would require significant further phonological, syntactic, and semantic analysis to verify, it does make the prediction

that otherwise similar languages that display different syntactic properties for simple foci should also have different phonotypes. Of interest in this connection are the Sicilian, Sardinian, and Triestino varieties, all of which readily allow non-contrastive foci to be fronted:

(19) A: What have you forgotten?

B: [I chiavi]$_{\text{Foc}}$ mi=scurdavu
the keys myself=forgot.1SG
'I forgot the keys.'

(Sicilian, Cruschina 2010:249)

(20) A: What have you read?

B: [Cussu libru]$_{\text{Foc}}$ appo lessu
this book have.1SG read
'I have read this book.'

(Sardinian, Jones 1993:17, Paoli 2010:277)

In the case of Sardinian, fronted non-constrastive foci such as *cussu libru* in (20) bear not the peaked stress characteristic of Italian contrastive foci, but instead the nuclear stress of the sentence (Jones 1993:332, Paoli 2010:276). Research into the phonology of Sicilian seems to indicate a similar contrast, with Cruschina (2011:150, fn. 9) noting that "intonational differences between fronted [contrastive foci] and fronted [non-constrastive foci] are clearly perceived by native speakers of both Sicilian and Sardinian," and further pointing to Folli & Payne's (2006) discovery of intonational differences. This suggests that, as expected, Sardinian and Sicilian differ in phonotype from standard Italian, allowing initial nuclear stress, and so exhibit a different pattern of focus constructions. This similarly seems to be the case for Triestino, investigated by Paoli (2010), although in this case the information-structural distinctions involved appear to be considerably more complex.

In this subsection, we have considered a number of non-compositional cases of focus constructions. Assessment of these constructions has shown that they are not in principle problematic for the general approach of this thesis, provided fairly specific assumptions are made about the mapping between phonology and information structure, all of which seem to be largely vindicated by our

preliminary investigations. In all cases though, there is no substitute for detailed pragmatic, semantic, syntactic, and (in this domain especially) phonological research.

9.2.2 The limitations of the current framework.

The investigations so far have clearly demonstrated that focus involves a complex interplay between phonological, syntactic, semantic and pragmatic factors. Under the present approach, the syntactic aspect is of the most interest, since the ultimate goal is to parametrise the crosslinguistic expression of focus. To this end, I have argued for a strictly compositional approach, and following this has led to some success, in particular for Nepali NAI, English CR, and ASL/LSB/$BSL_{1\text{-}2}$ doubling. However, it has also led to some difficulties, such as those considered in the previous subsection. While these are to some extent surmountable, the possible solutions show the wide variety of factors that are involved in evaluating the properties of focus constructions. For this reason, it is highly likely that certain factors are involved that are not considered here – for instance, the range of constructions available to a speaker may in fact play a role in its ultimate interpretation, as suggested by Onea (2007), Zimmermann & Onea (2011) *inter alia*. Nevertheless, such considerations are outside the scope of the current study, and so I continue to assume compositionality outside the cases discussed in 9.2.1. Furthermore, in the remainder of this chapter, I turn to a tentative typology of focus, which appears to support many of the conclusions that have been reached so far.

9.3 Categorial scales of complexity.

The preceding discussion has considered a wide range of focus constructions, and argued that a full syntactic understanding is achievable only through detailed investigation with a null hypothesis of compositionality. While this has been carried out for a small number of examples, in the majority of cases the analyses have been preliminary. We have further seen in 3.5 that attempts to formalise notions of syntactic and semantic complexity can readily run into unfalsifiability. It is therefore at best a difficult task to directly compare focus constructions, but in this section I outline two tentative scales by which constructions may be compared.

Since the attempts to formally measure complexity in 3.5 were shown to be problematic, there are in fact a number of different approaches that could be taken to distinguish constructions from one another. For instance, constructions could be ordered by their position in a computational hierarchy such as Uriagereka's (2008:ch.7) update of the Chomsky Hierarchy (suggested by Aritz Irurtzun, p.c.), by the degree of convention of implicature (suggested by David Beaver, p.c.), or even by more experimental factors such as processing time or average time of acquisition (see Lillo-Martin & Quadros 2005, 2008 for an approach to this for ASL and LSB focus constructions). For current purposes, however, to avoid committing to anything so specific, and to provide a general overview of variation, I instead make use of scales based on broad categories that have already been used over the previous chapters.

Section 3.2 introduced a number of focus constructions, placing them in the categories of "no marking" (3.2.1), "marking with stress" (3.2.2), "marking with prosody" (3.2.3), "morphological marking" (3.2.4), "marking with lexical items" (3.2.5), "syntactic marking" (3.2.6), and "multiple marking" (3.2.7). Each of these is essentially a structural description of the focus construction in question, and so using these categories a scale can be determined that roughly parallels syntactic complexity, but is more general. For instance, they may be very roughly ordered in terms of the amount of structure that seems to be involved, taking the simplest

cases to be those involving no marking, followed by purely phonological strategies such as stress and prosody (with some prosodic systems appearing to be more complex than stress, although this distinction is somewhat arbitrary). This can be followed by morphological and lexical item strategies, with morphological strategies potentially being simpler than lexical items given their more constrained distribution, inasmuch as these categories can be separated. This leaves syntactic and multiple strategies as the most complex, with multiple strategies topping the scale given their combination of structures. This therefore yields a rough scale along the following lines:

(21) none < stress < prosody < morphology < lexical items < syntax < multiple

This addresses the structural dimension of variation, but not the semantic one. However, a number of broad semantic categories have also been used throughout the discussion above. Let us retun to the contrast between the three English constructions considered in 3.4.2 and chapter 4:

(22) English stress focus:

a. I gave it to [*John*]$_{\text{Foc}}$.

b. ord = base
the relation between ord and ALT is simply one of inclusion

(23) English *it*-cleft focus:

a. It was [*John*]$_{\text{Foc}}$ that I gave it to.

b. ord = base & pres. true(base) → (∀p∈ALT, true(p) → (p = base))
ord is related to ALT by a presupposition of exhaustivity

(24) English *only* focus:

a. I only gave it to [John]$_{\text{Foc}}$.

b. ord = ∀p∈ALT, true(p) → (p = base)
ord is related to ALT by a truth-conditional exhaustivity

(English, repeated from (ch.3:1-3, 94-96))

While each case is given an explicit description, it can also be placed into a broad category – (22) is simple, having only an ord = base description, whereas (23) involves a complex presupposition, and (24) has a complex truth-conditional description. We have further seen that these categories are not simply specific to these constructions. For instance, the application of a number of semantic tests in 6.4 suggested that BSL_2 RQ (25) is also simple:

(25) BEEN EAT WHAT $[\text{CAKE}]_{\text{Foc}}$
'(She) ate *cake*.'

(BSL_2, partially repeated from (ch.6:70))

By contrast, the syntactically comparable construction in ASL instead exhibits exhaustive properties in many cases (26), and so is likely to instead involve either presuppositional or truth-conditional exhaustivity:

(26) *Context:* Meg bought the contextually salient book and CD.

a. # MEG BUY WHAT, $[\text{BOOK}]_{\text{Foc}}$
'The thing/What Meg bought is the book.'

b. MEG BUY WHAT, $[\text{BOOK, CD}]_{\text{Foc}}$
'The things/What Meg bought are/is the book and the CD.'

(ASL, repeated from (ch.6:31))

Furthermore, it need not only be exhaustivity that makes focus constructions complex. For instance, in chapter 7 it was argued that Nepali NAI creates a presupposition of emphasis by comparing ord and members of ALT for degree:

(27) a. $[\textit{Rameś}]_{\text{Foc}}$-**ai** laḍyo
Ramesh-**NAI** fell
'*Ramesh* fell.'

b. $[[\text{Op}_{\text{NAI}}]]^{o} = \lambda y: \forall x \in [[y]]^{f}, |y| \geq |x| \,.\, y$

(Nepali, (a) partially repeated from (ch.5:1); (b) repeated from (ch.7:9))

This again contrasts with English CR, which was argued in chapter 8 to create a truth-conditional prototypicality through ordering alternatives to a structurally-represented index:

(28) a. I'll make the tuna salad, and you make the [*salad*-salad]$_{\text{Foc}}$.

b. $[[\text{Op}_{\text{CR}}]]^{o} = \lambda y \lambda x \,.\, x \,\&\, x \in \max(y\text{-like.order}([[x]]^{f}))$

(English, (a) repeated from (ch.8:1); (b) from (ch.8:33))

As a result, though the relation between ord and ALT for a given focus construction may vary significantly in its specifics, it can nevertheless be placed into a broad category based on the type of this relation. For instance, this relation may be simple (with no relation between ord and ALT other than inclusion), presuppositional (e.g. relating ord and ALT in a condition on a partial function), or truth-conditional (relating ord and ALT in the truth-conditional component of the assertion). This therefore provides three broad categories of semantic complexity that may be ordered with respect to one another, without having to directly compare logical descriptions as in 3.5.1. One straightforward way to order these categories is as below, since presuppositions are not as strongly associated with the meaning of a construction as truth-conditional statements are, and both these categories are clearly more complex than simple foci.

(29) simple < presupposition < truth-conditional

However, in 9.2.1 we also considered fronted foci in Italian (30), which appear to involve an implicature of contrastivity:

(30) [*sullo scaffale*]$_{\text{Foc}}$ li ho messi.
on.the shelf them have.1SG put.PST.PTCP.PL
'It is on the shelf that I have put them.'

(Italian, partially repeated from (15))

While this was argued to be variant of simple focus, with the implicature arising from a combination of pragmatic, phonological, and syntactic reasons, it is nonetheless specifically associated with this construction as a result of these factors. This contrasts with cases such as Yucatec Maya pre-predicate focus, where implicatures can arise, but as a result of the item in focus rather than the construction itself, leading to contrasts such as (31a-b):

(31) a. [bu'l]$_{Foc}$ k=u hàant-ik Deysi
bean IPFV=A3 eat:TRANS-INCMPL.B3SG Deysi
'Deysi is eating *beans*.' (and nothing else)

b. [bu'l]$_{Foc}$ k=u hàant-ik le úulum=o'
bean IPFV=A3 eat:TRR-INCOMPL.B3SG DEF turkey=DIST
'The turkey is eating *beans*.' (but maybe other things too)

(Yucatec Maya, (a) repeated from (11b); (b) from (ch.4:17))

Consequently, cases such as Italian focus fronting, where there appears to be a conversational implicature tied to the construction, could arguably also be represented as a distinct category, occurring between more canonical simple foci and presuppositions as follows:[4]

(32) simple < implicature < presupposition < truth-conditional

This therefore provides a rough categorial scale of semantic complexity, and combined with the comparable scale of structural complexity in (21), allows for a preliminary description of the properties of a specific construction, situating it within a preliminary typology. As a result, the following section tentatively attempts to do this for every focus construction encountered so far.

[4] These four categories are unlikely to be the only types of relation that can be distinguished. For instance, following Potts (2005 *et seq.*), it might also be possible to distinguish a type involving conventional implicatures (see ch.7, footnote 1), although it is unclear how this should be ordered with respect to presuppositions.

9.4 Situating each construction.

This section briefly considers each focus construction introduced in this thesis, and attempts to broadly classify them within the structural and semantic scales of the previous subsection. Since these examples were chosen to demonstrate the range of variation shown in focus expression, the resulting classification leads to a primitive typology of focus. As has been mentioned several times above, fully accurate classification would require detailed analysis from a number of perspectives, and so each categorisation here should be viewed as extremely tentative, especially when it has not been considered in any depth in the current text. Nevertheless, the broad structural properties of constructions are usually clear from their descriptions, and a combination of tests, descriptions, and glosses can be used to determine a possible place within the scale of semantic complexity. Constructions are ordered alphabetically, first by language and then by construction name.

9.4.1 Arabic.

9.4.1.1 Arabic fronting.

(33) a. ʔallafat Zaynab-u riwaayat-an
wrote Zaynab-NOM novel-ACC
'Zaynab wrote a novel.'

b. [*riwaayat-an*]$_{\text{Foc}}$ ʔallafat Zaynab-u (laa [*zaynab-a*]$_{\text{Foc}}$)
novel-ACC wrote Zaynab-NOM not poem-ACC
'It was a *novel* that Zaynab wrote(, not a *poem*).'

(Arabic, repeated from (ch.3:26))

The construction in (33b) was introduced as an example of initial focus in 3.2.6, and so it is a **syntactic** strategy. The gloss suggests that this fronting is comparable to English clefts in its semantics. Ouhalla's (1997:11) discussion appears to support this, citing Moutaouakil (1989), who describes the construction as involving contrastive focus as opposed to new-information focus, "used in contexts where the speaker gives information which is in conflict with existing information." The optional continuation of (33b) also appears to support this, as it

excludes an alternative, although as we saw in e.g. table 6.2 above, such syntagmatic contrasts are possible with many focus constructions. This case is therefore not entirely conclusive, but for the purposes of the current overview I suppose a **presupposition** of exhaustivity is involved.

9.4.1.2 Arabic intonational.

(34) ʔallafat Zaynab-u [*riwaayat-an*]$_{\text{Foc}}$
wrote Zaynab-NOM novel-ACC
'Zaynab wrote a *novel*.'

(Arabic, repeated from (ch.3:9b))

The construction in (33b) appears to involve a focus following the negation that is not fronted, and this is clearer in (34), first encountered in 3.2.2, where the focus appears *in-situ*. Ouhalla (1997:11) notes that foci are nonetheless "marked by a special pitch accent (also called focal stress), known in the Arabic literature as *l-nabr*," which the italicisation indicates in (33-34). This case of focus is therefore marked purely by **stress**. Ouhalla (1997:11) further states that, following Moutaouakil (1989), the focus in (34) only involves new-information and is not contrastive, which is also indicated by the gloss. It therefore appears to be an instance of **simple** focus.

9.4.2 ASL.

9.4.2.1 ASL doubling.

(35) _____hn
ANN [LIKE]$_{\text{Foc}}$ ICE-CREAM [*LIKE*]$_{\text{Foc}}$
'Ann really *likes* ice-cream.'

(ASL, repeated from (ch.3:34))

This construction was introduced in 3.2.6 as a complex **syntactic** strategy, and was considered in detail in chapters 6-7, leading to the ultimate conclusion that it involves **presuppositionally** specified emphasis.

9.4.2.2 ASL FINISH.

(36) INDEX$_3$ BUY [BOOK]$_{Foc}$ **FINISH**
'She bought the book and nothing else.'

(ASL, repeated from (ch.6:fn.6, ii))

This **lexical item** was briefly mentioned in 6.2.2, footnote 6, where it was noted that Caponigro & Davidson (2011:347) take it to be a **truth-conditional** exhaustivity marker.

9.4.2.3 ASL fronting.

(37) a. A: WHAT YOU READ?
'What did you read?'

B: _____ I-focus
[BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'I read *Stokoe's book*.'

b. A: INDEX$_2$ READ CHOMSKY BOOK?
'Did you read Chomsky's book?'

B: _____ C-focus
NO, [BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'No, I read *Stokoe's book*.'

(ASL/LSB, (a) partially repeated from (ch.6:23a); (b) repeated from (ch.6:24))

This construction makes use of a **syntactic** strategy, and was considered in 6.2.2, where cases involving I-focus and C-focus non-manuals were both argued to be instances of the same construction, one encoding **simple** focus.

9.4.2.4 ASL in-situ.

(38) A: WHAT YOU READ?
'What did you read?'

B: INDEX$_1$ READ [BOOK STOKOE]$_{Foc}$
'I read *Stokoe's book*.'

(ASL/LSB, partially repeated from (ch.6:23a)

The *in-situ* response of B was seen briefly in 6.2.2. It appears to be an alternative means of expression of **simple** focus, and seems to involve **no marking**, although further investigation is clearly necessary.

9.4.2.5 ASL ONLY-ONE.

(39) KNOW WHAT? **ONLY-ONE** [KIM]$_{\text{Foc}}$ GET-A
'Know what? Only Kim got an A.'
(ASL, repeated from (ch.6:29))

This strategy, briefly considered in 6.2.2, involves the **lexical item** *ONLY-ONE*, and like its translation of English *only*, appears to encode a **truth-conditional** exhaustivity.

9.4.2.6 ASL RQ.

(40) _____br ____hn
CHAIR PAINT WHO, [*l-e-e*]$_{\text{Foc}}$
'The one who painted the chair was Lee.'
(ASL, repeated from (ch.6:30a))

This construction was introduced in 6.2.2, where it was noted that it has been variously analysed as as pseudoclefts (Petronio 1991, Wilbur 1994a, 1996, Grolla 2004), discourse-level question-answer pairs (Hoza et al. 1997), and copular clauses combining interrogative and declarative clauses (Caponigro & Davidson 2011). Whatever the correct structure, the marking is clearly **syntactic**, but its meaning is less obvious. Petronio (1991) and Caponigro & Davidson (2011) both note the construction exhibits exhaustivity in some contexts, but Caponigro & Davidson (2011) argue that this arises from the question-answer correspondence of the interrogative and declarative components of the RQ, with an optional covert truth-conditional exhaustivity operator occurring in the appropriate cases. However, if the pseudocleft analyses are correct, it may instead be that this exhaustivity arises from presuppositional cleft-like semantics. More research is clearly needed to determine the exact nature of this construction, but since it does not appear to consistently exhibit truth-conditional exhaustivity, I very tentatively suggest that these effects may result from a **presupposition**.

9.4.2.7 ASL THAT.

(41) A: You told *who*?
B: ____lb
[KAY]$_{Foc}$ **THAT**, TOLD FINISH
'It was *Kay* who I told.'

(ASL, repeated from (ch.6:fn.6, i))

The postnominal **lexical item** *THAT* was briefly mentioned in 6.2.2, footnote 6, where it was mentioned that it is a largely occurs in response to echo questions. Wilbur (2012:474-467) argues it is a marker of completive focus, and so under the current system it might be viewed as simple. However, its restriction to very specific contexts suggests it may be consistently associated with certain **implicatures**.

*9.4.2.8 ASL (*wh-*)final.*

(42) a. _____whq
WIN WHO
'Who is it that won?'

(ASL, repeated from (ch.6:32a))

Such cases were dicussed in 6.2.2 above, and involve a **syntactic** strategy. They are argued by Abner (2011a, b) to have a cleft-like semantics involving exhaustivity and an existential **presupposition** on the basis of a number of semantic tests. Abner (2011a:28) further notes that "modals and sentential negation were produced most often with the modal or negative element in a right peripheral position," suggesting the analysis may extend to non-*wh*-cases as well, making this a true focus construction rather than a specific form of *wh*-question.

9.4.3 Boni.

9.4.3.1 Boni á-.

(43) an biyo **á**-[ajika]$_{Foc}$
I water **FOC**-drink
'I *drink* water.'

(Boni (Cushitic), repeated from (ch.3:14c))

This apparently **morphological** strategy for focusing verbs was introduced in 3.2.4. Sasse (1981:264) discusses the interpretation of such cases in terms of the properties FOCUS and CONTRAST. Here FOCUS refers to "a constituent that is specifically marked as bearing the highest information value in a given sentence, i.e. the one that the speaker singles out as the most relevant contribution." Moreover, CONTRAST refers to "a constituent that is presented as contrastive to other constituents that the discourse may lead the addressee to expect in a particular position," and furthermore involves exhaustive listing (following Kuno 1972), "specifically identif[ying] one member of a limited set of possible alternatives." These therefore map roughly onto the notions of focus and exhaustivity that we have been using throughout, and Sasse (1981:264) notes that "[f]ocalized elements are often, but not necessarily, contrastive," suggesting that the exhaustivity shown is a pragmatic rather than structurally-encoded phenomenon. Verbal focus is also noted to display a different overall characteristic tonal pattern (Sasse 1981:271; compare *biyo* in (43) to *biyóo* in (44)), which may reflect a phonotype-based focus strategy.[5] Finally, Sasse (1981) translates verb focus with *á-* using either stress or *do*-support, which once again seems to support this construction involving **simple** focus.

9.4.3.2 Boni -é.

(44) an [biyóo]$_{\text{Foc}}$-**é** ajika
I water-**FOC** drink
'It's *water* that I drink.'

(Boni (Cushitic), repeated from (ch.3:14b))

Another apparently **morphological** strategy for argument focus in Boni was also introduced in 3.2.4, where the suffix *-é* (or in some cases *-éene*) marks the focused item. Much of the discussion in the 3.8.2.8 above also applies here, especially the fact that focus is not always exhaustive, with Sasse (1981) using a mixture of clefts (as in the above example) and stress focus in translations of *-é* focus. One

[5] Note that this would be circular reasoning if it was the only justification for the simple status of Boni *á-* focus, since it is an assumption of the current framework that phonological-prominence strategies are associated with simple focus. However, several other factors combine with this provide the full argument, and it would additionally not be problematic if Boni morphological focus encoded exhaustivity, but the evidence tentatively suggests that it does not.

difference, though, is the lack of a distinct tonal pattern, although this may be because arguments are already phonologically prominent. In general then this case is slightly less clear than verbal focus, but the varied uses and translations suggest that it encodes **simple** focus.

9.4.4 BSL_1.

9.4.4.1 BSL_1 doubling.

(45) [ONE-WEEK]$_{Foc}$ WORK BRISTOL [ONE-WEEK]$_{Foc}$
'(I) work in Bristol for one week.'

(BSL_1, repeated from (ch.3:56))

This **syntactic** construction was first encountered in 6.3, and was argued in 7.3 to encode a **presupposition** of emphasis.

9.4.4.2 BSL_1 ONLY.

Though no full examples were given, footnote 14 in 6.3 presented some evidence that BSL1 has at least one equivalent of English *only*, presumably a **lexical item** encoding a **truth-conditional** exhaustivity.

9.4.4.3 BSL_1 RQ.

(46) br
(SEE) KEYS WHERE [KITCHEN]$_{Foc}$
'Where the keys last were was in the kitchen.'

(BSL_1, repeated from (ch.3:69a))

The semantic status of these **syntactic** constructions, introduced in 6.4, is not enitirely clear in BSL_1. While Sutton-Spence & Woll (1999:70-71) directly compare these constructions to Wilbur's (1994a, 1996) analyses of ASL RQ (9.4.2.6) as pseudoclefts, they do not discuss their semantics. Moreover, the existence of a very similar construction in BSL_2 for simple focus (9.4.5.2) suggests that that the BSL_1 equivalent might also encode **simple** focus.

9.4.5 BSL$_2$.

9.4.5.1 BSL$_2$ doubling.

(47) [WHAT]$_{Foc}$ JOHN SAY [*WHAT*]$_{Foc}$
'*What* did John say?'

(BSL$_2$, repeated from (ch.6:67b))

These constructions were introduced in 6.3, but it was argued in 7.3.5 that involve not focus, but degree, and so they are not included in the focus typology of this chapter.

9.4.5.2 BSL$_2$ RQ.

(48) A: VICTORIA BEEN MEET WHO?
B: BEEN MEET WHO [TREVOR]$_{Foc}$
'(She) met *Trevor*.'

(BSL$_2$, partially repeated from (ch.6:70b))

In contrast to the comparable constructions in ASL (9.4.2.6), this **syntactic** construction was shown in 6.4 to pattern with **simple** focus using a number of diagnostic tests.

9.4.5.3 BSL$_2$ THAT'S-IT.

(49) JOHN BEEN EAT WHAT [APPLE]$_{Foc}$ **THAT'S-IT**
'Only *John* ate an apple.'

(BSL$_2$, repeated from (ch.6:68a))

The **lexical item** *THAT'S-IT*, introduced in 6.3, appears to function like English *only* (9.4.6.6), encoding a **truth-conditional** exhaustivity.

9.4.6 English.

9.4.6.1 English always.

(50) I **always** gave it to [*John*]$_{Foc}$

(English, repeated from (ch.3:21c))

Beaver & Clark (2008) argue that the association effects of this **lexical item**, encountered in 3.2.5, arise from it presupposing a free variable referring to an

implicit domain (see e.g. pp. 41-42), and so while this category does not fit entirely neatly into the semantic scale in use here, it can be viewed as a special kind of **presupposition**.

9.4.6.2 English cleft.

(51) It was [*John*]$_{\text{Foc}}$ that I gave it to.

(English, repeated from (ch.3:2))

This construction was introduced in 3.2, and was classified as using **syntactic** marking in 3.2.6. On the basis of Delin (1992:289), Halvorsen (1978), Horn (1981), Percus (1997), É. Kiss (1998) it was described as involving a **presupposition** of exhaustivity in 3.4.2.

9.4.6.3 English CR.

(52) I didn't give it to John [*Smith*]$_{\text{Foc}}$, I gave it to [***John*-John**]$_{\text{Foc}}$.

(English, repeated from (ch.3:4))

This **morphological** strategy was introduced in section 3.2.4, with chapter 8 arguing that it encodes a **truth-conditional** specification involving an ordering of alternatives and assertion of a maximum subset of them.

9.4.6.4 English even.

(53) I **even** gave it to [*John*]$_{\text{Foc}}$

(English, repeated from (ch.3:21b))

This **lexical item** was first introduced in 3.2.5, with 3.5.1 outlining an analysis of operators like *even* as involving a truth-conditional ordering of likelihood, with assertion of a maximal subset. Nevertheless, we ultimately saw that the prevailing view in the literature since Horn (1969) is that it is **presuppositional** (though Lycan 1991 argues against this) and so I tentatively place it in this category.

9.4.6.5 English intonational.

(54) I gave it to [*John*]$_{\text{Foc}}$.

(English, repeated from (ch.3:1))

This construction was introduced in 3.2, and was used as the canonical example of marking with **stress** in 3.2.2. It was further considered it in 3.4.2 and again in chapter 4 as the canonical case of **simple** ord = base focus.

9.4.6.6 English only.

(55) I **only** gave it to [*John*]$_{\text{Foc}}$.

(English, repeated from (ch.3:3))

In section 3.2.5 this construction as making use of a **lexical item** to mark focus. Following Rooth (1985, 1992, 1996) and Beaver & Clark (2008) (among many others), 3.4.1 outlined an analysis of *only* as **truth-conditionally** exhaustive.

9.4.7 Fongbe.

*9.4.7.1 Fongbe non-subject unmarked and (*wɛ́*) fronting.*

(56) A: What did the woman eat?

B: é ɖù [àyìkún]$_{\text{Foc}}$ (unmarked)
3SG eat bean
'She ate *beans*.'

B': [àyìkún]$_{\text{Foc}}$ (**wɛ́**) é ɖù (marked)
bean **FOC** 3SG eat
'She ate *beans*.' ~ 'It is *beans* that she ate.'

(Fongbe (Kwa), repeated from (ch.3:5a))

As introduced in 3.2.1 and 3.2.7, there are at least two strategies for Fongbe non-subjects. In response B of (56), there is **no** apparent marking, whereas response B' combines fronting and an optional focus marker, and so is arguably a case of **multiple** marking. As Zimmermann & Onea (2011:1662) indicate, the response in B' is more marked, and this is also indicated by the possibility of the cleft translation. However, though Fiedler et al. (2010:239) also suggest this, and provide the cleft translation, they state that the B' response "is not necessarily

interpreted contrastively – nor is its counterpart in [B] used uniquely for information focus." This latter assertion is unsurprising, given we have already seen that simple focus may be used in many contexts, but the variable readings of B' merit further investigation and application of diagnostics. Nevertheless, since B' is more marked than B and allows the possibility of the cleft translation, I suppose here that it realises a **presupposition** of exhaustivity, whereas B encodes **simple** focus.

9.4.7.2 Fongbe subject wɛ́.

(57) A: Who ate the beans?

B: [nyɔ̀nú ɔ́]$_{\text{Foc}}$ *(**wɛ́**) ɖu àyìkún
woman DEF **FOC** eat bean
'*The woman* ate the beans.'

(Fongbe (Kwa), repeated from (ch.3:5b))

As we saw in 3.2.5, subject focus behaves differently in Fongbe, requiring marking by an obligatory focus marker, and so this appears to be a strategy requiring a **lexical item**. Since in this case there does not seem to be the same opposition between marked and unmarked structures, and the translation makes use of English stress marking, I tentatively suppose that this construction encodes **simple** focus.

9.4.8 French.

9.4.8.1 French cleft.

(58) A: Who ate a cookie?

B: C'est [*Ella*]$_{\text{Foc}}$ (qui a mangé un biscuit).
it-is Ella that has eaten a cookie
'*Ella* ate a cookie.'

(French, repeated from (ch.3:32))

We encountered the French cleft construction in 3.2.6, which is a **syntactic** strategy for encoding focus. Unlike clefts in many languages, Belletti (2005:2) points out that in the case of subject focus, "the preferred (clausal) answer in French is […] a (reduced) cleft." This unmarked occurrence in question-answer

correspondence suggests that unlike many of the other clefts we consider, the construction in (58) in fact encodes **simple** focus. This is further supported by Hamlaoui's (2007) analysis of French clefts, which concludes "that the aim of a cleft sentence is to locate the focused constituent(s) in the position(s) where the grammar normally assigns the main stress, satisfying the stress-focus correspondence principle." (p.10) As has been assumed in 9.2.1 above, this satisfaction of the constraints of the focus construction is characteristic of simple foci.

9.4.9 German.

9.4.9.1 German intonational.

(59) A: Wen bewundert der Professor?
whom admires the.NOM professor
'Who(m) does the professor admire?'

B: Er bewundert einen [*Musiker*]$_{\text{Foc}}$
he admires a.ACC musician
'He admires a *musician*.'

(German, repeated from (ch.3:7))

This construction makes clear use of **stress**, as pointed out in 3.2.2, and furthermore the gloss and usage in question-answer correspondence suggest that it is a **simple** type of focus. It is further analysed in a manner semantically comparable to English stress focus in a wide variety of work (e.g. Jacobs 1984, von Stechow 1991, Krifka 1991, Schwarz 2005, Beaver & Clark 2008, Sudhoff 2010 *inter alia*), adding additional support to this assessment.

9.4.10 Gungbe.

9.4.10.1 Gungbe verb doubling.

(60) [Ðù]$_{\text{Foc}}$ (%**wɛ̀**) Sɛ́ná [ɖù]$_{\text{Foc}}$ blɛ́ɖì lɔ́
eat **FOC** Sena eat bread DET
'Sena *ate* the bread.'

(Gungbe (Kwa), repeated from (ch.3:43))

We encountered this construction in 3.2.7 and again in 9.2.1. In some dialects at least, it makes use of **multiple** marking, combining the syntactic process of verb doubling with a focus marker, though this marker need not be present in all varieties. In 9.2.1 it was tentatively supposed that this encodes **simple** verb focus, largely on the basis of glosses in Aboh (2004), Aboh & Dyakonova (2009) along with its apparently unmarked nature.

9.4.11 Gùrùntùm.

9.4.11.1 Gùrùntùm -á.

(61) a. Tí bà wúm-**á** [kwálíngálá]$_{\text{Foc}}$
3SG PROG chew-**FOC** colanut
'He is chewing *colanut*.'

b. **Á** [fúrmáyò]$_{\text{Foc}}$ bà wúm kwálíngálá
FOC fulani PROG chew colanut
'*The Fulani* is chewing colanut.'

(Gùrùntùm (West Chadic), repeated from (ch.3:16))

This construction was introduced in 3.2.4, which displayed an apparently **morphological** strategy involving the an *-á* marker attaching to the item before the focused one (61a), or being stranded if in initial position (61b). Hartmann & Zimmermann (2009) consider the usage of this construction in detail, showing it can be used for new information, selective, corrective, contrastive, and presentational focus, as well as in predicative constructions. This wide variety of uses is reminiscent of English stress focus, and this is also the usual translation given. When combined with the fact that *-á* focus is also the standard construction used in answer to *wh*-questions, shown throughout Hartmann & Zimmermann (2009), it makes sense to conclude that this construction encodes **simple** focus.

9.4.12 Hungarian.

9.4.12.1 Hungarian intonational.

(62) a. Anna énekel a mezōn
Anna-NOM sings the field-on
'Anna sings on the field.'

b. *Anna* énekel [*a mezōn*]$_{\text{Foc}}$
Anna-NOM sings the field-on
'Anna sings on *the field*.'

(Hungarian, repeated from (ch.3:8))

Csimraz (ms.) demonstrates that these cases, briefly considered in 3.2.2 above, involve a prosodic **stress**, and É. Kiss (1998) argues in detail that such *in-situ* foci do not have complex properties such as exhaustivity, and so they are likely semantically **simple**.

9.4.12.2 Hungarian preverbal.

(63) a. Tegnap este be mutattam Pétert Marinak
last night PRF introduced.1SG Peter.ACC Mary.DAT
'Last night I introduced Peter to Mary.'

b. Tegnap este [*Marinak*]$_{\text{Foc}}$ mutattam be Pétert
last night Mary.DAT introduced.1SG PRF Peter.ACC
'It was *to Mary* that I introduced Peter last night.'

(Hungarian, repeated from (ch.3:27))

This **syntactic** construction was introduced in 3.2.6. Its information-structural status remains highly controversial, with e.g. Szabolcsi (1981), É. Kiss (1998, 2008), and Horváth (2007) *inter alia* arguing it is semantically-specified for exhaustivity, but Kenesei (1986), Szabolcsi (1994), Onea (2007), Onea & Beaver (2011), and Destruel et al. (2015) arguing that this effect is not truth-conditional. These arguments are made on the basis of a number of diagnostic tests as well as experimental evidence in the case of Onea & Beaver (2011), Destruel et al. (2015), but the disagreement in the literature (including some disputes over data – see e.g. Onea & Beaver 2011:3) means the status of the construction remains inconclusive. Here I tentatively suppose that the structure encodes **truth-conditional**

exhaustivity, since this appears to be the majority view, but this remains in question pending further research.

9.4.13 Irish.

9.4.13.1 Irish cleft.

(64) Is é [Séan]$_{\text{Foc}}$ aL thigeann' nabhaile
COP him Sean COMP comes home
'It's Sean that comes home.'

(Irish, repeated from (ch.3:31))

The Irish cleft is another **syntactic** construction introduced in 3.2.6. McCloskey (1979) appears to consider them as roughly comparable to English clefts, consistently using them in translation, and "consider[s] […] only truth-conditional aspects of the meaning of clefts," assuming that they "mean exactly the same as their non-clefted counterparts." (p.113) He further cites Halvorsen (1978) for the differences, a general approach to clefts. This suggests that the properties specific to the cleft construction (e.g. exhaustivity) are instead **presuppositional**, as supposed for English clefts in 9.4.6.2 above.

9.4.14 Italian.

9.4.14.1 Italian final.

(65) A: Who has laughed?

B: Ha riso [*Gianni*]$_{\text{Foc}}$
has laughed John
'*John* has laughed.'

(Italian, repeated from (4b))

The **syntactic** construction in (65) was considered in moderate detail in 9.2.1 above. Its unmarkedness in question-answer correspondence and its movement to a position of phonological prominence based on the phonotype of the language led to the conclusion that it encodes **simple** focus.

9.4.14.2 Italian fronting.

(66) A: Dove hai messo i libri?
where have.2SG put.PST.PTCP the books
'Where have you put the books?'

B: [*sullo scaffale*]$_{Foc}$ li ho messi.
on.the shelf them have.1SG put.PST.PTCP.PL
'It is on the shelf that I have put them.'

(Italian, partially repeated from (15))

This **syntactic** construction was considered in 9.2.1 and 9.3. Though it was argued in 9.2.1 that it could be viewed as a variant of simple focus, it was noted in 9.3 that it was consistently linked with certain **implicatures**, and so could arguably be seen as more semantically complex than the final construction in 9.4.14.1.

9.4.15 Jamaican Creole.

9.4.15.1 Jamaican Creole a *fronting.*

(67) a. Mieri bai wan bami an wan bredrut
Mary buy one bammy and one breadfruit
'Mary bought one bammy and one breadfruit.'

b. **A** [wan bami an wan bredrut]$_{Foc}$ Mieri bai
FOC one bammy and one breadfruit Mary buy
'What Mary bought was (only) *one bammy and one breadfruit*.'

(Jamaican Creole, repeated from (ch.3:37))

The construction in (67b) combines fronting and marking with the *a* morpheme, and so was introduced in 3.2.7 as involving **multiple** marking. Durrleman (2008), Durrleman & Shlonsky (2015) argue that the construction is **truth-conditonally** exhaustive, based on the application of a number of diagnostics.

9.4.16 Japanese.

9.4.16.1 Japanese (double) -ga.

(68) a. [Taro]$_{\text{Foc}}$-**ga** gakusee desu
Taro-NOM student COP
'It's Taro who is a student.'

b. [zoo]$_{\text{Foc}}$-**ga** hana-**ga** nagai
elephant-NOM nose-NOM long
'It's the elephants that have long trunks.'

(Japanese, repeated from (ch.3:18))

As we saw in 3.2.4, Japanese appears to be able to **morphologically** express some form of exhaustive focus using the nominative *-ga* marker. For instance, in (68a), the focus is interpreted as exhaustive by default, as indicated by the cleft translation. However, Vermeulen (2012:196) notes that "the exhaustive reading appears to be an implicature rather than entailment, as it may be cancelled easily." A similar phenomenon is seen in the double *-ga* construction of (68b), where two arguments are marked with *-ga*, with the first receiving an exhaustive interpretation. Vermeulen (2012:197) states that this reading is "again an implicature rather than an entailment." For further discussion of (double) *-ga* constructions in Japanese, see Vermeulen (2012:196-197) and the references therein, especially Heycock (2008). For the current purposes though, I conclude that Japanese *-ga* is associated with an **implicature** of exhaustivity, though the explanation of this remains unclear.

9.4.16.2 Japanese prosodic.

(69) a. (φ Naoko-wa) (φ nichiyoobi-ni) (φ Nagoya-de) (φ Mari-ni) (φ atta)
Naoko-TOP Sunday-DAT Nagoya-INS Mari-DAT met
'Naoko met Mari in Nagoya on Sunday.'

b. (φ Naoko-wa) (φ nichiyoobi-ni) **(φ [Nagoya]$_{\text{Foc}}$-de Mari-ni atta)**
Naoko-TOP Sunday-DAT Nagoya-INS Mari-DAT met
'Naoko met Mari in *Nagoya* on Sunday.'

(Japanese, repeated from (ch.3:10))

This construction, introduced in 3.2.3 is a fairly complex **prosodic** strategy, involving prosodic rebracketing, increased tonal pitch on the focused item, and blocking of downstep within the focus. As Vermeulen (2012:187-189) shows, this strategy is the default full sentence response to a *wh*-question (though given constituents are usually elided), and it is consistently translated with English stress, suggesting it encodes **simple** focus.

9.4.17 Kabiye.

9.4.17.1 Kabiye verb doubling with kí*.*

(70) a. ma-ní-ʊ kabiyɛ
1SG-understand-IPFV Kabiye
'I understand Kabiye.'

b. [ma-**ní-ʊ**]$_{Foc}$ kabiyɛ **kí** [**ní-ʊ**]$_{Foc}$ ma-a yɔɔd-ʊ kʊ́
1SG-**understand-IPFV** Kabiye **KÍ** **understand-INF** 1SG-NEG speak-IPFV it
'I only understand Kabiye. I don't speak it.'

(Kabiye (Gur), repeated from (ch.3:44))

This construction, seen in 3.2.7, involves **multiple** marking, combining both verb doubling and the *kí* morpheme. The semantic properties of the construction are not entirely clear. Collins & Essizewa (2007:1) describe the structure as having "an interpretation of contrastive focus," and use of English *only* in the gloss of (70b) suggests exhaustivity may be involved. This is similarly implied by the frequent use of *only* and *just* throughout the glosses of Collins & Essizewa (2007), though not all translations involve exhaustivity. We might be tempted to suppose that this construction involves a truth-conditional exhaustivity, but the acceptability of the continuation in (71b) suggests that this construction patterns away from presuppositional and truth conditional cases (compare with e.g. the results of the ADD test, summarised in table 6.2 above).

(71) a. e-néu [**maki-ɪ**]$_{\text{Foc}}$ **kí** [**mab-ʊ**]$_{\text{Foc}}$ i-ɪ lééyu nɛ-ɪ
3SG-sister **beat-3SG** **KI** **beat-INF** 3SG-NEG play with-3SG
'His sister is *beating* him, she is not playing with him.'

b. e-néu [**maki-ɪ**]$_{\text{Foc}}$ **kí** [**mab-ʊ**]$_{\text{Foc}}$ nɪ/ɛlɛ ɪ-lééyu nɛ-ɪ ɖɪɖɔ
3SG-sister **beat-3SG** **KI** **beat-INF** and/but 3SG-play with-3SG also
'His sister is *beating* him, and/but she is playing with him too.'

(Kabiye (Gur), Essizewa, p.c.)

The semantic properties of verb doubling in Kabiye therefore remain unclear, but the felicity of (71b) combined with the inconsistent use of exhaustivity in glosses suggests that the denotation arises from an **implicature** rather than a presupposition or truth-conditional specification.

9.4.18 Kaqchikel.

9.4.18.1 Kaqchikel agent verb-marking (with ja*).*

(72) a. Ri.a.Juan x-Ø-u-tëj ri wäy
Juan COMPL-B3SG-A3SG-eat the tortilla
'Juan ate the tortilla.'

b. (**Ja**) [ri.a.Juan]$_{\text{Foc}}$ x-Ø-tj-**ö** ri wäy
FOC Juan COMPL-B3SG-eat-**AF** the tortilla
'It's *Juan* that ate the tortilla.'

(Kaqchikel (Mayan), repeated from (ch.3:39))

In this **multiple** marking strategy for agent focus, seen in 3.2.7, Kaqchikel combines morphological inflection of the verb stem with an optional focus marker before the focused argument. Erlewine (2013:5) notes that in such cases "the subject is necessarily interpreted with exhaustive focus, making it equivalent to a subject cleft," as is also apparent from the translation. Following this, we can suppose that like English clefts (9.4.6.2), this construction encodes a **presupposition** of exhaustivity.

9.4.19 K'ichee.

9.4.19.1 K'ichee fronting.

(73) a. A: What happened?

B: x-u-tij jun leej ri a Xwaan
INC-A3SG-eat a tortilla DET youth Juan
'Juan ate a tortilla.'

b. A: What did he eat?

B: [Jun leej]$_{Foc}$ x-u-tij-oh
a tortilla INCOMPL-A3SG-eat-SS
'He ate *a tortilla*.'

(K'ichee' (Mayan), repeated from (ch.3:25))

As we saw in 3.2.6, K'ichee can mark focus simply by fronting, a **syntactic** strategy. Velleman (2013:3) notes that he is specifically considering answering focus as opposed to contrastive, corrective, or associated focus, which appears to indicate that the construction in (73b) involves **simple** focus. This is further supported by the question-answer correspondence seen, as well as the English stress focus translation.

9.4.20 LSB.

9.4.20.1 LSB doubling.

(74) hn
INDEX$_1$ [LOSE]$_{Foc}$ BOOK [*LOSE*]$_{Foc}$
'Indeed I *lost* the book.'

(LSB, repeated from (ch.6:12))

As with ASL and BSL$_{1\text{-}2}$ doubling (9.4.2.1, 9.4.4.1, 9.4.5.1), this **syntactic** construction was considered in detail in chapter 6, and was ultimately analysed as involving an emphatic **presupposition** in 7.4.

9.4.20.2 LSB fronting.

(75) a. A: WHAT YOU READ?
'What did you read?'

B: I-focus
[BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'I read *Stokoe's book*.'

b. A: INDEX$_2$ READ CHOMSKY BOOK?
'Did you read Chomsky's book?'

B: C-focus
NO, [BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'No, I read *Stokoe's book*.'

(ASL/LSB, (a) partially repeated from (ch.6:23a); (b) repeated from (ch.6:24))

This **syntactic** strategy, considered in 6.2.2 above, is argued to be equivalent to ASL fronting (9.4.2.3) in Lillo-Martin & Quadros (2008), Quadros & Lillo-Martin (2010). I therefore view it as one construction encoding **simple** focus.

9.4.20.3 LSB in-situ.

(76) A: WHAT YOU READ?
'What did you read?'

B: INDEX$_1$ READ [BOOK STOKOE]$_{Foc}$
'I read *Stokoe's book*.'

(ASL/LSB, partially repeated from (ch.6:23a)

As with ASL *in-situ* focus (9.4.2.4), this construction appears to be an alternative realisation of **simple** focus apparently involving **no marking**.

*9.4.20.4 LSB (*wh-*)final.*

(77) whq
LIKE MARY WHO
'Who likes Mary?'

(LSB, repeated from (ch.6:fn.7, i)

This **syntactic** construction was briefly considered in footnote 7 of 6.2.2, where it was supposed that it was comparable to its ASL equivalent (9.2.4.8) in involving an exhaustive **presupposition**, with a little support for this assumption coming from the apparent markedness of the construction over other *wh*-question types.

9.4.21 Makhuwa.

9.4.21.1 Makhuwa conjoint.

(78) a. nthíyáná o-**hoó**-cá nráma
1.woman 1SM-PRF.**DJ**-eat 3.rice
'The woman ate rice.'

b. nthíyáná o-c-**aalé** [nramá]$_{\text{Foc}}$
1.woman 1SM-eat-PRF.**CJ** 3.rice
'The woman ate *rice*.'

(Makhuwa (Bantu), repeated from (ch.3:40))

This construction was considered in 3.2.7, where it was shown that the conjoint form marks focus through both verbal inflection and placement of the focused constituent in a specific structural position, and so involves **multiple** forms of marking. Its information-structural properties are considered in detail by van der Wal (2009, 2011), who concludes on the basis of a number of diagnostics that it encodes **truth-conditional** exclusivity.

9.4.22 Mandarin Chinese.

*9.4.22.1 Mandarin Chinese (*lian*)* ye*.*

(79) a. Tā bù xǐhuan chī pínggǔo
3SG NEG like eat apple
'He doesn't like eating apples.'

b. Tā (**lián**) [pínggǔo]$_{\text{Foc}}$ **yě** bù xǐhuan chī
3SG **even** apples **also** NEG like eat
'He doesn't even like eating *apples*.'

(Mandarin Chinese, repeated from (ch.3:45))

This construction, considered in 3.2.7, and again in 3.5, makes use of **multiple** strategies, with both fronting to a syntactic position, the morpheme *ye* (or *dou*), and optionally the morpheme *lian*. As we saw in 3.5, Badan (2008) argues its overall denotation is comparable to English *even*, whose scalar additive meaning is likely to be **presuppositional**, as concluded in 9.4.6.4 above.

9.4.23 Navajo.

9.4.23.1 Navajo daats'í.

(80) Mary bibid **daats'í** diniih
Mary [3.POSS.stomach]$_{\text{Foc}}$ **DAATS'Í** 3SG.hurt
'It might be Mary's stomach that hurts (or it might be her head).'

(Navajo (Athabaskan), repeated from (ch.3:23)

In 2.2.5 we saw that the Navajo **lexical item** *daats'í* associates with foci leading to a modal interpretation. Bogal-Allbriten (2013) analyses this association in some detail, comparing it directly with English *only*, and assigning a **truth-conditional** denotation involving possible world semantics.

9.4.24 Nepali.

9.4.24.1 Nepali intonational.

(81) A: Rameś-le ke kʰāyo
Ramesh-ERG what ate
'What did Ramesh eat?'

B: Rameś-le [*kerā*]$_{\text{Foc}}$ kʰāyo
Ramesh-ERG banana ate
'Ramesh ate a *banana*.'

(Nepali, partially repeated from (ch.5:3))

This construction involves **stress**, much like simple focus in English, and was considered in some detail in chapter 5. The application of a number of diagnostics suggested that it encodes **simple** focus (see e.g. table 5.2 above).

9.4.24.2 Nepali mātrai.

(82) [*Rameś*]$_{\text{Foc}}$ **mātrai** laḍyo
Ramesh only fell
'Only Ramesh fell.'

(Nepali, partially repeated from (ch.5:46c))

We saw a single instance of this construction in 5.3.11, which makes use of a **lexical item** to encode what appears to be a **truth-conditional** exhaustivity.

9.4.24.3 Nepali NAI.

(83) [*mai-le*]$_{\text{Foc}}$-**nai** kerā kʰāyo
1SG-ERG-**NAI** banana ate
'*I* ate a banana.'

(Nepali, repeated from (ch.5:8))

This construction involving **morphological** marking was considered in detail in chapters 5 and 7, with it ultimately being argued in 7.2.2 that it encodes a **presuppositional** emphasis.

9.4.25 Nupe.

9.4.25.1 Nupe ni.

(84) Musa gí kinkere ni
Musa eat scorpion NI
'(I assure you) Musa *did* eat the scorpion.'

(Nupe (Benue-Congo), repeated from (ch.7:2))

This structure was considered in 7.2.1, where it was noted that marking with *ni* emphasises the polarity of the sentence. Kandybowicz (2013) argues this function is independent of focus in Nupe, and so I do not include it in the typology here, but it may nevertheless be analysable as resulting from modification of focus-generated alternatives.

9.4.26 Podoko.

9.4.26.1 Podoko postverbal.

(85) a. A: Who cooked the meat?

B: a təla [mala]$_{\text{Foc}}$
VM cook mother.my
'*My mother* cooked it.'

b. A: What did one cook?

B: a təla [sləɓə]$_{\text{Foc}}$ nda
VM cook meat one
'One cooked *meat*.'

(Podoko (Biu-Mandara/Central Chadic), repeated from (ch.3:29))

As we originally saw in 3.2.6, Podoko makes use of a **syntactic** strategy where foci are placed in postverbal position. While Jarvis (1981) does not explicitly discuss the interpretation of such foci in any detail, they are described as involving new information (p.160), occur in question-answer correspondences, and are translated with English stress focus, all of which suggests they encode **simple** focus.

9.4.27 Polish.

9.4.27.1 Polish tylko*.*

(86) Maria **tylko** [rozmawiała]$_{\text{Foc}}$ z menedżerem
Maria only talked with manager
'Maria only *talked* to the manager.'

(Polish, repeated from (ch.3:22))

We encountered this construction in 3.2.5, which makes use of a focus-associating **lexical item**. Tomaszewicz (2012) considers a number of exclusive focus association particles in Polish, but argues that of these *tylko* is most like English *only* (9.4.6.6), and is **truth-conditionally** specified for exhaustivity.

9.4.28 Sardinian.

9.4.28.1 Sardinian fronting.

(87) A: What have you read?

B: [Cussu libru]$_{\text{Foc}}$ appo lessu
this book have.1SG read
'I have read this book.'

(Sardinian, repeated from (20))

This **syntactic** strategy was considered in 9.2.1, where it was argued to be a case of **simple** focus given its lack of contrastivity, occurrence in question-answer correpondences, and phonological properties.

9.4.29 Sicilian.

9.4.29.1 Sicilian fronting.

(88) A: What have you forgotten?

B: [I chiavi]$_{\text{Foc}}$ mi=scurdavau
the keys myself=forgot.1SG
'I forgot the keys.'

(Sicilian, repeated from (19))

This similar **syntactic** strategy was also considered in 9.2.1, and was argued to encode **simple** focus for the same reasons as Sardinian fronting (9.4.28.1).

9.4.29.2 Sicilian mirative fronting.

(89) A: Chi successi?
What happen.PST.3SG
'What happened?'

B: [*A machina*]$_{\text{Foc}}$ m'=arrubbaru
The car 1SG.POSS=steal.PST.3PL
'*My car* was stolen!'

(Sicilian, repeated from (ch.7:4))

This **syntactic** construction was briefly considered in 7.2.1, where it was noted that it has structural differences to non-mirative focus fronting (9.4.29.1). Footnote 1 of 7.2.1 observed that Bianchi et al. (2014) give this construction an explicit analysis as a conventional implicature in line with Potts (2005 *et seq.*), which is not part of the scale of semantic complexity used here (see footnote 4 above). However, Potts (2005)-style conventional implicatures are very similar to presuppositions, differing primarily in speaker orientedness and some projection properties, and Karttunen & Peters (1979), Karttunen & Zaenen (2005) argue that they are in fact the same thing. Consequently I classify mirative focus as **presuppositional** here, perhaps pending a more fine-grained scale of semantic complexity.

9.4.30 Sinhala.

9.4.30.1 Sinhala verb-marked.

(90) a. eyaa gaməṭə **yanna**
he.NOM village-DAT go.PRS.**A**
'He goes to the village'

b. eyaa [*gaməṭə*]$_{\text{Foc}}$ (y/tamay) **yanne**
he.NOM village-DAT EMPH go.PRS.**E**
'It's to the village he goes.'

(Modern Colloquial Sinhala, repeated from (ch.3:15))

As we saw in 3.2.4, Modern Colloquial Sinhala marks argument focus through inflection of the verb stem, and so this is a **morphological** strategy. Slade (2011:ch.5) considers the semantics of this construction in some detail, and argues that it is comparable to an English cleft (as seen in the translation), and introduces an existential **presupposition**.

9.4.30.2 Sinhala verb-marked final.

(91) mamə **yanne** [*gaməṭə*]$_{\text{Foc}}$
I.NOM go.PRS.**E** village-DAT
'It's to the village I go.'

(Modern Colloquial Sinhala, repeated from (ch.3:38c))

In 3.2.7, we saw that focused items may also occur in final postion, combining the **multiple** strategies of verb-marking and a specific syntactic position. Despite the different strategies, Slade (2011:ch.4-5) argues that this construction is semantically equivalent to the one in 9.4.30.1 above, with both having the same translation, and being analysed as involving an existential **presupposition**.

9.4.31 Spanish.

9.4.31.1 Spanish final.

(92) a. A: Qué pasó?
what happened
'What happened?'

B: Juan compró ayer el *periódico*.
Juan bought yesterday the newspaper
'Juan bought the newspaper yesterday.'

b. A: Quién compró el periódico ayer?
who bought the newspaper yesterday
'Who bought the newspaper yesterday?'

B: Ayer compró el periódico [*Juan*]$_{\text{Foc}}$.
yesterday bought the newspaper Juan
'*Juan* bought the newspaper yesterday.'

(Spanish, repeated from (ch.3:24))

This **syntactic** strategy was introduced in 3.2.6, and further considered in 3.3.1, 3.3.4, and 9.2.1, where it was concluded that it encodes **simple** focus on the basis of translations, entry into question-answer correspondence, and a number of phonologically-motivated analyses.

9.4.32 Tseltal.

9.4.32.1 Tseltal ja'*.*

(93) **ja'** lah s-lo' [alaxax]$_{\text{Foc}}$
FOC PFV 3.ERG-eat orange
'She ate an *orange*.'

(Tseltal (Mayan), repeated from (ch.3:20))

This construction, introduced in 3.2.5, makes use of the sentence-inital **lexical item** *ja'* to mark focus. Shklovsky (2005:128) describes this strategy as *in-situ* focus, but does not consider it in any further detail. However, the use of English stress in the translation in addition to comparison with the fronting construction (9.4.32.2) suggests that *ja'*-marking encodes **simple** focus.

*9.4.32.2 Tseltal (*ja') fronting.

(94) (**ja'**) [alaxax]$_{\text{Foc}}$ lah s-lo'
FOC orange PFV 3.ERG-eat
'It was an orange that she ate.'

(Tseltal (Mayan), repeated from (ch.3:36b))

As seen in 3.2.7, Tseltal focus may also be expressed through fronting combined with optional *ja'*-marking, and so this construction involves **multiple** strategies. Shklovsky (2005) considers the meaning of constituents that enter into this construction in some detail. Following a number of tests, especially those from É. Kiss (1998), he ultimately concludes that "[s]emantically […] these constituents are interpreted exhaustively," (p.136) which is further supported by analysis of ellipsis. This suggests that this construction should be placed in the **truth-conditional** category.

9.4.33 Yixing Chinese.

9.4.33.1 Yixing Chinese cleft.

(95) dzáŋsá zə́ [lə́ bə́dʒíŋ]$_{\text{Foc}}$ wɔ̌ khǽtshò gə́
Zhangsan COP in Beijing study driving ASP
'It is in Beijing that Zhangsan learns driving.'

(Yixing Chinese, repeated from (ch.3:64))

This construction was introduced in section 3.3.1, and makes use of a **syntactic** cleft strategy. They are noted by Xuhui Hu (p.c.) to be syntactically and semantically equivalent to *shi…de* clefts in Mandarin, which are usually analysed as presupposing exhaustivity (see e.g. Hole 2012:49-50), and this is also seen in the English cleft used to translate (95). I therefore suppose that the Yixing case also encodes a **presupposition** of exhaustivity.

9.4.33.2 Yixing Chinese prosodic.

(96) a. A: What happened?

B: (φ páŋ láo níŋ) (φ bɔ̀ndào gə̀) (φ só láo níŋ)
fat ATTR people meet ASP thin ATTR people
'Fat people met thin people.'

b. A: Who met thin people?

B: **[(φ pâŋ lào nǐŋ)]**$_{\textbf{Foc}}$ (φ bɔ̀ndào gə̀) (φ só láo níŋ)
fat ATTR people meet ASP thin ATTR people
'*Fat people* met thin people.'

c. A: Who did fat people meet?

B: (φ páŋ láo níŋ) (φ bɔ̀ndào gə̀) **[(φ sô lào nǐŋ)]**$_{\textbf{Foc}}$
fat ATTR people meet ASP thin ATTR people
'Fat people met *thin people*.'

(Yixing Chinese, repeated from (ch.3:11))

We saw this case in 3.2.3, where focus is marked by the blocking of a tonal sandhi process, and so this is a **prosodic** strategy. The structures were elicited through question-answer correspondence and appeared not to have any complex semantic properties, and so I suppose that they encode **simple** focus.

9.4.34 Yucatec Maya.

9.4.34.1 Yucatec Maya cleft.

(97) [bu'l]$_{\text{Foc}}$ le k=u hàant-ik Deysi=e' / le úulum=o'
bean DEF IPFV=A3 eat:TRANS-INCOMPL.B3SG Deysi=TOP DEF turkey=DIST
'Beans is what Deysi/the turkey is eating.' (and nothing else)

(Yucatec Maya, repeated from (13))

This **syntactic** construction was briefly dicussed in 9.2.1, where it was noted that unlike pre-predicate focus (9.4.34.2), it encodes exhaustivity. Skopeteas & Verhoeven (2015:19) take this exhaustivity to result in part from an existential **presupposition** introduced by the determiner *le*.

9.4.34.2 Yucatec Maya pre-predicate.

(98) a. T=u hàant-ah òon Pèedróoh
PFV=A3 eat:TRANS-COMPL.B3SG avocado Pedro
'Pedro ate avocado.'

b. òon t=u hàant-ah Pèedróoh
avocado PFV=A3 eat:TRANS-COMPL.B3SG Pedro
'Pedro ate an *avocado*.'

(Yucatec Maya, repeated from (ch.3:28))

After its introduction in 3.2.6, we considered this **syntactic** strategy in some detail in 9.2.1, where it was argued to encode **simple** focus on the basis of Skopeteas & Verhoeven's (2015:19-21) discussion of the ADDLIKELY test.

9.5 A Preliminary Typology.

On the basis of the discussion in 9.3 and 9.4, each of the constructions can be placed in the following table, forming a tentative typology of focus:

semantic complexity →

structural complexity ↓

	simple	implicature	presupposition	truth-conditional
none	ASL *in-situ* (38) Fongbe non-subject unmarked (56 B) LSB *in-situ* (76)			
stress	Arabic int. (34) English int. (54) German int. (59) Hungarian int. (62) Nepali int. (81)			
prosody	Japanese prosodic (69) Yixing Chinese prosodic (96)			
morphology	Boni á- (43) Boni -é (44) Gùrùntùm -*á* (61)	Japanese (double) -*ga* (68)	Nepali NAI (83) Sinhala verb-marked (90)	English CR (52)
lexical items	Fongbe subject *wɛ́* (57) Tseltal *ja'* (93)	ASL *THAT* (41)	English *always* (50) English *even* (53)	ASL *FINISH* (36) ASL *ONLY-ONE* (39) BSL$_1$ *ONLY* BSL$_2$ *THAT'S-IT* (49) English *only* (55) Navajo *daats'í* (80) Nepali *mātrai* (82) Polish *tylko* (86)
syntax	ASL fronting (37) BSL$_1$ RQ (46) BSL$_2$ RQ (48) French cleft (58) Italian final (65) K'ichee fronting (73) LSB fronting (75) Podoko postverbal (85) Sardinian fronting (87) Sicilian fronting (88) Spanish final (92) Yucatec Maya pre-predicate (98)	Italian fronting (66)	Arabic fronting (33) ASL doubling (35) ASL RQ (40) ASL (*wh*-)final (42) BSL$_1$ doubling (45) English cleft (51) Irish cleft (64) LSB doubling (74) LSB (*wh*-) final (77) Sicilian mirative fronting (89) Yixing Chinese cleft (95) Yucatec Maya cleft (97)	Hungarian preverbal (63) Jamaican Creole *a* fronting (67)
multiple	Gunge verb doubling (60)	Kabiye verb doubling with *kí* (70)	Fongbe non-subject (*wɛ́*) fronting (56 B') Kaqchikel agent verb-marking (with *ja*) (72) Mandarin Chinese (*lian*) *ye* (79) Sinhala verb-marked final (91)	Makhuwa conjoint (78) Tseltal (*ja'*) fronting (94)

Table 9.1: A tentative typology of 65 focus constructions based on two categorial scales of complexity.

We can make a number of observations on the basis of the tentative distribution shown in table 9.1. The first is that on the surface, the two scales of complexity do not seem to directly follow one another – constructions may be syntactically complex yet semantically simple (e.g. Gungbe verb doubling, Yucatec preverbal), and to some extent the reverse is true too (e.g. English *only*, Navajo *daats'í*). However, when semantically simple foci are encoded syntactically, their expression has a tendency to be relatively simple, consisting for the most part of a movement to a specific structural position, or in three cases a possible cleft-like construction ($BSL_{1\text{-}2}$ RQ, French cleft).[6] This is consistent with the suggestion in 9.2.1 that syntactically expressed simple foci make use of semantically inactive heads which conspire to place focused items in positions that the phonotype makes phonologically prominent, with the relative simplicity of these operations perhaps resulting from acquisitional restrictions on the mass postulation of such heads.

Moreover, while simple foci show a wide distribution across all structural categories, presumably due to the wide variation in phonotypes, the other semantic categories appear to be more restricted. In particular, the shaded section in table 9.1 represents an interesting typological gap: there appear to be no cases of semantically complex constructions being expressed purely with intonational or prosodic marking (or without marking altogether, which is less surprising). While to a certain extent it could be argued that specific cases of intonation are associated with implicatures (due to these profiles being associated with different implicit questions – see 3.4.3, 6.2.2, and 9.2.1), there appear to be no instances of intonation having presuppositional or truth-conditional effects. The structurally simplest possibility for encoding these complex meanings is therefore to express them on a single head, leading to a construction involving morphology or a lexical item. For the compositional cases, then, the typology in table 9.1 remains broadly consistent with the below statement:

[6] The sole exception to this generalisation is Gungbe verb doubling, which as noted in 9.2.1 may be due to the relative inaccessibility of verbs to phonologically-motived syntactic operations.

(99) syntactic complexity ≤ semantic complexity

(repeated from ch.3:107)

Furthermore, the gap seen provides some evidence for the phonological approach that has been supposed for the cases that do not appear to be compositional – such cases must be semantically simple, and their structural expression is constrained by the phonotype of the language. Therefore only simple foci may have purely phonological expression, and so a prediction is made that no complex meaning such as the truth-conditional exhaustivity of English *only* may be expressed through the phonology alone.[7]

This part of the thesis has provided an extended argument for the utility of compositionality as a heuristic in the syntactic analysis of focus, and also suggested an explanation for the cases that do not seem to fit this perspective. The preliminary typology in the current section appears to broadly confirm the predictions that this perspective takes, adding to the more detailed case studies that precede it. However, while these chapters have proposed compositional analyses of a number of syntactic constructions, they have not yet addressed the original concern of this work – the parametrisation of focus. We are now in a position to tackle this issue, which is the topic of the final chapter.

[7] One possible class of exceptions to this generalisation is the effect of focus on scalar items such as *or*:

(i) We can hire John or Mary.

(ii) We can hire John [*or*]$_{\text{Foc}}$ Mary.

(English; see also Schlenker et. al 2015 for ASL/LSF)

Whereas (i) allows the inclusive reading, the focus in (ii) enforces the exclusive one. While such effects are traditionally handled pragmatically (e.g. Horn 1989), Chierchia et al. (2012), Chierchia (2013) argue that they should be accounted for through the presence of an optional covert exhaustivity operator. However, this operator is triggered not by the focus itself, but by the presence of the scalar item, and so even under this approach the intonational focus does not itself have exhaustive meaning.

Part III
Algorithmic Acquisition of Focus Parameters

10. Algorithmic Acquisition of Focus Parameters.

10.1 Introduction.

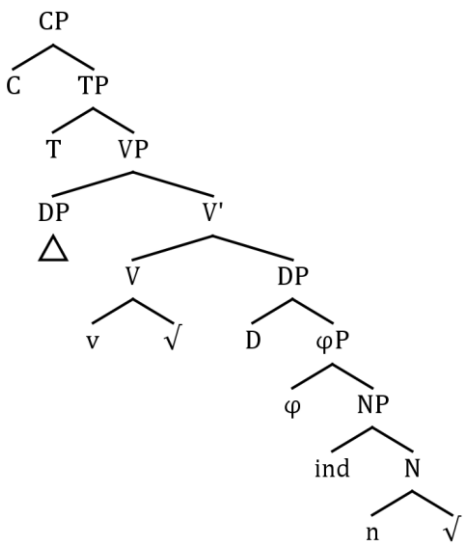
Part II began with the aim to parametrise the expression of focus in particular languages. Since variation is so rife in this domain, and since specific varieties themselves exhibit many different constructions, it initially seems difficult to see how this variation may be specified without recourse to the notion of construction. However, the compositional investigations of the previous chapter instead accounted for focus phenomena through the syntactic and semantic interaction of a number of invariant language-specific heads. This therefore provides a platform for lexicocentric parametrisation of focus, which is the subject of this final chapter. Beginning with a simplified background grammar, along with three focus constructions from each of English, Nepali, BSL_1, BSL_2, ASL, and LSB, I determine a possible range of heads responsible for the variation observed in each variety. When specified with valued/unvalued features and c-selectional behaviour, each set of heads therefore defines a grammar fragment corresponding to that language. These sets may then be compared to arrive at the potential categorial system involved, allowing for the construction of inputs to the algorithm in part I. When fed into this algorithm, these inputs result in a series of acquisitional trajectories that may be combined into a tree; essentially the algorithmic equivalent of a parameter hierarchy. This chapter is intended not as a fully accurate portrayal of the constructions and varieties involved, but instead as a demonstration of the utility of algorithmic parameter hierarchies in crosslinguistic parameterisation.

Section 10.2 introduces the background grammar to be used, and section 10.3 considers simple focus, an exclusive marker, and another construction for each of English, Nepali, BSL_1, BSL_2, ASL, and LSB, arriving at the complete set of heads involved in every simplified variety. In section 10.4, an input corresponding to each set of heads is determined, starting with the more straightforward cases of English and Nepali and then, through comparison, determining the inputs for the signed varieties. Section 10.5 compares the resulting acquisitional trajectories, and section 10.6 concludes.

10.2 A simplified background grammar.

Before the set of heads in a specific variety may be considered, it is necessary to first consider those heads that are likely to be common to all varieties. For this reason, I suppose that in all varieties that the transitive clause has broadly the following structure (movements omitted):

(1)

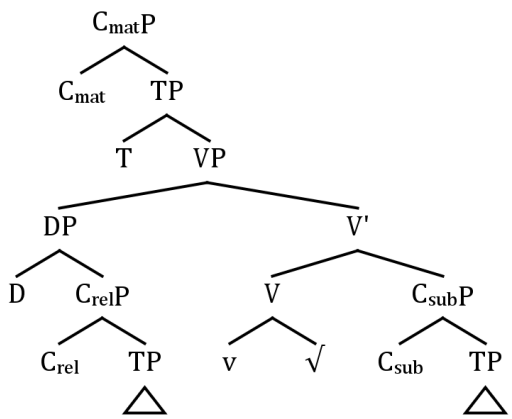


e.g. "John ate the bananas."

This largely represents a fairly conventional view of the clause, albeit with the simplifying omission of vP and nP subshells. Moreover, various assumptions from analyses in previous chapters are integrated. In particular, following the distributed morphological approach taken in chapter 8, N and V are formed by combination of a categoriser with a root, and the structurally-represented index proposed in this chapter is also present in Spec,NP.

However, to expand this grammar beyond this straightforward case, a few more heads must be introduced. Firstly, to implement clausal arguments, a subordinate C head is required in addition to the matrix C shown in (1) - which, unlike matrix C, may be c-selected by a verb. Furthermore, to implement the Kayne (1994)-style relatives used in 6.5, it is necessary to have a third C head, which may be c-selected by D, as shown in (2) (movements omitted):

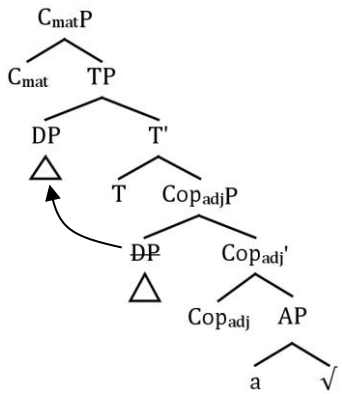
(2)



e.g. "The man that owns the company knows that John met Mary."

Since these relative constructions are used with adjectives in some of the examples that will be considered, it is additionally necessary to add an adjectival categorising head into the system, along with an adjectival predicative copula. The behaviour of these elements is demonstrated for English-style adjectival predicates (3a), Kayne (1994)-style adjectival relatives (3b)[1] and prenominal adjectives (3c):

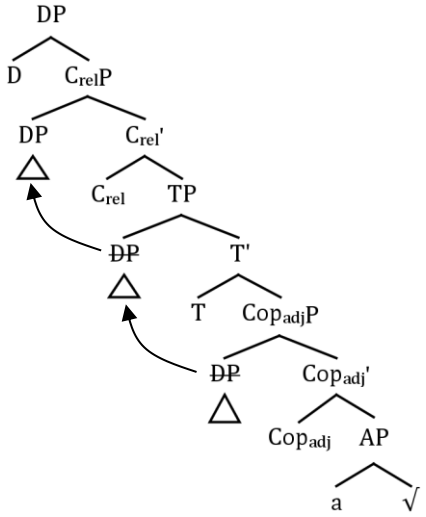
(3) a.



e.g. "John is tall"

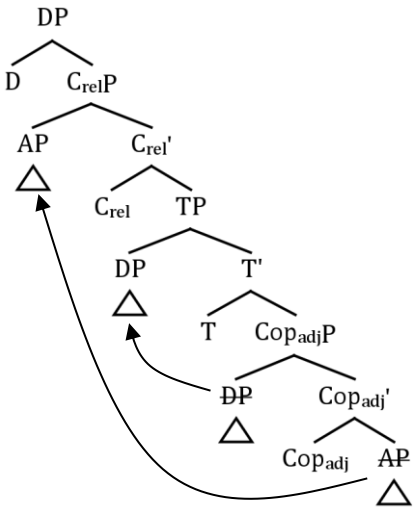
[1] For simplicity I suppose that relatives are headed by a null D, with the overt determiner (if present) being that of the raised DP.

b.



e.g. "The man that is tall."

c.



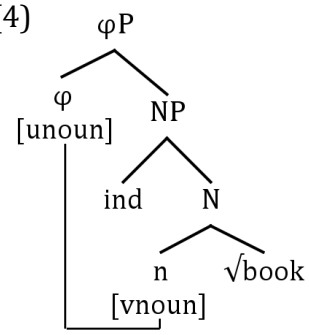
e.g. "The tall man."

It is likely that the raising operation to Spec,C_{rel}P exhibits a fair amount of crosslinguistic variation. For instance, head-initial languages without prenominal adjectives do not allow the structure in (3c), and we will see below that for BSL_1 and LSB, it is likely that relative heads raise to a lower position, if they raise at all. The trigger for this movement is also unclear, with Kayne (1994:90) suggesting the head must be locally governed by the external D, and Bianchi (1999:76) proposing that it "is triggered by a Relative Criterion, formally parallel to Rizzi's (1991) Wh-Criterion." Since this chapter aims to parametrise focus rather than relative constructions, I do not specify the feature(s) responsible for this raising to avoid such complications.

It is also necessary to introduce two heads for the formation of *wh*-question constructions – C_{wh}, which is the interrogative counterpart of C_{mat}, and D_{wh}, the *wh*-counterpart of D. C_{wh} specifies the interrogative force of a question, and agrees with and attracts D_{wh} in *wh*-movement languages. Note that it is likely that there are also *wh*-counterparts of embedded Cs to introduce indirect questions, but since such structures are not relevant to the cases we will consider below, I leave these heads aside. I will also assume that, like D, D_{wh} selects for C_{rel}P as well as φP. This in in part a simplifying assumption, since restricted relatives (e.g. "The man who I met") cannot be headed by a *wh*-element, but it is possible that this combination of heads is involved in free relatives (e.g. "Whoever eats bananas").

In terms of features, we can suppose that C_{wh} usually bears a [uwhq] feature, or a [uwhq^] feature in *wh*-movement languages, and that these features probe for the [vwhq] feature on D_{wh}. Similarly, T bears a [uphi(^)] feature, agreeing with [vphi] on φ, and in some varieties pied-piping the appropriate DP to Spec,TP. Moreover, the analysis of CR in chapter 8 supposed the following features in the nominal domain, responsible for number agreement on n, which I assume are present in all the varieties under consideration:

(4)



Finally, one feature is of paramount importance for the representation of focus – [vfoc]. As discussed in 3.4.2, I suppose that this feature is in fact introduced on a special feature assigning head, termed Foc_{feat}, which is invisible to c-selection and may combine with any phrase, resulting in an equivalent of that phrase but with the [vfoc] feature added.

Assuming the presence of no other heads, the system outlined above can be summarised as follows:

Head	**Features**	**C-selects**	**Inherent Specifier**[2]
C_{mat}	-	T	-
C_{wh}	[uwhq(^)]	T	-
C_{sub}	-	T	-
C_{rel}	-	T	-
T	[uphi(^)]	V, Cop_{adj}	-
v	-	(√), C_{sub}, D, D_{wh}	DP, $D_{wh}P$
Cop_{adj}	-	AP	DP, $D_{wh}P$
D	-	C_{rel}, φ	-
D_{wh}	[vwhq]	C_{rel}, φ	-
φ	[vphi, unoun]	N	-
ind	-	-	-
n	[vnoun]	(√)	ind
a	-	(√)	-
Foc_{feat}	[vfoc]	all heads	-

Table 10.1: Heads and their potential specifications for a generic grammar fragment.

In addition to the points noted above, this grammar is heavily simplified in various ways – for instance, prepositions are not represented, and there are likely multiple variants of each functional head with different phonological realisations (including null ones). It perhaps should also be supposed that combination with particular roots can alter the properties of a head, with e.g. unaccusative verbs not having inherent specifiers, and unergatives not c-selecting (though see e.g. Hale & Keyser 1993 for a possible alternative approach). Notwithstanding, this background grammar remains sufficiently representative that it may be parametrised for the properties under consideration, without introducing undue complexity.

In order to construct an input yielding the system in table 10.1, it is necessary to determine the set of properties for each head, which along with a prominence order results in the resulting categorial system. While it is not entirely obvious what system this should be, there are a few clues as to its nature, based on the

[2] See ch.2, footnote 15: I suppose that the base-generated DP argument in the specifier of VP is an inherent property of V. This can be extended to Cop_{adj} and N, with the specifier being 'ind' in this latter case.

similar behaviour of certain sets of heads. For instance, all Cs select TP, meaning they must constitute a category which the c-selectional feature for T is assigned to. Furthermore, v, n, and a may all combine with roots, which is perhaps better viewed as a consequence of their being categorising heads, rather than c-selection proper. This perspective is supported by the fact that after categorisation of a root, v can then c-select a range of heads (C_{sub}, D, D_{wh}), as would likely also be the case for n and a in a more complex system. For this reason, the selection of roots is placed in brackets in table 10.1.

Continuing this process of reasoning, leads to the conclusion that the following 6 categories must be present in the system:

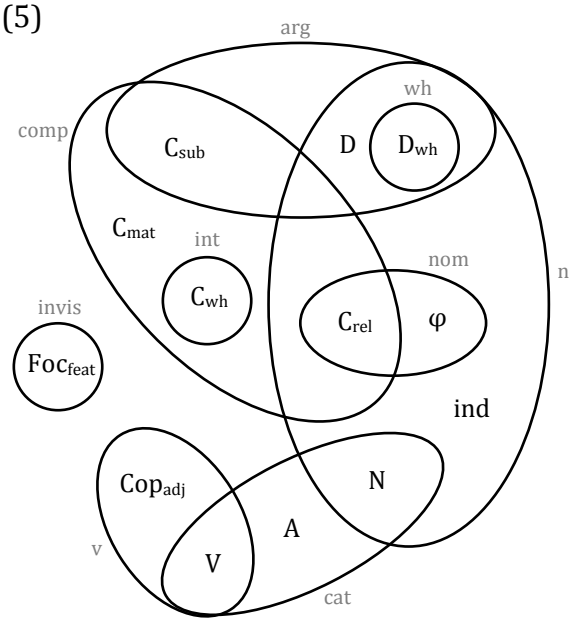
Category	**Shared Behaviour**
v, Cop_{adj}	c-selected by T
C_{sub}, D, D_{wh}	c-selected by V
C_{rel}, φ	c-selected by D, D_{wh}
C_{mat}, C_{wh}, C_{sub}, C_{rel}	c-select T
D, D_{wh}	c-select C_{rel}, φ
v, n, a	categorise roots

Table 10.2: Shared behaviour of heads in the system of table 10.1.

While this does not determine all the properties involved in the system, it does present a starting point for constructing an input. For instance, it is likely that the categorising heads (henceforth renamed to V, N, and A to avoid confusion with properties) share the property 'cat(egoriser),' and that all Cs have the property 'comp(lementiser).' Similarly, I suppose that V and Cop_{adj} both have the property 'v,' and that C_{sub}, D, and D_{wh} are possible 'arg(uments)' of V. It would be possible to continue this process and give D and D_{wh} a shared property such as 'det(erminer),' but if all heads involved in the nominal (C_{rel}, D, D_{wh}, φ, ind, N) are given the property 'n,' then the category of D and D_{wh} may be identifiable as [+N,+ARG]. The grouping of C_{rel} and φ is harder to determine; I suppose that they share the property 'nom(inal)' since they are each key to the construction of a different kind of nominal. A few similar heads also need to be distinguished from one another: D_{wh} from D with the property 'wh,' and C_{wh} from C_{mat} with the property

'int(errogative).' Finally, Foc_{feat} is invisible to c-selection, and so must have the special property 'invis(ible).' The resulting groupings of properties are summarised in the below Venn diagram:

(5)



By combining these categorial properties with non-categorial properties, including those corresponding to [uf(^)]s and c-selectional features, we can arrive at a list of properties for each head. This is shown below, along with a prominence order for all bare properties, and so (6) constitutes an input corresponding to the system in table 10.1 (for concreteness, [uwhq] and [uphi] are both specified to trigger movement):

(6) {<C_{mat}, {comp, {T}}>,
<C_{wh}, {comp, int, <whq, m>, {T}}>,
<C_{rel}, {n, comp, nom, {T}}>,
<C_{sub}, {comp, arg, {T}}>,
<T, {<phi, m>, {V, Cop_{adj}}}>,
<V, {v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {v, {A}}>,
<D, {n, arg, {C_{rel}, φ}}>,
<D_{wh}, {n, arg, wh, whq, {C_{rel}, φ}}>,
<φ, {n, nom, phi, {noun}, {N}}>,
<ind, {n}>,
<N, {n, cat, noun}>,
<A, {cat}>,
<Foc_{feat}, {invis, foc, {h|head(h)}}>}

<n, v, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, foc>

When the algorithm of chapter 2 is applied to this input, 51 categories are created, and the following specification of heads results:

(7)

C_{mat}	[-N,-V,-CAT,+COMP,-ARG,-INT]	(-N,-V,-CAT,-COMP,-INVIS)	
C_{wh}	[-N,-V,-CAT,+COMP,-ARG,+INT]	(-N,-V,-CAT,-COMP,-INVIS)	[uwhq^]
C_{rel}	[+N,-CAT,+COMP,-ARG,+NOM]	(-N,-V,-CAT,-COMP,-INVIS)	
C_{sub}	[-N,-V,-CAT,+COMP,+ARG]	(-N,-V,-CAT,-COMP,-INVIS)	
T	[-N,-V,-CAT,-COMP,-ARG,-INVIS]	(-N,+V)	[uphi^]
V	[-N,+V,+CAT]	(-CAT,+ARG)	
Cop_{adj}	[-N,+V,-CAT,-COMP,-ARG]	(-N,-V,+CAT)	
D	[+N,-CAT,-COMP,+ARG,-WH]	(+N,-CAT,-ARG,+NOM)	
D_{wh}	[+N,-CAT,-COMP,+ARG,+WH]	(+N,-CAT,-ARG,+NOM)	[vwhq]
φ	[+N,-CAT,-COMP,-ARG,+NOM]	(+N,+CAT)	[vphi,unoun]
ind	[+N,-CAT,-COMP,-ARG,-NOM]		
N	[+N,+CAT]		[vnoun]
A	[-N,-V,+CAT]		
Foc_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS]	()	[vfoc]

This system has exactly the properties described in table 10.1, and so the input in (6) is appropriate for this background grammar. In the following two sections, I examine how this background grammar should be modified to account for three focus constructions in each of six varieties, and from this determine an appropriate input in every case.

10.3 Tabulation of the heads in each variety.

Having proposed a background grammar, the next step towards the goal of parametrisation is to determine the set of heads involved in each variety. However, as the variation reviewed in part II shows, a complete account of all the focus constructions in a specific variety would likely require an extremely large number of heads, and so some simplification is therefore necessary. One strategy would be to restrict our scope to one focus construction in each variety, but while this would allow for parametrisation across varieties, it would fail to demonstrate how multiple constructions may be encoded within a single variety. For this reason, I consider three focus constructions for each language:

(i) The simple focus construction, used in QAC. (e.g. "[*John*]$_{Foc}$ arrived.")

(ii) The DP exclusive construction. (e.g. "**Only** [*the man*]$_{Foc}$ arrived.")[3]

(iii) One other semantically complex focus construction.

This allows each simplified variety to encode a range of focus constructions without introducing unmanageable complexity.

10.3.1 English.

English remains fairly close to the background grammar presented in 10.2, and has *wh*-movement as well as subject movement to Spec,TP, meaning C_{wh} and T bear [uwhq^] and [uphi^] respectively. However, to account for the focus constructions, two additional heads are required.

10.3.1.1 English simple focus.

As discussed throughout part II, English simple focus is realised using intonational prominence alone:

[3] In many varieties this is the same as the vP exclusive construction, so the restriction to DP exclusives is to some extent another simplification. However, it is likely that e.g. English vP-*only* and DP-*only* require different semantic denotations (though see Büring & Hartmann 2001:248 for an attempt at a unified denotation).

(8) I gave it to [*John*]$_{Foc}$.

(English, repeated from (ch.3:1))

This can therefore be viewed as a phonological reflex of marking with [vfoc], and so this construction can be described using Foc$_{feat}$ alone:

Head	**Features**	**C-selects**	**Invisible?**
Foc$_{feat}$	[vfoc]	all heads	yes

Table 10.3: Heads required for English simple focus.

Moreover, since this head is invisible to c-selection, as discussed above, it does not alter the c-selectional properties of any other heads in the system.

10.3.1.2 English DP exclusive focus.

English marks exclusive DPs using the particle *only*:

(9) **Only** [*the man*]$_{Foc}$ arrived.

(English)

This particle combines with a focus-marked nominal to yield an exclusive reading. As shown in (9), the particle precedes the determiner, and so I suppose it c-selects D. Moreover *only* is once again invisible to c-selection, so does not alter the c-selectional properties of any other head.

Head	**Features**	**C-selects**	**Invisible?**
only	-	D	yes
Foc$_{feat}$	[vfoc]	all heads	yes

Table 10.4: Heads required for English DP exclusive focus.

10.3.1.3 English CR.

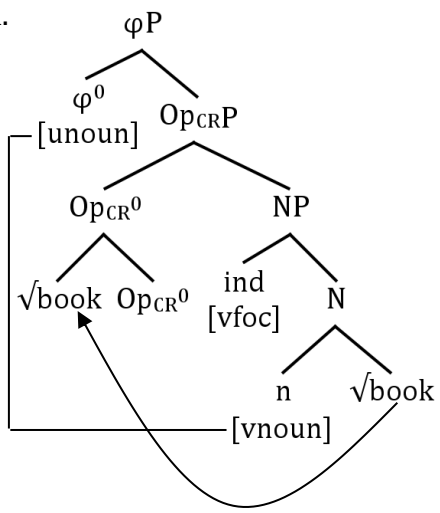
English CR, shown in (10a-b), was discussed in some detail in chapter 8, with the structures in (11a-b) being assigned to the reduplicated nominals in (10a) and (10b) respectively:

(10) a. I don't just read books, I read [*books*-books]$_{Foc}$.

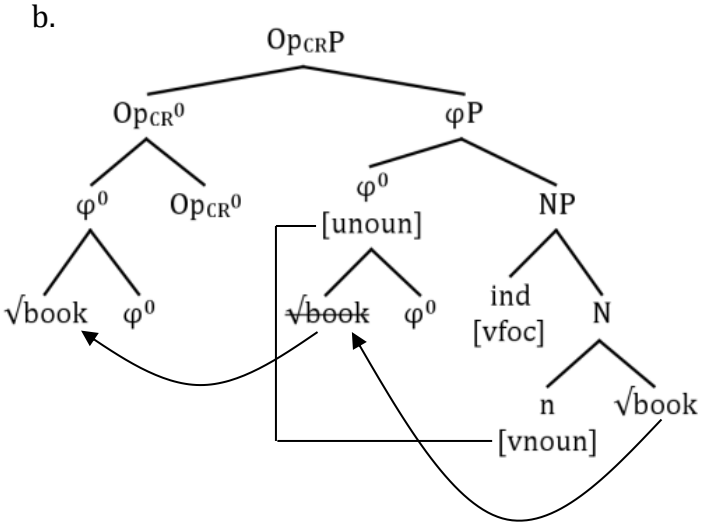
b. I don't just read books, I read [*book*-books]$_{Foc}$.

(English, repeated from (ch.8:12))

(11) a.



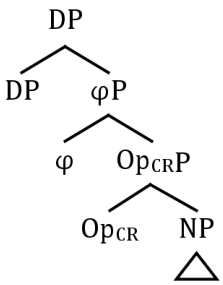
b.



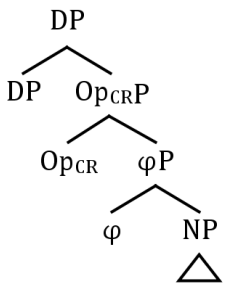
(English, (a) repeated from (ch.8:40), (b) from (ch.8:41))

In both cases the head-movement is driven by the semantic properties of Op_{CR}, with the two-step movement in (11b) resulting from Travis' (1984) head-movement constraint. Op_{CR} can therefore select either N (11a) or φ (11b), with the following simplified configurations:

(12) a.



b.



(English, repeated from (ch.8:43))

As noted in 2.4.2 and 8.4.1, while such configurations can be accounted for using c-selection of invisible heads, it is far simpler to suppose that the variably positioned element (in this case Op_{CR}) is invisible, occurring in different positions within a fixed hierarchy without affecting the sequence. Nominal cases of CR therefore involve the following heads:

Head	**Features**	**C-selects**	**Invisible?**
Op_{CR}	-	φ, N	yes
φ	[unoun]	N	no
ind	-	-	no
N	[vnoun]	(√)	no
Foc_{feat}	[vfoc]	all heads	yes

Table 10.5: Heads required for English CR.

Furthermore, non-nominal and phrasal cases of CR are analysed in 8.4.3 as involving the same construction, only with possible renumeration and recategorisation. By supposing that renumeration occurs standardly for phrasal idioms, and assuming that all categorising heads allow for the possibility of recategorisation, these cases can additionally be accounted for without having to introduce any further heads into the grammar.

10.3.1.4 English: Summary.

Combing the heads necessary for the above focus constructions with those of the background grammar results in the following set of heads:

Head	Features	C-selects	Invisible?
C_{mat}	-	T	no
C_{wh}	[uwhq^]	T	no
C_{sub}	-	T	no
C_{rel}	-	T	no
T	[uphi^]	V, Cop_{adj}	no
v	-	(√), C_{sub}, D, D_{wh}	no
Cop_{adj}	-	AP	no
D	-	C_{rel}, φ	no
D_{wh}	[vwhq]	C_{rel}, φ	no
only	-	D	yes
Op_{CR}	-	φ, N	yes
φ	[vphi, unoun]	N	no
ind	-	-	no
n	[vnoun]	(√)	no
a	-	(√)	no
Foc_{feat}	[vfoc]	all heads	yes

Table 10.6: Heads and their potential specifications for a simplified fragment of English.

This provides a simplified representation of English, allowing for the construction of a corresponding input in 10.4.1.

10.3.2 Nepali.

Perhaps the largest difference between English and Nepali is one of headedness: while English is head-initial, Nepali is head-final. For this reason, all heads in the Nepali fragment must be specified for finality, which I encode with the feature [vfin]. Furthermore, *wh*-elements remain *in-situ*, so I take C_{wh} to bear [uwhq] rather than [uwhq^], and since it is not clear that subjects move to Spec,TP, I take T to bear [uphi] rather than [uphi^]. Having determined these more general differences, I turn to specific focus constructions.

10.3.2.1 Nepali simple focus.

As summarised in 9.4.24.1, Nepali simple focus is, like English, realised using intonational prominence, and so only the invisible head Foc_{feat} is required to describe it:

(13) A: Rameś-le ke kʰāyo
Ramesh-ERG what ate
'What did Ramesh eat?'

B: Rameś-le [*kerā*]$_{\text{Foc}}$ kʰāyo
Ramesh-ERG banana ate
'Ramesh ate a *banana*.'

(Nepali, partially repeated from (ch.5:3))

Head	**Features**	**C-selects**	**Invisible?**
Foc_{feat}	[vfin, vfoc]	all heads	yes

Table 10.7: Heads required for Nepali simple focus.

10.3.2.2 Nepali DP exclusive focus.

As we saw in 9.4.24.2, Nepali DPs are given exclusive focus through a postnominal occurrence of the particle *mātrai*:

(14) [*Rameś*]$_{\text{Foc}}$ **mātrai** laḍyo
Ramesh only fell
'Only Ramesh fell.'

(Nepali, partially repeated from (ch.5:46c))

This particle can therefore be analysed much like English DP *only*, with the difference in positioning resulting simply from head-finality. It can therefore be modelled it as follows:

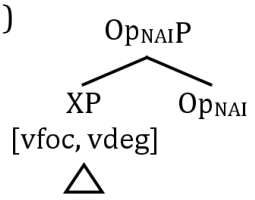
Head	**Features**	**C-selects**	**Invisible?**
mātrai	[vfin]	D	yes
Foc_{feat}	[vfin, vfoc]	all heads	yes

Table 10.8: Heads required for Nepali DP exclusive focus.

10.3.2.3 Nepali NAI *focus.*

In 7.2.2, Nepali NAI focus was given the following syntactically simple analysis:

(15)



(Nepali, adapted from (ch.7:10))

Op_{NAI} is therefore a head-final focus association operator that combines with focused phrases to yield an emphatically focused reading. As with *only*, *mātrai*, and Foc_{feat}, it appears to combine with heads without altering their c-selectional behaviour, and so I take it to be invisible to c-selection. Furthermore, since it involves emphatic focus, it is marked with [vdeg] as well as [vfoc]. In 7.2.2 I assumed that this feature was introduced on Deg_{feat}, comparable to Foc_{feat}, and here I further suppose that, like Foc_{feat}, Deg_{feat} may c-select any head.

However, one aspect of the behaviour of NAI is not so simple: its combinatorial restrictions. These were reviewed in 5.2, where it was shown that NAI may attach to an extremely wide range of structures (albeit with semantic differences in some cases, addressed in 7.3.4). The key exception to this is finite verbs,[4] with (16a) being ungrammatical, despite the grammaticality of NAI with infinitives (16b) and participles (16c-d):

[4] As discussed in 5.2, NAI is also incompatible with at least some indirect objects (i), but can occur on them when marking an FCI (ii):

(i) Rameś-le Lakṣmi-(***ai**)-lāi-(***nai**) kerā diyo
Ramesh-ERG Laksmi-**NAI**-DAT-**NAI** banana gave
'Ramesh gave *Laksmi* a banana.'

(ii) kas-**ai**-lāi die hunc^{h}a
who-**NAI**-DAT give.INF be.ok
'It's okay to give that to **anyone**.

(Nepali, (i) repeated from (ch.5:5), (ii) from (ch.5:29)

This lack of consistency combined with the ungrammaticality of NAI both sides of the case marker suggests that the restriction is not c-selectional, but thematic. As a result, I do not attempt to account for it here, but note that the Dutch focus particle *maar* is similarly incompatible with indirect objects (Hoogland 2014:40), suggesting that this may be attributable to a general interaction between focus and thematic structure.

(16) a. * u kʰāna [*kʰāyo*]$_{\text{Foc}}$-**nai**
3SG food ate-**NAI**
'He *ate* food.'

b. ma-lāi [*jān*]$_{\text{Foc}}$-**ai** par-cʰa
1SG-DAT go.INF-**NAI** must-PRS
'I must *go*.'

c. [*ga-ek*]$_{\text{Foc}}$-**ai** mānchʰe
go-PST.PTCP-**NAI** person
'The person who went.'

d. John-le syāu [*kʰā-eko*]$_{\text{Foc}}$-**nai** ho
John-ERG apple eat-PST.PTCP-**NAI** AUX
'John *ate* an apple.'

(Nepali, (a) repeated from (ch.5:22); (b-c) from (ch.5:20-21); (d) from (ch.5:18))

This unusual pattern clearly merits further investigation. However, it is worth noting that at least two of the grammatical combinations with NAI (16c-d) involve participles, which may be plausibly analysed as having a category other than V. Particularly interesting is the fact that "the perfect participial suffix *-eko* […] inflects like an adjective for gender and number, e.g. *-eko* (masculine singular), *-ekī* (feminine singular), and *-ekā* (plural)," (Acharya 1991:149). We can therefore suppose that in (16c-d) the verb has been recategorised in some manner, and if we extend this to the infinitive (16b), it is possible that in each of (16b-c), NAI is combining not with V but another category. This would allow the ungrammaticality of (16a) to result from an incompatibility with V in general, rather than one with finite V in particular. Adopting this view yields the following range of heads for NAI focus:

Head	**Features**	**C-selects**	**Invisible?**
Op_{NAI}	[vfin]	all heads but V	yes
Foc_{feat}	[vfin, vfoc]	all heads	yes
Deg_{feat}	[vfin, vdeg]	all heads	yes

Table 10.9: Heads required for Nepali NAI focus.

10.3.2.4 Nepali: Summary.

Combining these proposals together results in the below set of heads for the Nepali fragment:

Head	**Features**	**C-selects**	**Invisible?**
Op_{NAI}	[vfin]	all heads but V	yes
C_{mat}	[vfin]	T	no
C_{wh}	[vfin, uwhq]	T	no
C_{sub}	[vfin]	T	no
C_{rel}	[vfin]	T	no
T	[vfin, uphi]	V, Cop_{adj}	no
v	[vfin]	(√), C_{sub}, D, D_{wh}	no
Cop_{adj}	[vfin]	AP	no
D	[vfin]	C_{rel}, φ	no
D_{wh}	[vfin, vwhq]	C_{rel}, φ	no
mātrai	[vfin]	D	yes
φ	[vfin, vphi, unoun]	N	no
ind	[vfin]	-	no
n	[vfin, vnoun]	(√)	no
a	[vfin]	(√)	no
Foc_{feat}	[vfin, vfoc]	all heads	yes
Deg_{feat}	[vfin, vdeg]	all heads	yes

Table 10.10: Heads and their potential specifications for a simplified fragment of Nepali.

10.3.3 ASL.

Unlike Nepali, ASL is head-initial, and so as with English, no [vfin] features are necessary. Furthermore, since there is no clear evidence for subject movement to Spec,TP, I suppose that as in Nepali, T bears [uphi]. However, ASL is set apart from both these languages by the wide range of structures possible in *wh*-questions: the *wh*-element may occur *in-situ* (17a), initially (17b), and (in exhaustive cases) finally (17c):

(17) a. _____ whq
JOHN BUY WHAT
'What did John buy?'

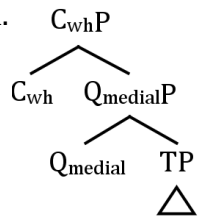
b. _____ whq
WHAT JOHN BUY
'What did John buy?'

c. _____ whq
WIN WHO
'Who is it that won?'

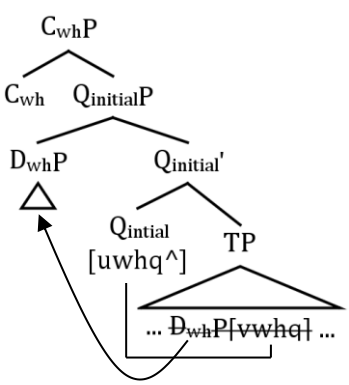
(ASL, (a-b) repeated from (ch.6:52), (c) from (ch.6:32a))

These structures were reviewed in 6.2, and in 7.4 they were abbreviated to $Q_{medial}P$, $Q_{initial}P$, and $Q_{final}P$ respectively. Further research is clearly necessary to determine the exact range of heads and semantic properties involved in each case, but for concreteness I assign these the following structures, in which the head names are descriptive placeholders:

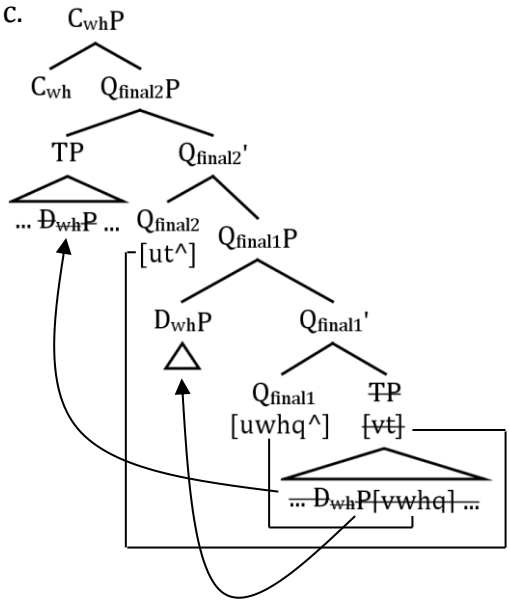
(18) a.



b.



c.



Of course, it is likely that many of the heads involved in these constructions will also have denotations yielding particular semantic readings, especially in the case of (17c). Nonetheless, a syntactic specification of the heads necessary for these structures is as follows:

Head	Features	C-selects	Invisible?
C_{wh}	-	Q_{medial}, $Q_{initial}$, Q_{final2}	no
Q_{medial}	-	T	no
$Q_{initial}$	[uwhq^]	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
D_{wh}	[vwhq]	C_{rel}, φ	no

Table 10.11: Heads required for ASL wh-*interrogatives.*

With these properties determined, I turn to specific focus constructions in ASL.

10.3.3.1 ASL simple focus.

As reviewed in 6.2.2, simple focus can be realised through fronting in both ASL and LSB:

(19) a. A: WHAT YOU READ?
'What did you read?'

B: I-focus
[BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'I read *Stokoe's book*.'

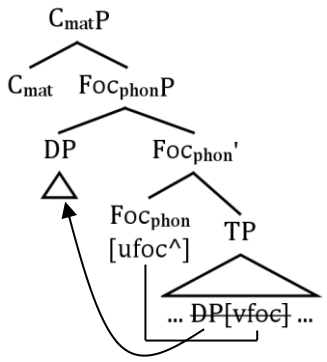
b. A: INDEX$_2$ READ CHOMSKY BOOK?
'Did you read Chomsky's book?'

B: C-focus
NO, [BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'No, I read *Stokoe's book*.'

(ASL/LSB, (a) partially repeated from (ch.6:23a); (b) repeated from (ch.6:24))

Given the discussion in 9.2.1, which takes simple foci to be phonologically motivated, this structure may be analysied using a single Foc_{phon} projection:

(20)



The heads involved in this construction can therefore be specified as follows:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Foc_{phon}, T	no
Foc_{phon}	[ufoc^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
Foc_{feat}	[vfoc]	all heads	yes

Table 10.12: Heads required for ASL simple focus.

10.3.3.2 ASP DP exclusive focus.

The ASL DP exclusive particle was reviewed in 6.2.2, with an example showing its occurrence prenominally:

(21) KNOW WHAT? **ONLY-ONE** [KIM]$_{Foc}$ GET-A
'Know what? Only Kim got an A.'

(ASL, repeated from (ch.6:29))

This particle may also occur postnominally, as shown in (22a-b):

(22) a. br
[KIM]$_{Foc}$ **ONLY-ONE** GET-A
'Kim is the only one who got an A.'

b. br br
cs lb
INDEX$_1$ RECENT FIND-OUT WHAT, [KIM]$_{Foc}$ **ONLY-ONE** GET-A
'I recently found out that Kim is the only one who got an A.'

(ASL, (a) Wilbur 2011:166, (b) 2012:477)

However, the non-manual markings and glosses in these cases both suggest that a more complex structure is involved, which combines marking of *ONLY-ONE* with fronting of the focused constituent. Moreover, postnominal *ONLY-ONE* is not felicitous in all cases:

(23) #ALL KNOW [KIM]$_{Foc}$ **ONLY-ONE** GET-A
'Everybody knows that only Kim got an A.'

(ASL, adapted from Wilbur 1994a:659)

As a result, it seems reasonable to suppose that *ONLY-ONE* attaches prenominally to [vfoc]-marked NPs, yielding an exclusive reading. To uphold the parallel with

English and Nepali, and in the absence of evidence to the contrary, I further suppose that it c-selects D, and is invisible to c-selection. It can therefore be described with the following heads:

Head	**Features**	**C-selects**	**Invisible?**
ONLY-ONE	-	D	yes
Foc_{feat}	[vfoc]	all heads	yes

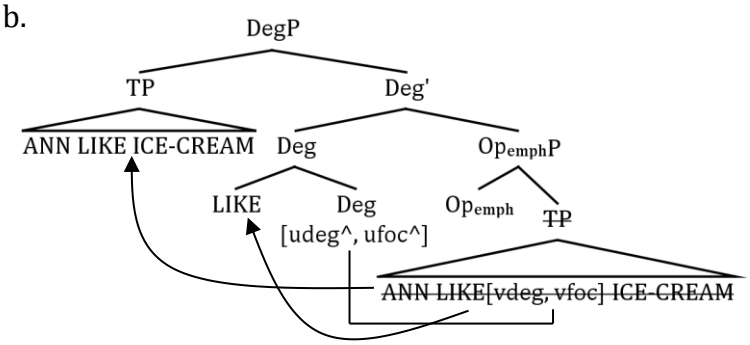
Table 10.13: Heads required for ASL DP exclusive focus.

10.3.3.3 ASL focus doubling.

Chapters 6-7 considered focus doubling in detail for a number of sign language varieties. For ASL in particular, the structure in (24a) was given the analysis of (24b):

(24) a. _____hn
ANN [LIKE]$_{\text{Foc}}$ ICE-CREAM [*LIKE*]$_{\text{Foc}}$
'Ann really *likes* ice-cream.'

b.



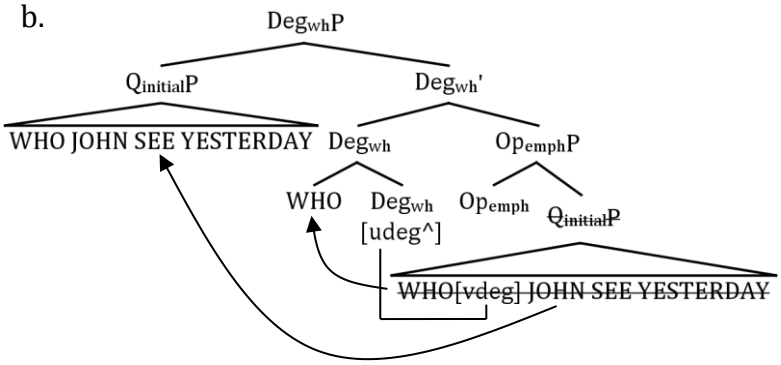
(ASL, (a) repeated from (ch.6:1), (b) adapted from (ch7:35)

Here, the incorporation of *LIKE* and the fronting of TP occur as a result of the semantic properties of Deg and Op_{emph} respectively, as discussed in the motivation of the analysis.

Not all doubling in ASL displays this structure, however, with the *wh*-doubling in (25a) instead being given the analysis in (25b) due to its differing syntactic and semantic properties:

(25) a. [WHO]$_{Foc}$ JOHN SEE YESTERDAY [*WHO*]$_{Foc}$

b.



(ASL, (a) repeated from (ch.6:53b), (b) adapted from (ch.7:39))

As discussed in 7.4, *wh*-doubling structures may only be formed from $Q_{initial}$Ps, and not any other interrogative structures. This restriction may be achieved if Op_{emph} is invisible to c-selection, allowing Deg_{wh} to select only $Q_{initial}$ through it. Moreover, in ASL non-*wh*-doubling is ungrammatical with *wh*-questions, and so Deg must only be able to select T through Op_{emph}:

(26) a. _____ whq
[WHO]$_{Foc}$ WILL BUY HOUSE [*WHO*]$_{Foc}$
'Who will buy a house?'

b. _____ whq
* WHO [WILL]$_{Foc}$ BUY HOUSE [*WILL*]$_{Foc}$

(ASL, repeated from (ch.6:7))

As a result, in 7.5, these heads were given the following specifications:

Head	**Features**	**C-selects**	**Invisible?**
Deg	[udeg^, ufoc^]	T	no
Deg_{wh}	[udeg^]	$Q_{initial}$	no
Op_{emph}	-	$Q_{initial}$, T	yes

Table 10.14: Specification of heads involved in ASL focus doubling – adapted from table 7.1.

This is sufficient to determine the internal syntax of doubling constructions, but to incorporate these analyses into our system, it is necessary to also determine the heads selecting Deg and Deg_{wh}. Since the examples in (24-25) involve matrix declarative and interrogative clauses, we can first assume that C_{mat} may c-select

Deg, and C_{wh} may c-select Deg_{wh}. The next question, then, is whether any other Cs may c-select these heads.

There are two properties of ASL doubling reviewed in 6.2.1 that aid in answering this question, both of which were identified by Petronio (1993:135): "the double occurs at the end of the sentence, [and] there is only one double per sentence." As a result, though subclause elements may double (27a) (assuming no island violations), this cannot be combined with another doubling of an element from the matrix clause (27b). Moreover, relative clause island violations (27c) cannot be rescued by confining the doubling to that clause, since the double must occur at the end of the sentence (27d):

(27) a. _____hn
INDEX$_1$ FEEL INDEX$_3$ [WILL]$_{Foc}$ WIN [WILL]$_{Foc}$
'I feel he will win.'

b. _____hn
* INDEX$_1$ [FEEL]$_{Foc}$ INDEX$_3$ [WILL]$_{Foc}$ WIN [*WILL*]$_{Foc}$ [*FEEL*]$_{Foc}$
'I feel he will win.'

c. _____r
* WOMAN [WILL]$_{Foc}$ COME TOMORROW NAMED s-u-e [*WILL*]$_{Foc}$
'The woman who will come tomorrow is named Sue.'

d. _____r
* WOMAN [WILL]$_{Foc}$ COME TOMORROW [*WILL*]$_{Foc}$ NAMED s-u-e
'The woman who will come tomorrow is named Sue.'

(ASL, (a-b, d) repeated from (ch.6:10); (c) from (ch.6:9a))

As noted in 6.21, the most consistent analysis of these restrictions is that doubling is a root clause phenomenon in ASL. If Op_{emph} may occur only in the matrix clause, then this restricts doublings to at most one, and ensures that that incorporated element is always realised clause-finally. Furthermore, we will see below that this restriction does not hold for all varieties, with the expected consequences, lending further support to this view of ASL doubling. As a result, Deg and Deg_{wh} may only be selected by C_{mat} and C_{wh} respectively.

One final aspect to determine is the source of the [vdeg] feature on emphatically focused heads. As with Nepali, I suppose that this is introduced on the invisible feature-assigning head Deg_{feat}. However, the ASL version of Deg_{feat} is more interesting one respect: its c-selectional restrictions. As we saw in 6.7.1, a very wide range of heads may double, but this range is likely not unlimited. However, it is for the most part difficult to restrict this range via c-selectional specification, since the majority of the heads involved in doubling are not local to the doubled head. Moreover, although Foc_{feat} does c-select doubled heads, it must also c-select any element that may be focused, which is likely to include some elements that cannot be doubled. By contrast, Deg_{feat} does not have this difficulty, and so it may be that the range of doubled elements can be determined by its c-selectional properties. However, without a precise characterisation of this range, it is difficult to determine these properties, and so for simplicity I will suppose that in all doubling varieties Deg_{feat}, like Foc_{feat}, c-selects all heads. It is worth noting, however, that the specification of this element may well be another locus of parameterisation in doubling constructions.

The results of this discussion are summarised below:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Deg, Foc_{phon}, T	no
C_{wh}	-	Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	no
Deg	[udeg^, ufoc^]	T	no
Deg_{wh}	[udeg^]	$Q_{initial}$	no
Op_{emph}	-	$Q_{initial}$, T	yes
$Q_{initial}$	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.15: Heads required for ASL focus doubling.

10.3.3.4 ASL: Summary.

In conclusion, I combine the above proposals with the background grammar, and take ASL to be composed of the following heads:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Deg, Foc_{phon}, T	no
C_{wh}	-	Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	no
C_{sub}	-	T	no
C_{rel}	-	T	no
Deg	[udeg^, ufoc^]	T	no
Deg_{wh}	[udeg^]	$Q_{initial}$	no
Op_{emph}	-	$Q_{initial}$, T	yes
Foc_{phon}	[ufoc^]	T	no
$Q_{initial}$	[uwhq^]	T	no
Q_{medial}	-	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
v	-	(√), C_{sub}, D, D_{wh}	no
Cop_{adj}	-	A	no
D	-	C_{rel}, φ	no
D_{wh}	[vwhq]	C_{rel}, φ	no
ONLY-ONE	-	D	yes
φ	[vphi, unoun]	N	no
ind	-	-	no
n	[vnoun]	(√)	no
a	-	(√)	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.16: Heads and their potential specifications for a simplified fragment of ASL.

10.3.4 LSB.

LSB is similar to ASL in many respects. As with ASL, we can view it as being head-initial, and having a T that bears [uphi] rather than [uphi^]. Furthermore, *wh*-phrases may once again appear *in-situ* (28a), initially (28b), or in some cases finally (28c):

(28) a. _____ whq
INDEX$_{DET}$ JOHN LIKE WHO
'Who does John like?'

b. _____ whq
WHO INDEX$_{DET}$ JOHN LIKE
'Who does John like?

c. _____ whq
LIKE MARY WHO
'Who likes Mary?'

(LSB, (a-b) repeated from (ch.6:47); (c) from (ch.6:fn.7))

These structures can therefore be assigned the same simplified analyses as in ASL:

Head	**Features**	**C-selects**	**Invisible?**
C_{wh}	-	Q_{medial}, $Q_{initial}$, Q_{final2}	no
Q_{medial}	-	T	no
$Q_{initial}$	[uwhq^]	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
D_{wh}	[vwhq]	C_{rel}, φ	no

Table 10.17: Heads required for LSB wh-*interrogatives.*

10.3.4.1 LSB simple focus.

As noted in 6.2.2, simple focus is realised exactly as in ASL:

(29) a. A: WHAT YOU READ?
'What did you read?'

B: _____ I-focus
[BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'I read *Stokoe's book*.'

b. A: INDEX$_2$ READ CHOMSKY BOOK?
'Did you read Chomsky's book?'

B: _____ C-focus
NO, [BOOK STOKOE]$_{Foc}$ INDEX$_1$ READ
'No, I read *Stokoe's book*.'

(ASL/LSB, (a) partially repeated from (ch.6:23a); (b) repeated from (ch.6:24))

As a result, I assign it the same analysis:

Head	Features	C-selects	Invisible?
C_{mat}	-	Foc_{phon}, T	no
Foc_{phon}	[ufoc^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
Foc_{feat}	[vfoc]	all heads	yes

Table 10.18: Heads required for LSB simple focus.

10.3.4.2 LSB DP exclusive focus.

Lira & de Souza (2008) give several examples involving NP exclusives, each of which involves a prenominal particle given the Portuguese gloss of either *SÓ* or *SOMENTE*, as in the following cases:

(30) a. PESSOA TRABALHAR HOSPITAL **SOMENTE** [ROUPA BRANC@]$_{Foc}$
person work hospital **only** clothes white
'As pessoas que trabalham no hospital usam somente roupa branca.'
'(The) people who work at the hospital wear only white clothes.'

b. EU INTERPRETAR LIBRAS **SÓ** [SURD@]$_{Foc}$ ENTENDER
I interpret LSB **only** deaf understand
'Eu interpretei em LIBRAS e somente os surdos entenderam.'
'I interpreted in LSB and only the deaf understood.'

(LSB, Lira & de Souza 2008, entries for *SOMENTE* and *INTERPRETAR*, English trans. Michelle Sheehan (p.c.))

However, while these are two different particles in Portuguese, they are realised identically in LSB, as the entries for *SÓ* and *SOMENTE* show. As a result, I model LSB DP exclusives with the single head SÓ, which as in the other varieties c-selects D, and is invisible:

Head	Features	C-selects	Invisible?
SÓ	-	D	yes
Foc_{feat}	[vfoc]	all heads	yes

Table 10.19: Heads required for LSB DP exclusive focus.

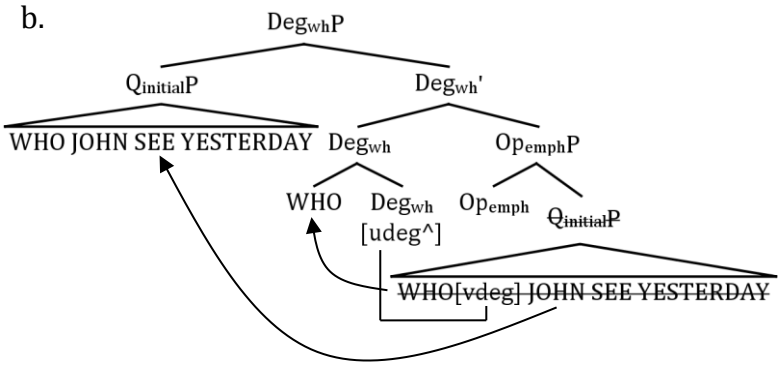
10.3.4.3 LSB focus doubling.

Focus doubling in LSB was given a similar analysis to ASL in 7.4, though some differences between the varieties were accounted for. Firstly, unlike in ASL, *wh*-

doubling may be constructed not only with $Q_{initial}$Ps (31a-b), but also with Q_{medial}Ps (32a-b):

(31) a. _____ whq ____ whq
[WHO]$_{Foc}$ JOHN SEE YESTERDAY [*WHO*]$_{Foc}$
'Who exactly did John see yesterday?'

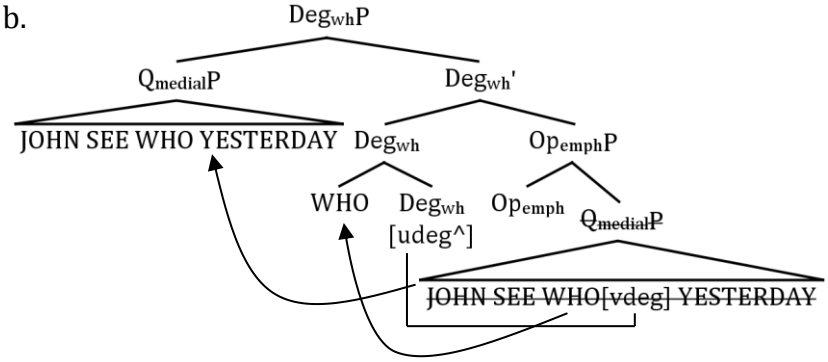
b.



(LSB, (a) repeated from (ch.6:45), (b) adapted from (ch.7:39) – identical to the ASL derivation in (25))

(32) a. _____ wh ____ wh
JOHN SEE [WHO]$_{Foc}$ YESTERDAY [*WHO*]$_{Foc}$
'Who exactly did John see yesterday?'

b.



(LSB, (a) adapted from (ch.6:43a); (b) from (ch.7:40) – ungrammatical in ASL)

As discussed in 7.4, this can be accounted for straightforwardly by supposing that Deg_{wh} may c-select both $Q_{initial}$P and Q_{medial}P through Op_{emph}, rather than only $Q_{initial}$P.

Somewhat more surprising is the grammaticality of non-*wh*-doubling with medial interrogatives (33a), but not with initial interrogatives (33b):

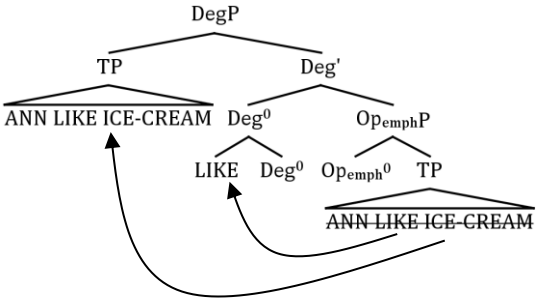
(33) a. focus
JOHN [WILL]$_{Foc}$ BUY BOOK WHEN [*WILL*]$_{Foc}$
'When *will* John really buy the book?'

b. whq
* WHEN JOHN [WILL]$_{Foc}$ BUY BOOK [*WILL*]$_{Foc}$
'When in fact *will* John really buy the book?'

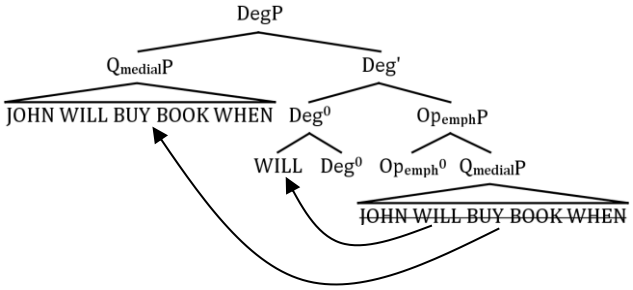
(LSB, repeated from (ch.6:19))

As a result, in this variety some interrogative structures must be c-selected through Op_{emph} by Deg as well as Deg_{wh}. In particular, this was accounted for in 7.4 by supposing that Deg could select not only T (34a), but also Q_{medial} (34b), though not $Q_{initial}$ (34c):

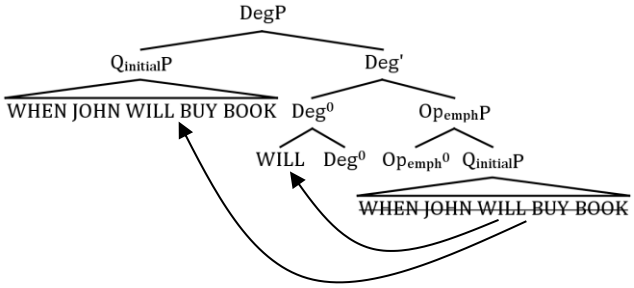
(34) a. Deg c-selects TP:



b. Deg c-selects $Q_{medial}P$:



c. * Deg c-selects $Q_{initial}P$



(LSB, repeated from (ch.7:42))

The properties of these heads were therefore summarised as follows:

Head	**Features**	**C-selects**	**Invisible?**
Deg	[udeg^, ufoc^]	Q_{medial}, T	no
Deg_{wh}	[udeg^]	$Q_{initial}$, Q_{medial}	no
Op_{emph}	-	$Q_{initial}$, Q_{medial}, T	yes

Table 10.20: Specification of heads involved in LSB focus doubling – adapted from table 7.1.

Moreover, we can readily add to this specification with the c-selectional properties of matrix complementisers. As in ASL, C_{mat} may only accommodate non-wh-doubling, and so c-selects Deg and not Deg_{wh}, whereas unlike in ASL, C_{wh} may c-select Deg as well as Deg_{wh}.

As we saw in 6.2.1, LSB doubling also differs from its ASL equivalent in the behaviour of subordinate clauses and relatives. While in ASL, doubling is restricted to once per sentence, Quadros (1999:227-228) observes that it may occur once per clause; thus all of (35a-c) are grammatical:

(35) a. _____ hn
INDEX$_1$ [WOULD-LIKE]$_{Foc}$ PAY HOUSE [*WOULD-LIKE*]$_{Foc}$

b. _____ hn
INDEX$_1$ WOULD-LIKE [PAY]$_{Foc}$ HOUSE [*PAY*]$_{Foc}$

c. _____ hn
INDEX$_1$ [WOULD-LIKE]$_{Foc}$ [PAY]$_{Foc}$ HOUSE [*PAY*]$_{Foc}$ [*WOULD-LIKE*]$_{Foc}$
'I would like to pay for the house.'

(LSB, repeated from (ch.6:20))

It therefore appears that in (35c) the doubling of *WOULD-LIKE* occurs within the matrix clause, whereas that of *PAY* occurs in a subordinate clause. Similarly, (35b) can be said to involve only a single instance of doubling, within a subordinate clause. As a result, I suppose that Deg can also be c-selected by C_{sub} in LSB.

Finally, doubling may also occur within a relative clause, as in (35b):

(36) a. _____r
GIRL BICYCLE FALL IS HOSPITAL

b. _____r
GIRL [BICYCLE]$_{Foc}$ FALL [BICYCLE]$_{Foc}$ IS HOSPITAL
'The girl that fell off the bicycle is in the hospital.'

(LSB, adapted from Quadros 1999:221-222)

It therefore appears that C_{rel} is also able to c-select Deg,[5] and with this observation I conclude the discussion of LSB doubling with the following summary:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Deg, Foc_{phon}, T	no
C_{wh}	-	Deg, Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	no
C_{sub}	-	Deg, T	no
C_{rel}	-	Deg, T	no
Deg	[udeg^, ufoc^]	Q_{medial}, T	no
Deg_{wh}	[udeg^]	$Q_{initial}$, Q_{medial}	no
Op_{emph}	-	$Q_{initial}$, Q_{medial}, T	yes
$Q_{initial}$	[uwhq^]	T	no
Q_{medial}	-	T	no
T	[vt, uphi]	V, Cop_{adj}	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.21: Heads required for LSB focus doubling.

[5] The careful reader may observe that in some cases the fronting of the relative head to Spec,C_{rel}P may result in the incorrect word order. It is therefore possible that this head either does not (always) front, or fronts to a position below Op_{emph}, and so enters into the doubling construction along with the rest of the clause. Though such considerations are beyond the scope of this work, it is likely that careful examination of the behaviour of LSB relatives, especially object relatives, would be necessary to resolve these questions. See also footnote 6 below for similar difficulties involving BSL_1 relatives.

10.3.4.4 LSB: Summary.

Combining the results of this discussion yields the following specification for LSB:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Deg, Foc_{phon}, T	no
C_{wh}	-	Deg, Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	no
C_{sub}	-	Deg, T	no
C_{rel}	-	Deg, T	no
Deg	[udeg^, ufoc^]	Q_{medial}, T	no
Deg_{wh}	[udeg^]	$Q_{initial}$, Q_{medial}	no
Op_{emph}	-	$Q_{initial}$, Q_{medial}, T	yes
Foc_{phon}	[ufoc^]	T	no
$Q_{initial}$	[uwhq^]	T	no
Q_{medial}	-	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
v	-	(√), C_{sub}, D, D_{wh}	no
Cop_{adj}	-	A	no
D	-	C_{rel}, φ	no
D_{wh}	[vwhq]	C_{rel}, φ	no
SÓ	-	D	yes
φ	[vphi, unoun]	N	no
ind	-	-	no
n	[vnoun]	(√)	no
a	-	(√)	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.22: Heads and their potential specifications for a simplified fragment of LSB.

10.3.5 BSL_2.

As argued in 6.3, the SVO word order of BSL_1 and BSL_2 makes them amenable to analyses comparable to those of ASL and LSB. In particular, therefore, I take both varieties to be largely head-initial. Furthermore, in 6.5 it was additionally noted that both varieties allow final (37) and medial (38) *wh*-structures, with initial structures appearing to be ungrammatical (39):

(37) a. PROFESSOR LECTURE WHEN
'When does the professor lecture?'

b. GIRL BEEN EAT WHAT
'What did the girl eat?'

((a) BSL_1, repeated from (ch.6:100c); (b) BSL_2, partially repeated from (ch.6:70a))

(38) a. WHO GO WITH
'Who will she go with?'

b. MEET WHO VICTORIA
'Who did Victoria meet?'

((a) BSL_1 repeated from (ch.6:101a); (b) BSL_2, partially repeated from (ch.6:70b))

(39) a. * WHEN PROFESSOR LECTURE
'When does the professor lecture?'

b. * WHAT GIRL (BEEN) EAT
'What did the girl eat?'

((a) BSL_1 repeated from (ch.6:100a); (b) BSL_2, from (ch.6:102c))

The examples in (36) are the least marked, and can be analysed similarly to Q_{final} constructions in ASL and LSB, only involving heads that do not contribute the same exhaustive interpretation. The medial cases in (37) are more complex, since they are more semantically marked and appear to involve some degree of syntactic reorganisation. However, as noted in 6.3, certain monoclausal sentences in BSL exhibit a number of unexpected movements, apparently dependent on the semantics of the verbs involved:

(40) a. FOOD PACK
O V

b. MAKE CAKE
V O

(BSL_1, repeated from (ch.6:88))

It is unclear to what extent the reorderings in (38) are a result of such processes rather than a property of the *wh*-construction itself. For this reason, I suppose for simplicity that $BSL_{1\text{-}2}$ medial questions simply result from c-selection of a TP by a (semantically complex) Q_{medial} head. Notwithstanding, further research is clearly

needed into the behaviour of both these constructions and of movements in simple clauses more generally.

Summarising, this simplified account of the *wh*-interrogative systems of BSL_1 and BSL_2 requires the following heads:

Head	Features	C-selects	Invisible?
C_{wh}	-	Q_{medial}, Q_{final2}	no
Q_{medial}	-	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
D_{wh}	[vwhq]	C_{rel}, φ	no

Table 10.23: Heads required for BSL_1 and BSL_2 wh-*interrogatives.*

This system therefore appears syntactically comparable to ASL and LSB, albeit lacking $Q_{initial}$. However, as noted above, differences in markedness suggest that these elements may have rather different denotations in $BSL_{1\text{-}2}$. Finally, it is also stated in table 10.23 that T bears [uphi] rather than [uphi^], since as in Nepali, ASL, and LSB, there is no clear evidence for movement of the subject to Spec,TP.

10.3.5.1 BSL_2 simple focus.

BSL_2 RQ constructions such as (41) were considered in some detail in 6.4, where it was argued that they are an instance of a simple focus construction on the basis of a number of semantic tests.

(41) A: GIRL BEEN EAT WHAT?
B: BEEN EAT WHAT [CAKE]$_{Foc}$
'(She) ate *cake*.'

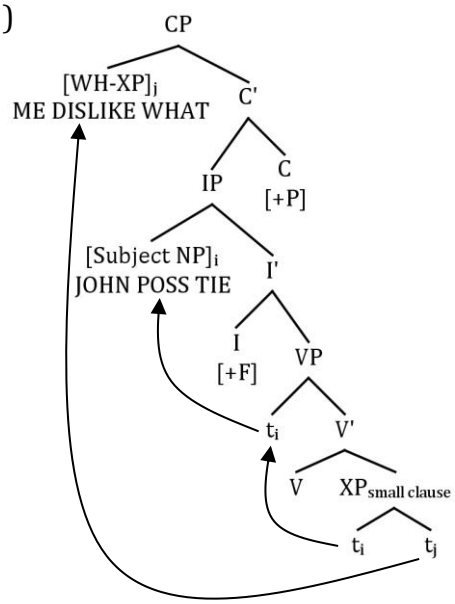
(BSL_2, partially repeated from (ch.6:70a))

These appear structurally comparable to the "rhetorical question" constructions of ASL, discussed in 6.2.2, but are significantly less marked, exhibiting none of the exhaustivity discussed by Petronio (1991) and Caponigro & Davidson (2011) for ASL. As noted above, a wide range of analyses have been suggested for these constructions in ASL, ranging from pseudoclefts (Petronio 1991, Wilbur 1994a,

1996, Grolla 2004) to discourse-level question-answer pairs (Hoza et al. 1997), to copular clauses combining interrogative and declarative clauses (Caponigro & Davidson 2011).

Given the semantic and probable syntactic differences, it is likely that BSL_2 RQs cannot be analysed exactly as their ASL equivalents, and so their precise structure must be left to further research. However, for concreteness, it is necessary to make use of a tentative analysis here, and so I adapt the approach of Wilbur (1996) for ASL, shown below:

(42)

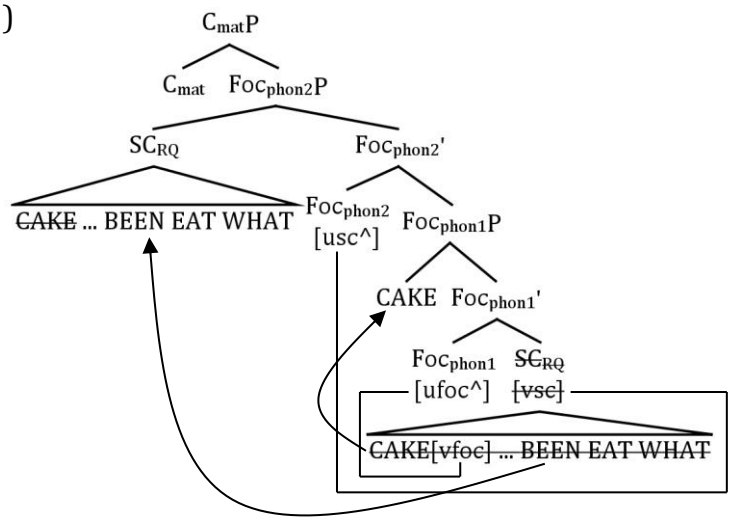


(ASL, Wilbur 1996:247 via Sandler & Lillo-Martin 2006:429)

Both the "question" and the "answer" of the RQ are initially introduced as the respective predicate and subject of a small clause. The "answer" is then fronted to Spec,IP, which is taken to be a focus position, and this is followed by fronting of the "question" to Spec,CP, yielding the correct word order. Many aspects of this analysis cannot be maintained – for instance, in the current framework it is unclear why foci should front to Spec,IP in particular, and the head-final C is an assumption of some early approaches to *wh*-final and *wh*-doubling constructions (e.g. Petronio 1993, Petronio & Lillo-Martin 1997, Neidle et al. 2000). Furthermore, since this construction is an instance of simple focus in BSL_2, we should expect it to be derived using phonologically-motivated Foc_{phon} heads.

I nevertheless retain the core of Wilbur's (1996) analysis by supposing that the "question" and the "answer" of the RQ originate in a small clause, and then taking this small clause to be selected by a Foc_{phon} head. By making use of two such heads, the lower can agree with the focused phrase, triggering focus fronting, whereas the higher can agree with and front the remnant small clause. This therefore leads to the following picture of BSL_2 RQ focus:

(43)



(BSL_2)

For reasons of simplicity, I do not delve into the structure of the small clause itself, but it seems likely that it contains a subject DP and a predicate $Q_{final2}P$. Leaving aside this internal analysis, the BSL_2 RQ construction requires the following heads:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Foc_{phon2}, T	no
Foc_{phon2}	[usc^]	Foc_{phon1}	no
Foc_{phon1}	[ufoc^]	SC_{RQ}	no
SC_{RQ}	[vsc]	-	no
Foc_{feat}	[vfoc]	all heads	yes

Table 10.24: Heads required for BSL_2 simple focus.

10.3.5.2 BSL_2 DP exclusive focus.

BSL_2 DP exclusive focus was considered briefly in 6.3, and is encoded by the particle *THAT'S-IT*, which usually occurs postnominally:

(44) a. JOHN BEEN EAT WHAT [APPLE]$_{Foc}$ **THAT'S-IT**
'Only *John* ate an apple.'

b. JOHN [APPLE]$_{Foc}$ THAT'S-IT MARY [PEAR]$_{Foc}$ **THAT'S-IT**
'John only ate *an apple*, and Mary only ate *a pear*.'

(BSL$_2$, repeated from (ch.6:68a-b))

While this particle can appear doubled in some cases, it is likely that this results from some combination of exclusive marking with doubling, as discussed in 7.3.5:

(45) JOHN **THAT'S-IT** [APPLE]$_{Foc}$ **THAT'S-IT**
'John only ate *an apple*.'

(BSL$_2$, repeated from (ch.6:68c))

As a result, I suppose that BSL$_2$ DP exclusive focus is marked with a particle c-selecting D, as in the other varieties we have considered. However, unlike English, ASL, and LSB, this particle appears to be head-final. I therefore summarise the heads involved in this construction as follows:

Head	**Features**	**C-selects**	**Invisible?**
THAT'S-IT	[vfin]	D	yes
Foc$_{feat}$	[vfoc]	all heads	yes

Table 10.25: Heads required for BSL$_2$ DP exclusive focus.

10.3.5.3 BSL$_2$ wh-*doubling.*

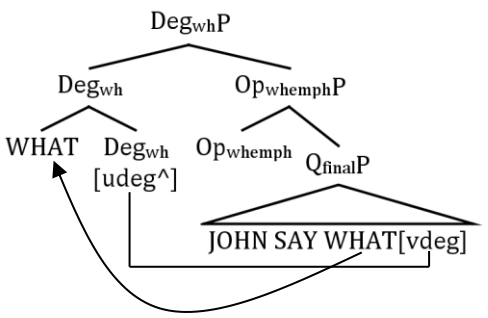
In 6.3, it was argued that doubling in BSL$_2$ is largely limited to *wh*-doubling in direct questions, such as the following:

(46) [WHAT]$_{Foc}$ JOHN SAY [*WHAT*]$_{Foc}$
'*What* did John say?'

(BSL$_2$, repeated from (ch.6:67b))

This was given the following analysis in 7.3.5:

(47)



(BSL$_2$, adapted from (ch.7:31))

As noted in 9.4.5.1, this purely degree-based analysis means that BSL$_2$ *wh*-doubling is not strictly a focus construction, but it is included here for contrast with the "true" focus doubling exhibited by other sign language varieties. Since the structure appears to be characterised by *wh*-phrases that "bracket" the sentence, we can suppose that Op_{whemph} c-selects only $Q_{final2}P$. Furthermore, if we take Op_{whemph} to be invisible by analogy with Op_{emph}, then Deg_{wh} must also c-select only $Q_{final2}P$. Conseqeuntly, BSL$_2$ doubling was summarised in 7.5 as having the following properties:

Head	**Features**	**C-selects**	**Invisible?**
Deg_{wh}	[udeg^]	Q_{final}	no
Op_{whemph}	-	Q_{final}	yes

Table 10.26: Specification of heads involved in LSB focus doubling – adapted from table 7.1.

Furthermore, since the structure in (47) appears to be confined to matrix *wh*-questions, I also assume that Deg_{wh} is only c-selected by C_{wh}. This provides a complete specification for *wh*-doubling in BSL$_2$:

Head	**Features**	**C-selects**	**Invisible?**
C_{wh}	-	Deg_{wh}, Q_{medial}, Q_{final2}	no
Deg_{wh}	[udeg^]	Q_{final2}	no
Op_{whemph}	-	Q_{final2}	yes
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
Deg_{feat}	[vdeg]	all heads	yes

Table 10.27: Heads required for BSL$_2$ wh-*doubling.*

10.3.5.4 BSL_2: Summary.

Combining the heads from the above discussion yields the following specification for BSL_2:

Head	Features	C-selects	Invisible?
C_{mat}	-	Foc_{phon2}, T	no
C_{wh}	-	Deg_{wh}, Q_{medial}, Q_{final2}	no
C_{sub}	-	T	no
C_{rel}	-	T	no
Deg_{wh}	[udeg^]	Q_{final2}	no
Op_{whemph}	-	Q_{final2}	yes
Foc_{phon2}	[usc^]	Foc_{phon1}	no
Foc_{phon1}	[ufoc^]	SC_{RQ}	no
Q_{medial}	-	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
SC_{RQ}	[vsc]	-	no
v	-	(√), C_{sub}, D, D_{wh}	no
Cop_{adj}	-	A	no
D	-	C_{rel}, φ	no
D_{wh}	[vwhq]	C_{rel}, φ	no
THAT'S-IT	[vfin]	D	yes
φ	[vphi, unoun]	N	no
INDEX	-	-	no
n	[vnoun]	(√)	no
a	-	(√)	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.28: Heads and their potential specifications for a simplified fragment of BSL_2.

10.3.6 BSL_1.

Since it is presumably a fairly closely related variety, it is unsurprising that in many respects BSL_1 is similar to BSL_2. In particular, as discussed in 10.3.5, it also allows both medial and final *wh*-questions, and in addition I once again suppose that T bears [uphi] rather than [uphi^]. As a result, these aspects of the language are specified exactly as in BSL_2:

Head	Features	C-selects	Invisible?
C_{wh}	-	Q_{medial}, Q_{final2}	no
Q_{medial}	-	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
D_{wh}	[vwhq]	C_{rel}, φ	no

Table 10.29: Heads required for BSL₁ and BSL₂ wh-*interrogatives (repeated from table 10.23).*

10.3.6.1 BSL₁ simple focus.

BSL_1, like BSL_2, exhibits a form of RQ focus, discussed in 6.4:

(48) START WHEN [FOURTEEN YEARS-AGO]$_{Foc}$
'When it started was fourteen years ago.'

(BSL_1, repeated from (ch.6:69b))

However, it is not clear whether these constructions represent simple focus (as in BSL_2), or are a more marked construction (as in ASL). Consequently, it would be necessary to apply a wide range of semantic tests to BSL_1 to accurately determine its simple focus construction. One point against viewing BSL_1 RQ as simple focus is Sutton-Spence & Woll's (1999:70-71) reference to Wilbur's (1994a, 1996) analyses of ASL, and their consequent glossing of RQ constructions using clefts. However, it is entirely possible that, like BSL_2, BSL_1 RQ is semantically different to its ASL equivalent. Moreover, RQ constructions appear to be widely used, and it is not obvious there exists any simpler construction such as focus fronting. As a result, for current purposes I suppose that RQ is also used for simple focus in BSL_1, analysed as in BSL_2:

Head	Features	C-selects	Invisible?
C_{mat}	-	Foc_{phon2}, T	no
Foc_{phon2}	[usc^]	Foc_{phon1}	no
Foc_{phon1}	[ufoc^]	SC_{RQ}	no
SC_{RQ}	[vsc]	-	no
Foc_{feat}	[vfoc]	all heads	yes

Table 10.30: Heads required for BSL₁ simple focus.

10.3.6.2 BSL_1 DP exclusive focus.

As discussed in footnote 14 of Chapter 6 there appear to be a number of BSL signs equivalent to English *only*, suggesting wide dialectal variation, but also making it highly likely that BSL_1 uses a particle for DP exclusive focus. In the absence of examples of its use, I suppose that as in BSL_2, this particle is head-final and c-selects D:

Head	**Features**	**C-selects**	**Invisible?**
ONLY	[vfin]	D	yes
Foc_{feat}	[vfoc]	all heads	yes

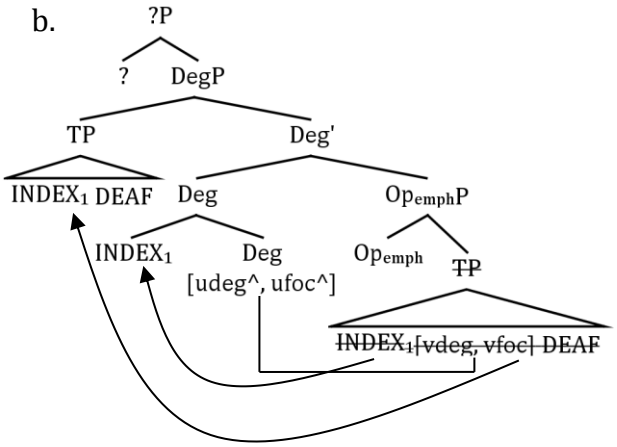
Table 10.31: Heads required for BSL_1 DP exclusive focus.

10.3.6.3 BSL_1 doubling.

In 7.3, BSL_1 focus doubling was divided into three types, with each being given a different analysis: non-adjectival/non-*wh*-doubling (49), adjectival doubling (50), and *wh*-doubling (51):

(49) a. $[INDEX_1]_{Foc}$ DEAF $[INDEX_1]_{Foc}$
'I'm deaf, I am.'

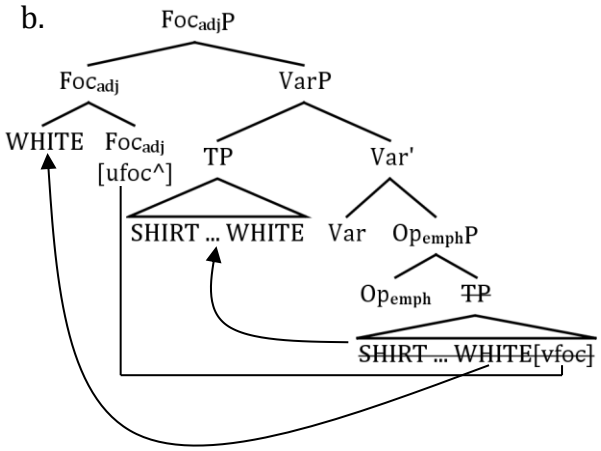
b.



(BSL_1, (a) repeated from (ch.6:58b); (b) adapted from (ch.7:20))

(50) a. [WHITE]$_{Foc}$ SHIRT [WHITE]$_{Foc}$
'White shirt.'

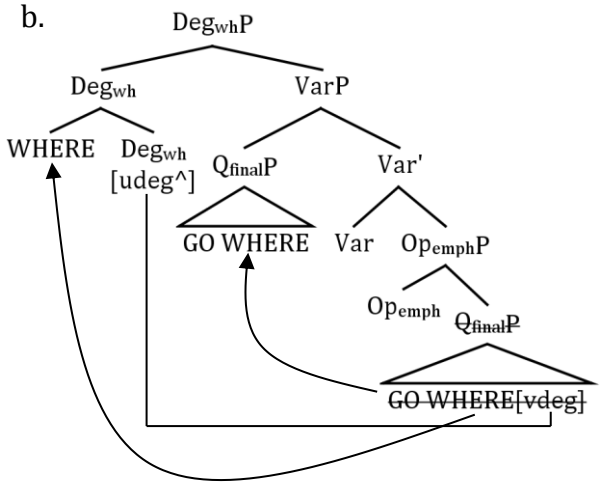
b.



(BSL$_1$, (a) repeated from (ch.6:60); (b) adapted from (ch.7:18))

(51) a. [WHERE]$_{Foc}$ GO [WHERE]$_{Foc}$
'Where is she going?'

b.



(BSL$_1$, (a) repeated from (ch.6:97c); (b) adapted from (ch.7:23))

As discussed in some detail in 7.3, the fronting of TP/Q$_{final}$P is semantically motivated by Op$_{emph}$, as in ASL and LSB. However, unlike in these varieties, this fronting can occur both before and after the incorporation of the doubled element, depending on the syntactic and semantic properties of this element. The majority of doubled elements incorporate into Deg, which c-selects Op$_{emph}$, and so incorporation precedes fronting of TP (49). However, adjectives and *wh*-elements incorporate into Foc$_{adj}$ and Deg$_{wh}$ respectively, both of which c-select Var, which

leads to incorporation occurring after fronting of TP/Q_{final}P (50-51). One consequence of this analysis is that at the end of the derivation in (50), a "wildcard" head with any semantic properties must be combined with DegP to satisfy the semantic requirements of Op_{emph}. As in 7.3.2, I term this head '?,' and suppose that it is invisible to c-selection; since it does not contribute any semantic properties of its own to the derivation, '?' could be a wide range of heads, with one possibility being a defective C. Finally, as with BSL_2, *wh*-doubling always appears to "bracket" the entire sentence, and so it appears that only Q_{final}Ps may enter into *wh*-doubling constructions.

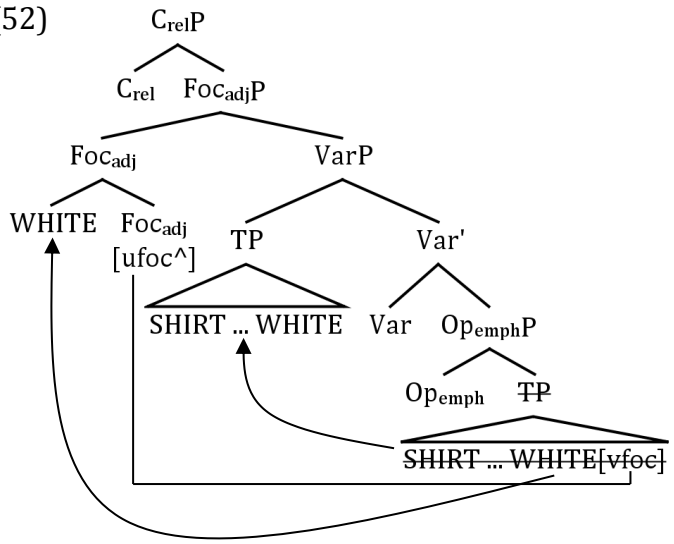
The properties of the heads involved in these constructions were therefore summarised in 7.5 as follows:

Head	**Features**	**C-selects**	**Invisible?**
?	-	Deg	yes
Deg	[udeg^, ufoc^]	T	no
Deg_{wh}	[udeg^]	Var	no
Foc_{adj}	[ufoc^]	Var	no
Var	-	Q_{final}, T	no
Op_{emph}	-	Q_{final}, T	yes

Table 10.32: Specification of heads involved in BSL_1 focus doubling – adapted from table 7.1.

As with ASL and LSB, these specifications can be extended to allow for the specification of doubling in our fragment of BSL_1. I again suppose that the non-adjectival/non-*wh*-doubling structure in (49) is c-selected by C_{mat}, and unlike LSB, there does not seem to be any evidence of doubling in subordinate clauses (aside from relatives, which are discussed below), and so C_{sub} c-selects only T. Moreover, all examples of doubling in interrogatives are cases of *wh*-doubling, and so, like ASL, I suppose that C_{wh} c-selects Deg_{wh}, but not Deg. This leaves relative clauses, which, as discussed in 6.5, appear to be the domain of adjectival doubling, and so C_{rel} must be able to c-select Foc_{adj} as follows:

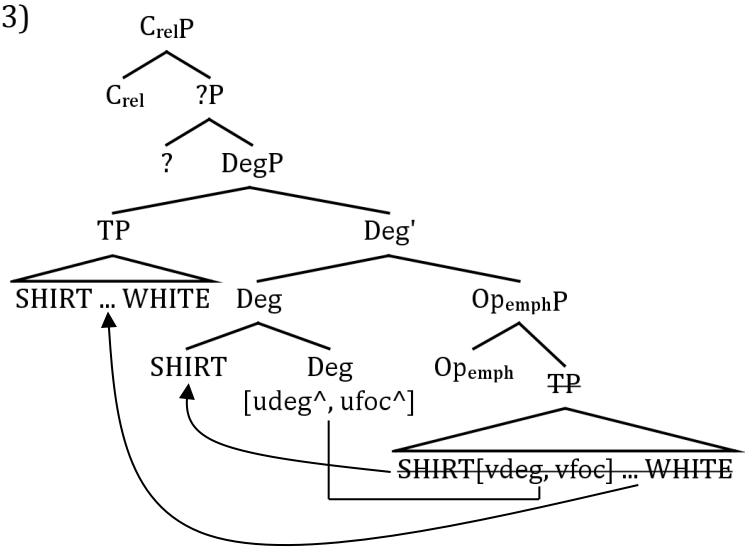
(52)



(BSL$_1$, extended structure of (50b))

However, this is not the only kind of doubling that may occur in adjectival relatives: as shown in 6.5, non-adjectival doubling may also occur. Such cases can be assigned the structure in (53),[6] which forms a minimal pair with (52). As a result, C_{rel} must c-select Deg as well as Foc_{adj}.

(53)



(BSL$_1$, analysis of (ch.6:111b))

[6] As with LSB (see footnote 5 above), it is unclear whether the relative head fronts in this case, and if it does, it is likely to a position below Op_{emph}.

These specifications can be summarised as follows:[7]

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Deg, Foc_{phon2}, T	no
C_{wh}	-	Deg_{wh}, Q_{medial}, Q_{final2}	no
C_{rel}	-	Deg, Foc_{adj}, T	no
?	-	Deg	yes
Deg	[udeg^, ufoc^]	T	no
Deg_{wh}	[udeg^]	Var	no
Foc_{adj}	[ufoc^]	Var	no
Var	-	Q_{final2}, T	no
Op_{emph}	-	Q_{final2}, T	yes
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.33: Heads required for BSL_1 focus doubling.

[7] One difficulty with these specifications is that the ability of Var and Op_{emph} to c-select both Q_{final2} and T leaves open the possibility of Q_{final2} occurring in non-*wh*-doubling constructions, and a bare T without Q_{final2} occurring in *wh*-doubling constructions. While it is possible that the sentences these structures correspond to may be grammatical, it seems unlikely. For this reason, I suppose that the clause type prevents such structures from emerging, with Q_{final2} (or Q_{medial}) being required in interrogative clauses, and incompatible with declarative clauses.

10.3.6.4 BSL_1: Summary.

Combining the results of this discussion leads to the below specification for BSL_1:

Head	**Features**	**C-selects**	**Invisible?**
C_{mat}	-	Deg, Foc_{phon2}, T	no
C_{wh}	-	Deg_{wh}, Q_{medial}, Q_{final2}	no
C_{sub}	-	T	no
C_{rel}	-	Deg, Foc_{adj}, T	no
?	-	Deg	yes
Deg	[udeg^, ufoc^]	T	no
Deg_{wh}	[udeg^]	Var	no
Foc_{adj}	[ufoc^]	Var	no
Var	-	Q_{final2}, T	no
Op_{emph}	-	Q_{final2}, T	yes
Foc_{phon2}	[usc^]	Foc_{phon1}	no
Foc_{phon1}	[ufoc^]	SC_{RQ}	no
Q_{medial}	-	T	no
Q_{final2}	[ut^]	Q_{final1}	no
Q_{final1}	[uwhq^]	T	no
T	[vt, uphi]	V, Cop_{adj}	no
SC_{RQ}	[vsc]	-	no
v	-	(√), C_{sub}, D, D_{wh}	no
Cop_{adj}	-	A	no
D	-	C_{rel}, φ	no
Dwh	[vwhq]	C_{rel}, φ	no
ONLY	[vfin]	D	yes
φ	[vphi, unoun]	N	no
ind	-	-	no
n	[vnoun]	(√)	no
a	-	(√)	no
Foc_{feat}	[vfoc]	all heads	yes
Deg_{feat}	[vdeg]	all heads	yes

Table 10.34: Heads and their potential specifications for a simplified fragment of BSL_1.

10.4 Determining an input for each variety.

Having determined a specified set of heads corresponding to each simplified variety, we are now in a position to construct an input for each case, demonstrating how that variety might be acquired by the algorithm in chapter 1. For some of the varieties, this input is a relatively straightforward extension of the general one given in 10.2, but in others the wider range of heads involved requires more detailed considerations. For this reason, I first construct an input for English (10.4.1) and Nepali (10.4.2), before turning to the four sign language varieties in 10.4.3, arriving at an input for each through comparison.

10.4.1 English.

The specification of English is very similar to the background grammar defined in 10.2, as only two new heads are added to the system: Op_{CR} and *only*. As a result, much of this input can be retained, with almost all of the following necessary categories already being defined by the system:

Category	**Shared Behaviour**	**Categorial Features**
v, Cop_{adj}	c-selected by T	+V
C_{sub}, D, D_{wh}	c-selected by V	+ARG
C_{rel}, φ	c-selected by D, D_{wh}	+NOM
φ, n	c-selected by Op_{CR}	?
C_{mat}, C_{wh}, C_{sub}, C_{rel}	c-select T	+COMP
D, D_{wh}	c-select C_{rel}, φ	+N, +ARG
v, n, a	categorise roots	+CAT
only, Op_{CR}, Foc_{feat}	invisible	+INVIS

Table 10.35: Shared behaviour of heads in English.

However, one category that is not defined by the system consists of φ and n. For this reason, I assign both of these heads the property 'low,' since they are low in the nominal projection. Moreover, the members of the +INVIS category must be distinguished from one another, and so I suppose *only* has the property 'excl(usive),' and Foc_{feat} the property 'feat(ure-assigner).' Finally, unless there is good reason to suppose otherwise (and we shall see some such cases below), I assume that language specific properties are acquired later than more general

ones, and so I place these new properties late in the prominence order. This leads to the following input for English:

(54) {<C_{mat}, {comp, {T}}>,
<C_{wh}, {comp, int, <whq, m>, {T}}>,
<C_{rel}, {n, comp, nom, {T}}>,
<C_{sub}, {comp, arg, {T}}>,
<T, {<phi, m>, {V, Cop_{adj}}}>,
<V, {v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {v, {A}}>,
<D, {n, arg, {C_{rel}, φ}}>,
<D_{wh}, {n, arg, wh, whq, {C_{rel}, φ}}>,
<only, {invis, excl, {D}}>,
<Op_{CR}, {invis, {φ, N}}>,
<φ, {n, nom, phi, low, {noun}, {N}}>,
<ind, {n}>,
<N, {n, cat, noun, low}>,
<A, {cat}>,
<Foc_{feat}, {invis, foc, feat, {h|head(h)}}>}
<n, v, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, excl, feat, foc, low>

Applying the algorithm of chapter 2 to this input results in the following specification of heads via the creation of 67 categories, which corresponds to table 10.6 above:

(55)

C_{mat}	[-N,-V,-CAT,+COMP,-ARG,-INT]	(-N,-V,-CAT,-COMP,-INVIS)	
C_{wh}	[-N,-V,-CAT,+COMP,-ARG,+INT]	(-N,-V,-CAT,-COMP,-INVIS)	[uwhq^]
C_{rel}	[+N,-CAT,+COMP,-ARG,+NOM,-LOW]	(-N,-V,-CAT,-COMP,-INVIS)	
C_{sub}	[-N,-V,-CAT,+COMP,+ARG]	(-N,-V,-CAT,-COMP,-INVIS)	
T	[-N,-V,-CAT,-COMP,-ARG,-INVIS]	(-N,+V)	[uphi^]
V	[-N,+V,+CAT]	(-CAT,+ARG)	
Cop_{adj}	[-N,+V,-CAT,-COMP,-ARG]	(-N,-V,+CAT)	
D	[+N,-CAT,-COMP,+ARG,-WH,-LOW]	(+N,-CAT,-ARG,+NOM)	
D_{wh}	[+N,-CAT,-COMP,+ARG,+WH,-LOW]	(+N,-CAT,-ARG,+NOM)	[vwhq]
only	[-N,-V,-CAT,-COMP,-ARG,+INVIS,+EXCL]	(+N,-CAT,-COMP,+ARG,-WH)	
Op_{CR}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT]	(+N,+LOW)	
φ	[+N,-CAT,-COMP,-ARG,+NOM,+LOW]	(+N,+CAT)	[vphi,unoun]
ind	[+N,-CAT,-COMP,-ARG,-NOM,-LOW]		
N	[+N,+CAT,+LOW]		[vnoun]
A	[-N,-V,+CAT]		
Foc_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT]	()	[vfoc]

10.4.2 Nepali.

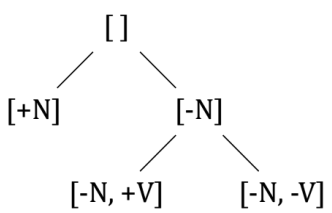
As with English, Nepali differs from the background grammar in 10.2 only in a small number of heads: in this case, Op_{NAI}, *mātrai*, and Deg_{feat}. As before, most necessary categories can already be defined:

Category	**Shared Behaviour**	**Categorial Features**
all heads but V	c-selected by Op_{NAI}	?
v, Cop_{adj}	c-selected by T	+V
C_{sub}, D, D_{wh}	c-selected by V	+ARG
C_{rel}, φ	c-selected by D, D_{wh}	+NOM
C_{mat}, C_{wh}, C_{sub}, C_{rel}	c-select T	+COMP
D, D_{wh}	c-select C_{rel}, φ	+N, +ARG
v, n, a	categorise roots	+CAT
Op_{NAI}, matrai, Foc_{feat}, Deg_{feat}	invisible	+INVIS

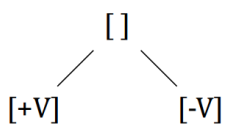
Table 10.36: Shared behaviour of heads in Nepali.

The clear exception here is "all heads but V," which is the category c-selected by Op_{NAI}. It is not unreasonable to assume that V here extends also to Cop_{adj}, and so it might seem that the category of heads that Op_{NAI} c-selects could be specified as [-V]. However, if the input was kept as in English and the background grammar, then the [±V] distinction would be dependent on [-N], meaning only [-N, -V] could be referred to, and not simply [-V]. This point is made by the below Hasse diagrams:

(56) a.



b.



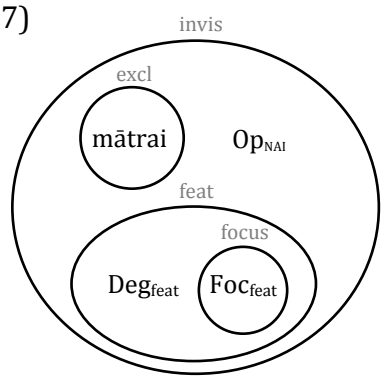
As a result, 'v' must be ordered before 'n' in the prominence order for Nepali.

There are two more considerations to take into account. The first is that unlike English, Nepali is consistently head-final, and so every head bears the feature [vfin], and so consequently each head in the input must have the 'fin(al)' property. Since this property is assigned to the category of all heads, it can appear at any point in the prominence order. However, as head-finality is likely a very prominent

aspect of Nepali, I suppose this feature is the first property considered, meaning that it is determined before any subcategories are identified.

Secondly, some more properties are necessary to distinguish all the invisible heads. Similarly to English, I suppose that *mātrai* is 'excl(usive),' and that Deg_{feat} and Foc_{feat} are both 'feat(ure-assigners).' This leaves Deg_{feat} and Foc_{feat} to be distinguished from one another, which I do by supposing Foc_{feat} has the property 'focus' (which is distinct from 'foc,' a property relating to bearing [vfoc]). These distinctions are shown in the Venn diagram in (57), and may be added to the prominence order much as in English.

(57)



As a result, Nepali has the following input:

(58) {<Op_{NAI}, {fin, invis, {h|head(h) & h ≠ V ∨ Cop_{adj}}}>,
<C_{mat}, {fin, comp, {T}}>,
<C_{wh}, {fin, comp, int, {whq}, {T}}>,
<C_{rel}, {fin, n, comp, nom, {T}}>,
<C_{sub}, {fin, comp, arg, {T}}>,
<T, {fin, {phi}, {V, Cop_{adj}}}>,
<V, {fin, v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {fin, v, {A}}>,
<D, {fin, n, arg, {C_{rel}, φ}}>,
<D_{wh}, {fin, n, arg, wh, whq, {C_{rel}, φ}}>,
<mātrai, {fin, invis, excl, {D}}>,
<φ, {fin, n, nom, phi, {noun}, {N}}>,
<ind, {fin, n}>,
<N, {fin, n, cat, noun}>,
<A, {fin, cat}>,
<Foc_{feat}, {fin, invis, feat, focus, foc, {h|head(h)}}>,
<Deg_{feat}, {fin, invis, feat, deg, {h|head(h)}}>}

<fin, v, n, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, excl, feat, focus, foc, deg>

This leads to the creation of 51 categories, and the following specification of heads:

(59)

Op_{NAI}	[-V,-N,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT]	(-V)	[vfin]
C_{mat}	[-V,-N,-CAT,+COMP,-ARG,-INT]	(-V,-N,-CAT,-COMP,-INVIS)	[vfin]
C_{wh}	[-V,-N,-CAT,+COMP,-ARG,+INT]	(-V,-N,-CAT,-COMP,-INVIS)	[vfin,uwhq]
C_{rel}	[-V,+N,-CAT,+COMP,-ARG,+NOM]	(-V,-N,-CAT,-COMP,-INVIS)	[vfin]
C_{sub}	[-V,-N,-CAT,+COMP,+ARG]	(-V,-N,-CAT,-COMP,-INVIS)	[vfin]
T	[-V,-N,-CAT,-COMP,-ARG,-INVIS]	(+V)	[vfin,uphi]
V	[+V,+CAT]	(-V,-CAT,+ARG)	[vfin]
Cop_{adj}	[+V,-CAT]	(-V,-N,+CAT)	[vfin]
D	[-V,+N,-CAT,-COMP,+ARG,-WH]	(-V,+N,-CAT,-ARG,+NOM)	[vfin]
D_{wh}	[-V,+N,-CAT,-COMP,+ARG,+WH]	(-V,+N,-CAT,-ARG,+NOM)	[vfin,vwhq]
mātrai	[-V,-N,-CAT,-COMP,-ARG,+INVIS,+EXCL]	(-V,+N,-CAT,-COMP,+ARG,-WH)	[vfin]
φ	[-V,+N,-CAT,-COMP,-ARG,+NOM]	(-V,+N,+CAT)	[vfin,vphi,unoun]
ind	[-V,+N,-CAT,-COMP,-ARG,-NOM]		[vfin]
N	[-V,+N,+CAT]		[vfin,vnoun]
A	[-V,-N,+CAT]		[vfin]
Foc_{feat}	[-V,-N,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,+FOCUS]	()	[vfin,vfoc]
Deg_{feat}	[-V,-N,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,-FOCUS]	()	[vfin,vdeg]

10.4.3 ASL, LSB, and $BSL_{1\text{-}2}$.

Unlike English and Nepali, the sign language varieties considered above have many more heads than the background grammar, largely due to the complexity of the constructions described. However, since the heads involved are fairly similar across varieties, the categorial systems in each case are best determined by crosslinguistic comparison. For this reason, I initially consider all four varieties at once, allowing for the identification of a general categorial system as well as more language-specific idiosyncrasies. This information can then be used to construct a possible input for each variety.

The table on the following page is constructed similarly to those for English (10.35) and Nepali (10.36), establishing necessary categories on the basis of shared behaviour of heads. However, unlike the earlier tables, these categories are compared across all four signed varieties, with equivalent or similar groupings of heads being equated crosslinguistically. For instance, in both ASL and LSB, Deg, Foc_{phon}, and T form a category, as all three are c-selected by C_{mat}. Since BSL_2 lacks Deg and Foc_{phon}, and BSL_1 lacks Foc_{phon}, it might seem that the same category cannot be established in these varieties. However, they do exhibit the categories of Foc_{phon1}, T (in BSL_2) and Deg, Foc_{phon1}, T (in BSL_1), which can be hypothesised to be equivalent, since all four categories are consistent with Deg, Foc_{phon}, Foc_{phon1}, and T forming a "crosslinguistic category." In other cases, the equivalence of categories is

not so clear, as with c-selection by Op_{emph} in ASL and LSB, which targets a slightly different range of heads despite all heads involved being present in both varieties. In such cases, then, the hypothesis of equivalence is not as strong, but may relate to the same properties being expressed across different heads in depending on the variety. As we shall see below, these proposed equivalences are only hypotheses, and in several cases we will not uphold them in the final specification.

Taking this approach results in the identification of a wide range of categories, some of which can be identified by previously proposed properties, but many of which cannot:

ASL	LSB	BSL_2	BSL_1	Shared Behaviour	Cat. Feats.
Deg, Foc_{phon}, T	Deg, Foc_{phon}, T	Foc_{phon2}, T	Deg, Foc_{phon2}, T	c-selected by C_{mat}	?
Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	Deg, Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	Deg_{wh}, Q_{medial}, Q_{final2}	Deg_{wh}, Q_{medial}, Q_{final2}	c-selected by C_{wh}	?
-	Deg, T	-	Deg, Foc_{adj}, T	c-selected by C_{sub}, C_{rel} (LSB); C_{rel} (BSL_1)	?
-	Q_{medial}, T	-	-	c-selected by Deg	?
-	$Q_{initial}$, Q_{medial}	-	-	c-selected by Deg_{wh}	?
$Q_{initial}$, T	$Q_{initial}$, Q_{medial}, T	-	-	c-selected by Op_{emph}	?
-	-	-	Q_{final2}, T	c-selected by Var, Op_{emph}	?
v, Cop_{adj}	v, Cop_{adj}	v, Cop_{adj}	v, Cop_{adj}	c-selected by T	+V
C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	c-selected by v	+ARG
C_{rel}, φ	C_{rel}, φ	C_{rel}, φ	C_{rel}, φ	c-selected by D, D_{wh}	+NOM
C_{sub}, C_{rel}, Deg, Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}	Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}	C_{sub}, C_{rel}, Q_{medial}, Q_{final1}	C_{sub}, Deg, Q_{medial}, Q_{final1}	c-select T	?
-	C_{sub}, C_{rel}	-	-	c-select Deg, T	?
-	-	Deg_{wh}, Op_{whemph}	-	c-select Q_{final2}	?
-	-	-	Deg_{wh}, Foc_{adj}	c-select Var	?
-	-	-	Var, Op_{emph}	c-select Q_{final2}, T	?
D, D_{wh}	D, D_{wh}	D, D_{wh}	D, D_{wh}	c-select C_{rel}, φ	+N, +ARG
Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	c-select all heads	+FEAT
v, n, a	v, n, a	v, n, a	v, n, a	subcategorise roots	+CAT
Op_{emph}, ONLY-ONE, Foc_{feat}, Deg_{feat}	Op_{emph}, SÓ, Foc_{feat}, Deg_{feat}	Op_{whemph}, THAT'S-IT, Foc_{feat}, Deg_{feat}	?, Op_{emph}, ONLY, Foc_{feat}, Deg_{feat}	invisible	+INVIS
Deg, Foc_{phon}	Deg, Foc_{phon}	Foc_{phon1}	Deg, Foc_{adj}, Foc_{phon1}	bear [ufoc^]	?
Deg, Deg_{wh}	Deg, Deg_{wh}	Deg_{wh}	Deg, Deg_{wh}	bear [udeg^]	?
$Q_{initial}$, Q_{final1}	$Q_{initial}$, Q_{final1}	Q_{final1}	Q_{final1}	bear [uwhq^]	?

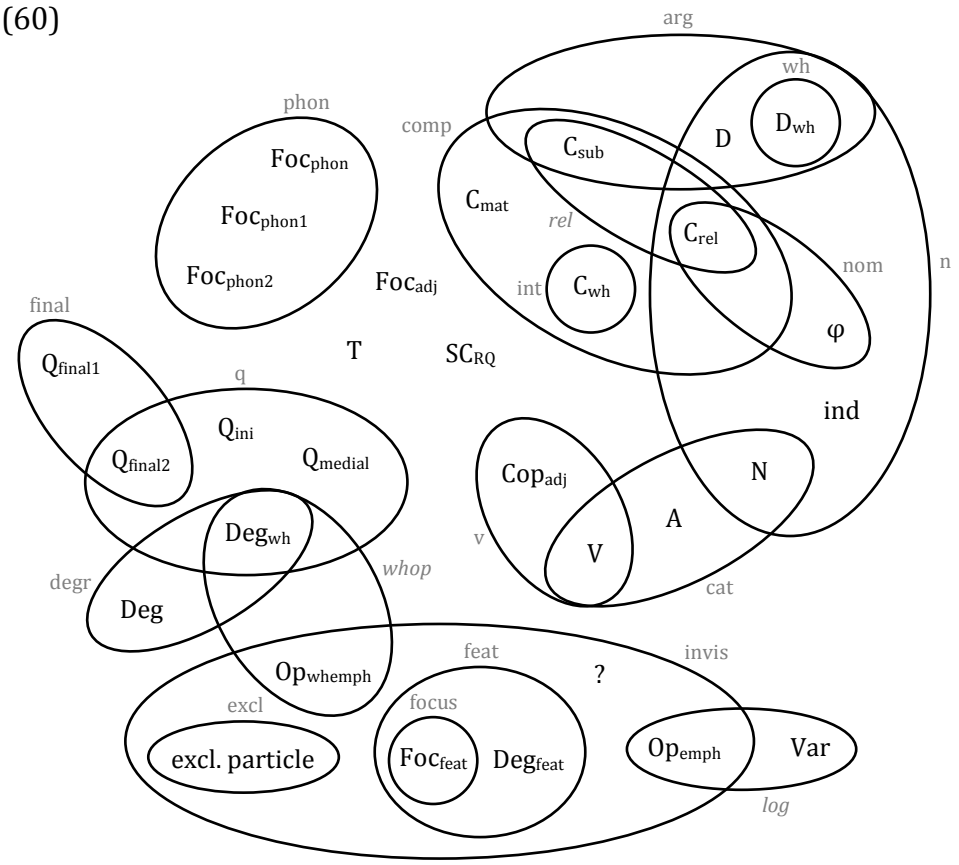
Table 10.37: Comparison of necessary categories across ASL, LSB, and $BSL_{1\text{-}2}$ (version 1).

As in English and Nepali, it is necessary to determine the properties responsible for these categories before inputs can be constructed. In some cases, this is relatively straightforward. For instance, the grouping of Deg and Deg_{wh} likely results from the property 'degr(ee),' (distinct from 'deg,' which relates to bearing [vdeg]) and supposing that Deg_{wh}, $Q_{initial}$, Q_{medial}, and Q_{final2} all have the property 'q,' means the category c-selected by C_{wh} can be determined for all varieties but LSB. I also suppose that Q_{final2} and Q_{final1} have the property 'final' (descriptive of *wh*-finality, and so distinct from 'fin,' which determines head-finality), and that Foc_{phon}, Foc_{phon2}, and Foc_{phon1} have the property 'phon(ological).'

Some categories are specific to individual varieties, but nevertheless have relatively clear shared properties. For instance, C_{rel} and C_{sub} both c-select Deg and T in LSB, and it seems reasonable to suppose that they are both 'sub(ordinate).' Similarly, albeit somewhat less clearly, Var and Op_{emph} c-select Q_{final2} and T in BSL_1, and they are both primarily involved in 'log(ical)' expressions. Finally, Deg_{wh} and Op_{whemph} in BSL_2 c-select Q_{final2}, and can both be thought of as 'wh(-)op(erators).'

These specifications can be combined with the background grammar, as well as with the properties 'excl,' 'feat,' and 'focus' proposed for English and Nepali. This results in the following Venn diagram of properties, which holds across all four varieties. Properties specific to a single language are italicised.

(60)



This allows for the identification of 9 more categories, although in some cases hypotheses of equivalence must be revised:

ASL	LSB	BSL_2	BSL_1	Shared Behaviour	Cat. Feats.
-	-	Foc_{phon2}, T	Deg, Foc_{phon2}, T	c-selected by C_{mat}	?
Deg, Foc_{phon}, T	Deg, Foc_{phon}, T	-	-	c-selected by C_{mat}	-Q, -FINAL
Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	-	Deg_{wh}, Q_{medial}, Q_{final2}	Deg_{wh}, Q_{medial}, Q_{final2}	c-selected by C_{wh}	+Q
-	Deg, Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	-	-	c-selected by C_{wh}	?
-	Deg, T	-	-	c-selected by C_{sub}, C_{rel}	-Q, -PHON
-	-	-	Deg, Foc_{adj}, T	c-selected by C_{rel}	?
-	Q_{medial}, T	-	-	c-selected by Deg	?
-	$Q_{initial}$, Q_{medial}	-	-	c-selected by Deg_{wh}	+Q, -DEGR
$Q_{initial}$, T	$Q_{initial}$, Q_{medial}, T	-	-	c-selected by Op_{emph}	?
-	-	-	Q_{final2}, T	c-selected by Var, Op_{emph}	?
v, Cop_{adj}	v, Cop_{adj}	v, Cop_{adj}	v, Cop_{adj}	c-selected by T	+V
C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	c-selected by v	+ARG
C_{rel}, φ	C_{rel}, φ	C_{rel}, φ	C_{rel}, φ	c-selected by D, D_{wh}	+NOM
C_{sub}, C_{rel}, Deg, Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}	Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}	C_{sub}, C_{rel}, Q_{medial}, Q_{final1}	C_{sub}, Deg, Q_{medial}, Q_{final1}	c-select T	?
-	C_{sub}, C_{rel}	-	-	c-select Deg, T	*+SUB*
-	-	Deg_{wh}, Op_{whemph}	-	c-select Qfinal2	*+WHOP*
-	-	-	Deg_{wh}, Foc_{adj}	c-select Var	?
-	-	-	Var, Op_{emph}	c-select Q_{final2}, T	*+LOG*
D, D_{wh}	D, D_{wh}	D, D_{wh}	D, D_{wh}	c-select C_{rel}, φ	+N, +ARG
Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	c-select all heads	+FEAT
v, n, a	v, n, a	v, n, a	v, n, a	subcategorise roots	+CAT
Op_{emph}, ONLY-ONE, Foc_{feat}, Deg_{feat}	Op_{emph}, SÓ, Foc_{feat}, Deg_{feat}	Op_{whemph}, THAT'S-IT, Foc_{feat}, Deg_{feat}	?, Op_{emph}, ONLY, Foc_{feat}, Deg_{feat}	invisible	+INVIS
Deg, Foc_{phon}	Deg, Foc_{phon}	Foc_{phon1}	Deg, Foc_{adj}, Foc_{phon1}	bear [ufoc^]	?
Deg, Deg_{wh}	Deg, Deg_{wh}	Deg_{wh}	Deg, Deg_{wh}	bear [udeg^]	+DEGR
$Q_{initial}$, Q_{final1}	$Q_{initial}$, Q_{final1}	-	-	bear [uwhq^]	?
-	-	Q_{final1}	Q_{final1}	bear [uwhq^]	-Q, +FINAL

Table 10.38: Comparison of necessary categories across ASL, LSB, and $BSL_{1\text{-}2}$ (version 2). Categorial features specific to a variety are italicised.

This leaves us with 10 unidentified categories across all four varieties, none of which appear to be be positively or negatively identifiable on the basis of the properties in (60). As noted above, some of these proposed categories differ across varieties, whereas others vary only in that different varieties involve a different range of heads. Still others are entirely unique to specific varieties, and so their crosslinguistic behaviour cannot be established.

More properties must therefore be added into the system to distinguish these categories, but it is neither clear what these properties should be, nor which heads they should appear on, since categories could be both negatively or positively defined. For concreteness and simplicity, however, I suppose that each category in the below table is positively defined by a single property, whose name I take from the start of the alphabet for crosslinguistically valid categories, and from the end of the alphabet for those categories specific to particular varieties. This yields the following specification of categories:

Category	**Present in:**	**Proposed Property**
Deg, Foc_{phon2}, T	BSL_2, BSL_1	a
$Q_{initial}$, T, (Q_{medial})	ASL, LSB	**b**
Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}, (Deg, C_{sub}, (C_{rel}))	ASL, LSB, BSL_2, BSL_1	**c**
Deg, Foc_{adj}, Foc_{phon}, Foc_{phon1}	ASL, LSB, BSL_2, BSL_1	d
$Q_{initial}$, Q_{final1}	ASL, LSB	e
Deg, Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	LSB	*z*
Deg, Foc_{adj}, T	BSL_1	*y*
Q_{final2}, T	BSL_1	*x*
Deg_{wh}, Foc_{adj}	BSL_1	*w*

Table 10.39: Putative properties defining the remaining categories across ASL, LSB, and $BSL_{1\text{-}2}$. Categorial features specific to a variety are italicised; those whose specification differs across varieities are in bold.

As indicated by the brackets and bolded properties, 'b' and 'c' spread differently across heads depending on the variety, whereas the other properties are distributed consistently. The only outstanding category is the LSB-specific grouping of Q_{medial} and T, which is omitted from the table above as it can be identified as [-E,+B].

As can be seen in table 10.39, the crosslinguistic categories appear to exhibit fairly robust behaviour across varieties they appear in, lending some support to their existence, but the exact combination of properties that yield these patterns remain to be identified. Nevertheless, the simplifications used here allow the crosslinguistic comparison of categories to be completed:

ASL	**LSB**	**BSL_2**	**BSL_1**	**Shared Behaviour**	**Cat. Feats.**
-	-	Foc_{phon2}, T	Deg, Foc_{phon2}, T	c-selected by C_{mat}	+A
Deg, Foc_{phon}, T	Deg, Foc_{phon}, T	-	-		-Q, -FINAL
Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	-	Deg_{wh}, Q_{medial}, Q_{final2}	Deg_{wh}, Q_{medial}, Q_{final2}	c-selected by C_{wh}	+Q
-	Deg, Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}	-	-	c-selected by C_{wh}	*+Z*
-	Deg, T	-		c-selected by C_{sub}, C_{rel}	-Q, -PHON
-	-	-	Deg, Foc_{adj}, T	c-selected by C_{rel}	*+Y*
-	Q_{medial}, T	-	-	c-selected by Deg	-E, +B
-	$Q_{initial}$, Q_{medial}	-	-	c-selected by Deg_{wh}	+Q, -DEGR
$Q_{initial}$, T	$Q_{initial}$, Q_{medial}, T	-	-	c-selected by Op_{emph}	**+B**
-	-	-	Q_{final2}, T	c-selected by Var, Op_{emph}	*+X*
v, Cop_{adj}	v, Cop_{adj}	v, Cop_{adj}	v, Cop_{adj}	c-selected by T	+V
C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	C_{sub}, D, D_{wh}	c-selected by v	+ARG
C_{rel}, φ	C_{rel}, φ	C_{rel}, φ	C_{rel}, φ	c-selected by D, D_{wh}	+NOM
C_{sub}, C_{rel}, Deg, Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}	Foc_{phon}, $Q_{initial}$, Q_{medial}, Q_{final1}	C_{sub}, C_{rel}, Q_{medial}, Q_{final1}	C_{sub}, Deg, Q_{medial}, Q_{final1}	c-select T	**+C**
-	C_{sub}, C_{rel}	-	-	c-select Deg, T	*+SUB*
-	-	Deg_{wh}, Op_{whemph}	-	c-select Q_{final2}	*+WHOP*
-	-	-	Deg_{wh}, Foc_{adj}	c-select Var	*+W*
-	-	-	Var, Op_{emph}	c-select Q_{final2}, T	*+LOG*
D, D_{wh}	D, D_{wh}	D, D_{wh}	D, D_{wh}	c-select C_{rel}, φ	+N, +ARG
Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	Foc_{feat}, Deg_{feat}	c-select all heads	+FEAT
v, n, a	v, n, a	v, n, a	v, n, a	subcategorise roots	+CAT
Op_{emph}, ONLY-ONE, Foc_{feat}, Deg_{feat}	Op_{emph}, SÓ, Foc_{feat}, Deg_{feat}	Op_{whemph}, THAT'S-IT, Foc_{feat}, Deg_{feat}	?, Op_{emph}, ONLY, Foc_{feat}, Deg_{feat}	invisible	+INVIS
Deg, Foc_{phon}	Deg, Foc_{phon}	Foc_{phon1}	Deg, Foc_{adj}, Foc_{phon1}	bear [ufoc^]	+D
Deg, Deg_{wh}	Deg, Deg_{wh}	Deg_{wh}	Deg, Deg_{wh}	bear [udeg^]	+DEGR
$Q_{initial}$, Q_{final1}	$Q_{initial}$, Q_{final1}	-	-	bear [uwhq^]	+E
-	-	Q_{final1}	Q_{final1}	bear [uwhq^]	+FINAL, -Q

Table 10.40: Comparison of necessary categories across ASL, LSB, and $BSL_{1\text{-}2}$ (version 3). Categorial features specific to a variety are italicised; those whose specification differs across varieties are in bold.

Applying these properties to each variety leads to the following inputs for ASL (61), LSB (62), BSL_2 (63), and BSL_1(64):

(61) **ASL:**

{<C_{mat}, {comp, {Deg, Foc_{phon}, T}}>,
<C_{wh}, {comp, int, {Deg_{wh}, $Q_{initial}$, Q_{medial}, Q_{final2}}}>,
<C_{sub}, {comp, arg, c, {T}}>,
<C_{rel}, {n, comp, nom, c, {T}}>,
<Deg, {degr, c, <foc, m>, <deg, m>, {T}}>,
<Deg_{wh}, {q, degr, <deg, m>, {$Q_{initial}$}}>,
<Op_{emph}, {invis, {$Q_{initial}$, T}}>,
<Foc_{phon}, {phon, c, <foc, m>, {T}}>,
<$Q_{initial}$, {q, e, b, c, <whq, m>, {T}}>,
<Q_{medial}, {q, c, {T}}>,
<Q_{final2}, {q, final, <t, m>, {Q_{final1}}}>,
<Q_{final1}, {final, e, c, <whq, m>, {T}}>,
<T, {t, b, {phi}, {V, Cop_{adj}}}>,
<V, {v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {v, {A}}>,
<D, {n, arg, {C_{rel}, φ}}>,
<D_{wh}, {n, arg, wh, whq, {C_{rel}, φ}}>,
<ONLY-ONE, {invis, excl, {D}}>,
<φ, {n, nom, phi, {noun}, {N}}>,
<ind, {n}>,
<N, {n, cat, noun}>,
<A, {cat}>,
<Foc_{feat}, {invis, feat, focus, foc, {h|head(h)}}>,
<Deg_{feat}, {invis, feat, deg, {h|head(h)}}>}

(62) **LSB:**

{<C_{mat}, {comp, {Deg, Foc_{phon}, T}}>,
<C_{wh}, {comp, int, {Deg_{wh}, $Q_{initial}$, Q_{medial}}}>,
<C_{sub}, {comp, arg, sub, {T, Deg}}>,
<C_{rel}, {n, comp, nom, sub, {T, Deg}}>,
<Deg, {degr, a, d, z, <foc, m>, <deg, m>, {Q_{medial}, T}}>,
<Deg_{wh}, {q, degr, z, <deg, m>, {$Q_{initial}$, Q_{medial}}}>,
<Op_{emph}, {invis, {$Q_{initial}$, Q_{medial}, T}}>,
<Foc_{phon}, {phon, a, c, d, <foc, m>, {T}}>,
<$Q_{initial}$, {q, b, c, e, z, <whq, m>, {T}}>,
<Q_{medial}, {q, b, c, z, {T}}>,
<Q_{final2}, {q, final, z, <t, m>, {Q_{final1}}}>,
<Q_{final1}, {final, c, e, <whq, m>, {T}}>,
<T, {t, a, b, {phi}, {V, Cop_{adj}}}>,
<V, {v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {v, {A}}>,
<D, {n, arg, {C_{rel}, φ}}>,
<D_{wh}, {n, arg, wh, whq, {C_{rel}, φ}}>,
<SÓ, {invis, excl, {D}}>,
<φ, {n, nom, phi, {noun}, {N}}>,
<ind, {n}>,
<N, {n, cat, noun}>,
<A, {cat}>,
<Foc_{feat}, {invis, feat, focus, foc, {h|head(h)}}>,
<Deg_{feat}, {invis, feat, deg, {h|head(h)}}>}

(63) **BSL$_2$:**

{<C_{mat}, {comp, {Foc_{phon2}, T}}>,
<C_{wh}, {comp, int, {Deg_{wh}, Q_{medial}, Q_{final2}}}>,
<C_{sub}, {comp, arg, c, {T}}>,
<C_{rel}, {n, comp, nom, c, {T}}>,
<Deg_{wh}, {q, whop, <deg, m>, {Q_{final2}}}>,
<Op_{whemph}, {invis, whop, {Q_{final2}}}>,
<Foc_{phon2}, {phon, a, <sc, m>, {Foc_{phon1}}}>,
<Foc_{phon1}, {phon, <foc, m>, {SC_{RQ}}}>,
<Q_{medial}, {q, c, {T}}>,
<Q_{final2}, {q, final, <t, m>, {Q_{final1}}}>,
<Q_{final1}, {final, c, <whq, m>, {T}}>,
<T, {a, t, {phi}, {V, Cop_{adj}}}>,
<V, {v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {v, {A}}>,
<SC_{RQ}, {sc}>,
<D, {n, arg, {C_{rel}, φ}}>,
<D_{wh}, {n, arg, wh, whq, {C_{rel}, φ}}>,
<THAT'S-IT, {invis, excl, fin, {D}}>,
<φ, {n, nom, phi, {noun}, {N}}>,
<ind, {n}>,
<N, {n, cat, noun}>,
<A, {cat}>,
<Foc_{feat}, {invis, feat, focus, foc, {h|head(h)}}>,
<Deg_{feat}, {invis, feat, deg, {h|head(h)}}>}

(64) **BSL$_1$:**

{<C_{mat}, {comp, {T, Deg, Foc_{phon2}}}>,
<C_{rel}, {n, comp, nom, {T, Deg, Foc_{adj}}}>,
<C_{wh}, {comp, int, {Q_{final2}, Q_{medial}, Deg_{wh}}}>,
<C_{sub}, {comp, arg, c, {T}}>,
<?, {invis, {Deg}}>,
<Deg, {degr, a, c, d, y, <foc, m>, <deg, m>, {T}}>,
<Deg_{wh}, {q, degr, w, <deg, m>, {Var}}>,
<Foc_{adj}, {b, d, w, y, <foc, m>, {Var}}>,
<Var, {log, {Q_{final2}, T}}>,
<Op_{emph}, {invis, log, {Q_{final2}, T}}>,
<Foc_{phon2}, {phon, a, <sc, m>, {Foc_{phon1}}}>,
<Foc_{phon1}, {phon, b, d, <foc, m>, {SC_{RQ}}}>,
<Q_{medial}, {q, c, {T}}>,
<Q_{final2}, {q, final, x, <t, m>, {Q_{final1}}}>,
<Q_{final1}, {final, c, <whq, m>, {T}}>,
<T, {a, t, x, y, {phi}, {V, Cop_{adj}}}>,
<V, {v, cat, {C_{sub}, D, D_{wh}}}>,
<Cop_{adj}, {v, {A}}>,
<SC_{RQ}, {sc}>,
<D, {n, arg, {C_{rel}, φ}}>,
<D_{wh}, {n, arg, wh, whq, {C_{rel}, φ}}>,
<ONLY, {invis, excl, fin, {D}}>,
<φ, {n, nom, phi, {noun}, {N}}>,
<ind, {n}>,
<N, {n, cat, noun}>,
<A, {cat}>,
<Foc_{feat}, {invis, feat, focus, foc, {h|head(h)}}>,
<Deg_{feat}, {invis, feat, deg, {h|head(h)}}>}

The only remaining component to these inputs is a prominence order for each variety. While many different orders are possible, this number can be restricted in various ways. Most importantly, some negatively defined categories will only emerge if properties are ordered correctly. For instance, if 'log' were ordered after 'c' in the below order for BSL_1, then the [-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT,-LOG,-C] category would not be created. This category uniquely identifies the head '?,' and so as a result this head cannot be assigned its c-selectional feature. A secondary consideration is of crosslinguistic similarity – presumably, it is preferable for prominence orders to be similar where there is not good reason for any differences.

As a result, I suppose that the properties are first ordered much as in the background grammar, since this is nearly a proper subgrammar of the signed varieties. These properties are followed by those that are common to all varieties, ordered in such a way as to produce the necessary categories. Only when it is unavoidable do two prominence orders diverge. At this point any remaining common features are still ordered similarly where possible, with language-specific features being ordered later.

Even with these guiding restrictions, a vast number of prominence orders are possible, but those stated in (65) are an attempt to satisfy the restrictions fairly straightforwardly:

(65) **ASL:** <n, v, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, excl, feat, focus, foc, deg, q, final, phon, degr, t, e, b, c, d, sub, z>

LSB: <n, v, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, excl, feat, focus, foc, deg, q, final, phon, degr, t, e, b, c>

BSL_2: <n, v, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, excl, feat, focus, foc, deg, q, final, phon, whop, a, t, c, sc, fin>

BSL_1: <n, v, cat, noun, comp, arg, wh, whq, nom, phi, int, invis, excl, feat, focus, foc, deg, q, final, phon, degr, a, t, log, c, d, w, x, y, sc, fin>

When these inputs are given to the algorithm, the below specifications of heads are produced:

ASL – 171 categories created, yielding the following specification of heads, which corresponds to table 10.16:

(66)

C_{mat}	[-N,-V,-CAT,+COMP,-ARG,-INT,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL)	
C_{wh}	[-N,-V,-CAT,+COMP,-ARG,+INT,-C]	(-N,-V,-CAT,-COMP,-INVIS,+Q)	
C_{sub}	[-N,-V,-CAT,+COMP,+ARG,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	
C_{rel}	[+N,-CAT,+COMP,-ARG,+NOM,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	
Deg	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,+DEGR,-E,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[ufoc^,udeg^]
Deg_{wh}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,+DEGR,-E,-C]	(-N,-V,-CAT,-COMP,-INVIS,+Q,+E)	[udeg^]
Op_{emph}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT,-C]	(-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR,+B)	
Foc_{phon}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,+PHON,-DEGR,-E,-B,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[ufoc^]
$Q_{initial}$	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,-DEGR,+E,+B,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[uwhq^]
Q_{medial}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,-DEGR,-E,-B,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	
Q_{final2}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,+FINAL,-E,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL)	[ut^]
Q_{final1}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,+FINAL,+E,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[uwhq^]
T	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-DEGR,-E,+B,-C]	(-N,+V)	[vt,uphi]
V	[-N,+V,+CAT]	(-CAT,+ARG)	
Cop_{adj}	[-N,+V,-CAT,-COMP,-ARG,-C]	(-N,-V,+CAT)	
D	[+N,-CAT,-COMP,+ARG,-WH,-C]	(+N,-CAT,-ARG,+NOM)	
D_{wh}	[+N,-CAT,-COMP,+ARG,+WH,-C]	(+N,-CAT,-ARG,+NOM)	[vwhq]
ONLY-ONE	[-N,-V,-CAT,-COMP,-ARG,+INVIS,+EXCL,-C]	(+N,-CAT,-COMP,+ARG,-WH)	
φ	[+N,-CAT,-COMP,-ARG,+NOM,-C]	(+N,+CAT)	[vphi,unoun]
ind	[+N,-CAT,-COMP,-ARG,-NOM,-C]		
N	[+N,+CAT]		[vnoun]
A	[-N,-V,+CAT]		
Foc_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,+FOCUS,-C]	()	[vfoc]
Deg_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,-FOCUS,-C]	()	[vdeg]

LSB – 199 categories created, yielding the following specification of heads, which corresponds to table 10.22:

(67)

C_{mat}	[-N,-V,-CAT,+COMP,-ARG,-INT,-SUB]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL)	
C_{wh}	[-N,-V,-CAT,+COMP,-ARG,+INT,-SUB]	(-N,-V,-CAT,-COMP,-INVIS,+Q,-FINAL)	
C_{sub}	[-N,-V,-CAT,+COMP,+ARG,+SUB]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON)	
C_{rel}	[+N,-CAT,+COMP,-ARG,+NOM,+SUB]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON)	
Deg	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,+DEGR,-E,-C,+D,+Z]	(-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR,-E,+B)	[ufoc^,udeg^]
Deg_{wh}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,+DEGR,-E,-C,+Z]	(-N,-V,-CAT,-COMP,-INVIS,+Q,-FINAL,-DEGR)	[udeg^]
Op_{emph}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT]	(-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR,+B)	
Foc_{phon}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,+PHON,-DEGR,-E,-B,+C,+D,-Z]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[ufoc^]
$Q_{initial}$	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,-DEGR,+E,+B,+C,+Z]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[uwhq^]
Q_{medial}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,-DEGR,-E,+B,+C,+Z]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	
Q_{final2}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,+FINAL,-E,-C,+Z]	(-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL)	[ut^]
Q_{final1}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,+FINAL,+E,+C,-Z]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR)	[uwhq^]
T	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-DEGR,-E,+B,-C,-D,-Z]	(-N,+V)	[vt,uphi]
V	[-N,+V,+CAT]	(-CAT,+ARG)	
Cop_{adj}	[-N,+V,-CAT,-COMP,-ARG]	(-N,-V,+CAT)	
D	[+N,-CAT,-COMP,+ARG,-WH]	(+N,-CAT,-ARG,+NOM)	
D_{wh}	[+N,-CAT,-COMP,+ARG,+WH]	(+N,-CAT,-ARG,+NOM)	[vwhq]
SÓ	[-N,-V,-CAT,-COMP,-ARG,+INVIS,+EXCL]	(+N,-CAT,-COMP,+ARG,-WH)	
φ	[+N,-CAT,-COMP,-ARG,+NOM]	(+N,+CAT)	[vphi,unoun]
ind	[+N,-CAT,-COMP,-ARG,-NOM]		
N	[+N,+CAT]		[vnoun]
A	[-N,-V,+CAT]		
Foc_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,+FOCUS]	()	[vfoc]
Deg_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,-FOCUS]	()	[vdeg]

BSL$_2$ – 143 categories created, yielding the following specification of heads, which corresponds to table 10.28:

(68)

C_{mat}	[-N,-V,-CAT,+COMP,-ARG,-INT,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+A)	
C_{wh}	[-N,-V,-CAT,+COMP,-ARG,+INT,-C]	(-N,-V,-CAT,-COMP,-INVIS,+Q)	
C_{sub}	[-N,-V,-CAT,+COMP,+ARG,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A)	
C_{rel}	[+N,-CAT,+COMP,-ARG,+NOM,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A)	
Deg_{wh}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,+WHOP,-C]	(-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL)	[udeg^]
Op_{whemph}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT,+WHOP,-C]	(-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL)	
Foc_{phon2}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,+PHON,-WHOP,+A,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A)	[usc^]
Foc_{phon1}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,+PHON,-WHOP,-A,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-A)	[ufoc^]
Q_{medial}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,-WHOP,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A)	
Q_{final2}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,+FINAL,-WHOP,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL)	[ut^]
Q_{final1}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,+FINAL,-WHOP,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A)	[uwhq^]
T	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-WHOP,+A,-C]	(-N,+V)	[vt,uphi]
V	[-N,+V,+CAT]	(-CAT,+ARG)	
Cop_{adj}	[-N,+V,-CAT,-COMP,-ARG,-C]	(-N,-V,+CAT)	
SC_{RQ}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-WHOP,-A,-C]		[vsc]
D	[+N,-CAT,-COMP,+ARG,-WH,-C]	(+N,-CAT,-ARG,+NOM)	
D_{wh}	[+N,-CAT,-COMP,+ARG,+WH,-C]	(+N,-CAT,-ARG,+NOM)	[vwhq]
THAT'S-IT	[-N,-V,-CAT,-COMP,-ARG,+INVIS,+EXCL,-WHOP,-C]	(+N,-CAT,-COMP,+ARG,-WH)	[vfin]
φ	[+N,-CAT,-COMP,-ARG,+NOM,-C]	(+N,+CAT)	[vphi,unoun]
ind	[+N,-CAT,-COMP,-ARG,-NOM,-C]		
N	[+N,+CAT]		[vnoun]
A	[-N,-V,+CAT]		
Foc_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,+FOCUS,-WHOP,-C]	()	[vfoc]
Deg_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,-FOCUS,-WHOP,-C]	()	[vdeg]

BSL$_1$ – 237 categories created, yielding the following specification of heads, which corresponds to table 10.34:

(69)

C_{mat}	[-N,-V,-CAT,+COMP,-ARG,-INT,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+A)	
C_{wh}	[-N,-V,-CAT,+COMP,-ARG,+INT,-C]	(-N,-V,-CAT,-COMP,-INVIS,+Q)	
C_{sub}	[-N,-V,-CAT,+COMP,+ARG,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR,+A)	
C_{rel}	[+N,-CAT,+COMP,-ARG,+NOM]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-LOG,+Y)	
?	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT,-LOG,-C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+DEGR)	
Deg	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,+DEGR,+A,-LOG,+C,+D,+Y]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR,+A)	[ufoc^,udeg^]
Deg_{wh}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,+DEGR,-LOG,-C,+W,-X]	(-N,-V,-CAT,-COMP,-INVIS,+LOG)	[udeg^]
Foc_{adj}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-DEGR,-A,-LOG,-C,+D,+W,-X,+Y]	(-N,-V,-CAT,-COMP,-INVIS,+LOG)	[ufoc^]
Var	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-DEGR,-A,+LOG,-C]	(-N,-V,-CAT,-COMP,-INVIS,-LOG,-C,+X)	
Op_{emph}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,-FEAT,+LOG,-C]	(-N,-V,-CAT,-COMP,-INVIS,-LOG,-C,+X)	
Foc_{phon2}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,+PHON,-DEGR,+A,-LOG,-C,-D,-W,-X]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A)	[usc^]
Foc_{phon1}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,+PHON,-DEGR,-A,-LOG,-C,+D,-W,-X]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-A,-LOG,-D)	[ufoc^]
Q_{medial}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,-FINAL,-DEGR,-LOG,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR,+A)	
Q_{final2}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,+Q,+FINAL,-LOG,-C,+X]	(-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL)	[ut^]
Q_{final1}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,+FINAL,-LOG,+C]	(-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR,+A)	[uwhq^]
T	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-DEGR,+A,-LOG,-C,-D,-W,+X,+Y]	(-N,+V)	[vt,uphi]
V	[-N,+V,+CAT]	(-CAT,+ARG)	
Cop_{adj}	[-N,+V,-CAT,-COMP,-ARG]	(-N,-V,+CAT)	
SC_{RQ}	[-N,-V,-CAT,-COMP,-ARG,-INVIS,-Q,-FINAL,-PHON,-DEGR,-A,-LOG,-C,-D,-W,-X,-Y]		[vsc]
D	[+N,-CAT,-COMP,+ARG,-WH]	(+N,-CAT,-ARG,+NOM)	
D_{wh}	[+N,-CAT,-COMP,+ARG,+WH]	(+N,-CAT,-ARG,+NOM)	[vwhq]
ONLY	[-N,-V,-CAT,-COMP,-ARG,+INVIS,+EXCL,-LOG,-C]	(+N,-CAT,-COMP,+ARG,-WH)	[vfin]
φ	[+N,-CAT,-COMP,-ARG,+NOM]	(+N,+CAT)	[vphi,unoun]
ind	[+N,-CAT,-COMP,-ARG,-NOM]		
N	[+N,+CAT]		[vnoun]
A	[-N,-V,+CAT]		
Foc_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,+FOCUS,-LOG,-C]	()	[vfoc]
Deg_{feat}	[-N,-V,-CAT,-COMP,-ARG,+INVIS,-EXCL,+FEAT,-FOCUS,-LOG,-C]	()	[vdeg]

We have therefore arrived at an input for all 6 fragment grammars that, when given to the algorithm, produces the correct specification of heads.

10.5 Comparing the acquisitional trajectories of each fragment.

The aim of this chapter was to parameterise the expression of focus across six varieties. We now have come considerably closer to this goal, having arrived at an input for each variety that leads to its acquisition. However, while some comparison was required to determine the specifications of the signed varieties, we have not yet considered the differing acquisitional trajectories for each language, and where these trajectories diverge.

As discussed in 2.2.7, acquisition of an input by the algorithm in chapter 1 maps directly onto a parameter hierarchy, with each "question" in the algorithm corresponding to a node on a tree. In theory, then, we could represent the acquisition of all six inputs from 10.4 on such a tree. However, this would be an extremely large diagram, since the number of questions involved even in a single loop of the algorithm can be greater than twice the current number of categories. For this reason, it is necessary to abridge our description of the algorithm's operation, and, to this end, (70) lists the six possible outcomes of a single loop:

(70) a. Create a new categorial division.

b. Assign a valued feature.

c. Assign a c-selectional feature.

d. Assign an unvalued feature that triggers movement.

e. Assign an unvalued feature that does not trigger movement.

f. Create no new categorial divisions, and assign no features.

Leaving aside the loops of type (70f), since these are vacuous and add no new information, each of these outcomes can be described using one of the following two general statements:

(71) a. **Divide [αX, βY, ...] into [±P]:**

For C [αX, βY, …], assign all heads in C with p the categorial feature [+P], and all heads in C without p the categorial feature [-P].

From C create new categories [αX, βY, …, +P] and [αX, βY, …, -P], and for each subcategory of C […, αX, …, βY, …] which contains at least one [+P] head and one [-P] head, create new categories […, αX, …, βY, …, +P] and […, αX, …, βY, …, -P].

Order categories by "size" and append new visible categories to the prominence order in "size" order.

b. **Assign [vp]/[up(^)]/(γZ, δW, ...) to [αX, βY, ...]:**

Assign [vp]/[up(^)]/(γZ, δW, …) to [αX, βY, …] and all heads in [αX, βY, …].

In the case of [vp], additionally append the property {p} to the prominence order.

These summarised statements allow for the construction of an acquisitional tree, where each non-root, non-terminal node is a statement of either type (71a) or (71b), corresponding to the outcome of a non-vacuous loop of the algorithm. The root node then indicates the start of the algorithm, and terminal nodes indicate its termination in a particular variety.

Taking this approach, the acquisitional trajectories of the six inputs from 10.4 are summarised and compared in the tree in (72). This tree is essentially the algorithmic equivalent of a parameter hierarchy, and has a number of interesting properties. Nepali is the most outlying variety, due not only to its consistent head-finality, but also to its ordering of 'v' before 'n' in the prominence order. By contrast, English and the signed varieties at first follow a similar pathway, but English diverges from this first, leaving only the signed varieties. BSL_2 then diverges from this pathway, followed by BSL_1, leaving only LSB and ASL, which themselves diverge after a few more shared loops. The hierarchy thus seems to broadly reflect the syntactic similarity of varieties. Finally, BSL_1 is by far the most

complex variety,[8] with a total of 55 non-vacuous loops and 237 categories. It is therefore possible that this complexity motivated reanalysis to BSL_2, a system with only 47 non-vacuous loops and 143 categories. This abridged hierarchy thus allows for productive comparison of algorithmic trajectories across varieties.

[8] It may also be noted that both Nepali and English represent considerably simpler systems than any of the signed varieties. This is likely to be largely an artefact of the particular constructions chosen to be modelled by these fragment grammars, but may to some extent reflect a simpler focus system in these languages.

(72)

Start
Assign [vfin] to []
Divide [] into [V]
Divide [-V] into [N]
Divide [] into [CAT]
Assign [vnoun] to [-V,+N,+CAT]
Divide [-V,-CAT] into [COMP]
Divide [-V,-CAT] into [ARG]
Divide [-V,+N,-CAT,-COMP,+ARG] into [WH]
Assign [vwhq] to [-V,+N,-CAT,-COMP,+ARG,+WH]
Divide [-V,+N,-CAT,-ARG] into [NOM]
Assign [vphi] to [-V,+N,-CAT,-COMP,-ARG,+NOM]
Divide [-V,-N,-CAT,+COMP,-ARG] into [INT]
Divide [-V,-N,-CAT,-COMP] into [INVIS]
Divide [-V,-N,-CAT,-COMP,+INVIS] into [EXCL]
Divide [-V,-N,-CAT,-COMP,+INVIS,-EXCL] into [FEAT]
Divide [-V,-N,-CAT,-COMP,+INVIS,-EXCL,+FEAT] into [FOCUS]
Assign [vfoc] to [-V,-N,-CAT,-COMP,+INVIS,-EXCL,+FEAT,+FOCUS]
Assign [vdeg] to [-V,-N,-CAT,-COMP,+INVIS,-EXCL,+FEAT,-FOCUS]
Assign () to [-V,-N,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Assign (-V) to [-V,-N,-CAT,-COMP,+INVIS,-EXCL,-FEAT]
Assign (+V) to [-V,-N,-CAT,-COMP,-INVIS]
Assign (-V,+N,+CAT) to [-V,+N,-CAT,-COMP,-ARG,+NOM]
Assign (-V,-N,+CAT) to [+V,-CAT]
Assign [unoun] to [-V,+N,-CAT,-COMP,-ARG,+NOM]
Assign (-V,-CAT,+ARG) to [+V,+CAT]
Assign (-V,+N,-CAT,-COMP,+ARG,-WH) to [-V,-N,-CAT,-COMP,+INVIS,+EXCL]
Assign [uwhq] to [-V,-N,-CAT,+COMP,-ARG,+INT]
Assign (-V,+N,-CAT,-ARG,+NOM) to [-V,+N,-CAT,+ARG]
Assign [uphi] to [-V,-N,-CAT,-COMP,-INVIS]
Assign (-V,-N,-CAT,-COMP,-INVIS) to [-V,-CAT,+COMP]
Stop - Nepali
Divide [] into [N]
Divide [-N] into [V]
Divide [] into [CAT]
Assign [vnoun] to [+N,+CAT]
Divide [-CAT] into [COMP]
Divide [-CAT] into [ARG]
Divide [+N,-CAT,-COMP,+ARG] into [WH]
Assign [vwhq] to [+N,-CAT,-COMP,+ARG,+WH]
Divide [+N,-CAT,-ARG] into [NOM]
Assign [vphi] to [+N,-CAT,-COMP,-ARG,+NOM]
Divide [-N,-V,-CAT,+COMP,-ARG] into [INT]
Divide [-N,-V,-CAT,-COMP] into [INVIS]
Divide [-N,-V,-CAT,-COMP,+INVIS] into [EXCL]
Divide [-N,-V,-CAT,-COMP,+INVIS,-EXCL] into [FEAT]
Assign [vfoc] to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Divide [+N] into [LOW]
Assign () to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Assign (-N,+V) to [-N,-V,-CAT,-COMP,-INVIS]
Assign (+N,+CAT) to [+N,-CAT,+LOW]
Assign (-N,-V,+CAT) to [-N,+V,-CAT]
Assign [unoun] to [+N,-CAT,+LOW]
Assign (-CAT,+ARG) to [-N,+V,+CAT]
Assign (+N,-CAT,-COMP,+ARG,-WH) to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign [uwhq˜] to [-N,-V,-CAT,+COMP,-ARG,+INT]
Assign (+N,-CAT,-ARG,+NOM) to [+N,-CAT,+ARG]
Assign [uphi˜] to [-N,-V,-CAT,-COMP,-INVIS]
Assign (-N,-V,-CAT,-COMP,-INVIS) to [-CAT,+COMP]
Assign (+N,+LOW) to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,-FEAT]
Stop - English
Divide [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT] into [FOCUS]
Assign [vfoc] to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT,+FOCUS]
Assign [vdeg] to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT,-FOCUS]
Divide [-N,-V,-CAT,-COMP,-INVIS] into [Q]
Divide [-N,-V,-CAT,-COMP,-INVIS] into [FINAL]
Divide [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL] into [PHON]
Divide [-N,-V,-CAT,-COMP] into [WHOP]
Divide [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL] into [A]
Assign [vt] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A]
Divide [-CAT] into [C]
Assign [vsc] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-A]
Assign [vfin] to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign () to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Assign (-N,+V) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A]
Assign (+N,+CAT) to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-N,-V,+CAT) to [-N,+V,-CAT]
Assign [unoun] to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-CAT,+ARG) to [-N,+V,+CAT]
Assign (+N,-CAT,-COMP,+ARG,-WH) to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign [uwhq˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL]
Assign (+N,-CAT,-ARG,+NOM) to [+N,-CAT,+ARG]
Assign [uphi] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A]
Assign [ufoc˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A]
Assign [udeg˜] to [-N,-V,-CAT,-COMP,-INVIS,+WHOP]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q) to [-N,-V,-CAT,+COMP,-ARG,+INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL) to [-N,-V,-CAT,-COMP,+WHOP]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL) to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+A) to [-N,-V,-CAT,+COMP,-ARG,-INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,+A]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A) to [-CAT,+C]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-A) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A]
Assign [ut˜] to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign [usc˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,+A]
Stop - BSL2
Divide [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL] into [A]
Assign [vt] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,+A]
Divide [-CAT] into [C]
Divide [-N,-V,-CAT,-COMP] into [C]
Divide [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-LOG] into [D]
Divide [-N,-V,-CAT,-COMP,-INVIS,-FINAL,-LOG,-C] into [W]
Divide [-N,-V,-CAT,-COMP,-INVIS,-LOG,-C] into [X]
Divide [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-LOG] into [Y]
Assign [vsc] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-LOG,-Y]
Assign [vfin] to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign () to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Assign (-N,+V) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-LOG,-C,+X]
Assign (+N,+CAT) to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-N,-V,+CAT) to [-N,+V,-CAT]
Assign [unoun] to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-CAT,+ARG) to [-N,+V,+CAT]
Assign (+N,-CAT,-COMP,+ARG,-WH) to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign [uwhq˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL]
Assign (+N,-CAT,-ARG,+NOM) to [+N,-CAT,+ARG]
Assign [uphi] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-LOG,-C,+X]
Assign [ufoc˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-LOG,+D]
Assign [udeg˜] to [-N,-V,-CAT,-COMP,-INVIS,-FINAL,+DEGR]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q) to [-N,-V,-CAT,+COMP,-ARG,+INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL) to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+DEGR) to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,-FEAT,-LOG]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+A) to [-N,-V,-CAT,+COMP,-ARG,-INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,+A]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR,+A) to [-N,-V,-CAT,+C]
Assign [ut˜] to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,+LOG) to [-N,-V,-CAT,-COMP,-INVIS,-FINAL,-LOG,-C,+W]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-A,-LOG,-D) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,-A]
Assign (-N,-V,-CAT,-COMP,-INVIS,-LOG,-C,+X) to [-N,-V,-CAT,-COMP,+LOG]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-LOG,+Y) to [+N,-CAT,+COMP]
Assign [usc˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+PHON,+A]
Stop - BSL1
Divide [-N,-V,-CAT,-COMP,-INVIS,-FINAL] into [DEGR]
Assign [vt] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR]
Divide [-N,-V,-CAT,-COMP,-INVIS] into [E]
Divide [-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR] into [B]
Divide [-CAT] into [C]
Assign () to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Assign (-N,+V) to [-N,-V,-CAT,-COMP,-INVIS,-Q,-C]
Assign (+N,+CAT) to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-N,-V,+CAT) to [-N,+V,-CAT]
Assign [unoun] to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-CAT,+ARG) to [-N,+V,+CAT]
Assign (+N,-CAT,-COMP,+ARG,-WH) to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign [uwhq˜] to [-N,-V,-CAT,-COMP,-INVIS,+E]
Assign (+N,-CAT,-ARG,+NOM) to [+N,-CAT,+ARG]
Assign [uphi] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-C]
Assign [ufoc˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,+C]
Assign [udeg˜] to [-N,-V,-CAT,-COMP,-INVIS,-FINAL,+DEGR]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q) to [-N,-V,-CAT,+COMP,-ARG,+INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL) to [-N,-V,-CAT,+COMP,-ARG,-INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL) to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR) to [-CAT,+C]
Assign [ut˜] to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q,+E) to [-N,-V,-CAT,-COMP,-INVIS,+Q,-FINAL,+DEGR]
Assign (-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR,+B) to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,-FEAT]
Stop - ASL
Divide [-N,-V,-CAT,-COMP,-INVIS] into [C]
Divide [-N,-V,-CAT,-COMP,-INVIS,-Q,-E] into [D]
Divide [-CAT,+COMP] into [SUB]
Divide [-N,-V,-CAT,-COMP,-INVIS] into [Z]
Assign () to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,+FEAT]
Assign (-N,+V) to [-N,-V,-CAT,-COMP,-INVIS,-C,-Z]
Assign (+N,+CAT) to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-N,-V,+CAT) to [-N,+V,-CAT]
Assign [unoun] to [+N,-CAT,-COMP,-ARG,+NOM]
Assign (-CAT,+ARG) to [-N,+V,+CAT]
Assign (+N,-CAT,-COMP,+ARG,-WH) to [-N,-V,-CAT,-COMP,+INVIS,+EXCL]
Assign [uwhq˜] to [-N,-V,-CAT,-COMP,-INVIS,+E]
Assign (+N,-CAT,-ARG,+NOM) to [+N,-CAT,+ARG]
Assign [uphi] to [-N,-V,-CAT,-COMP,-INVIS,-C,-Z]
Assign [ufoc˜] to [-N,-V,-CAT,-COMP,-INVIS,-Q,-E,+D]
Assign [udeg˜] to [-N,-V,-CAT,-COMP,-INVIS,-FINAL,+DEGR]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q,-FINAL) to [-N,-V,-CAT,+COMP,-ARG,+INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL) to [-N,-V,-CAT,+COMP,-ARG,-INT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,+FINAL) to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON) to [-CAT,+COMP,+SUB]
Assign (-N,-V,-CAT,-COMP,-INVIS,+Q,-FINAL,-DEGR) to [-N,-V,-CAT,-COMP,-INVIS,+Q,-FINAL,+DEGR]
Assign (-N,-V,-CAT,-COMP,-INVIS,-Q,-FINAL,-PHON,-DEGR) to [-N,-V,-CAT,-COMP,-INVIS,+C]
Assign [ut˜] to [-N,-V,-CAT,-COMP,-INVIS,+Q,+FINAL]
Assign (-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR,+B) to [-N,-V,-CAT,-COMP,+INVIS,-EXCL,-FEAT]
Assign (-N,-V,-CAT,-COMP,-INVIS,-FINAL,-DEGR,-E,+B) to [-N,-V,-CAT,-COMP,-INVIS,-Q,+Z]
Stop - LSB

10.6 Conclusion.

This chapter has provided a demonstration of the lexicocentric parameterisation of focus expression. This was accomplished by the construction of sets of specified heads corresponding to each variety, followed by the determination of algorithmic inputs corresponding to each of these fragments, allowing the resulting acquisitional trajectories to be compared in a tree. The compositional approach to focus constructions taken in part II was necessary for the determination of the heads in these fragments, and the formal algorithm of part I was sufficient for their acquisition. As such, this chapter represents a case for the approaches to focus and to parameterisation that are developed in this thesis.

As noted throughout the chapter, many assumptions and simplifications were required to arrive at the specific analyses presented here. As a result, they doubtless have many problems, and would be vastly improved by further research. However, their qualified success can be seen as an argument for the compositional analysis of focus constructions, and for emergent, algorithmic acquisition of lexicocentric parameters.

General Conclusion.

This thesis began with the following questions:

(i) How should parameters be approached from a minimalist perspective?

(ii) How can we account for the vast range of variation in focus expression without resorting to the notion of construction?

Part I answers question (i) with the proposal of a domain-general algorithm that categorises heads in the lexicon, and distributes features over these categories. This retains the lexicocentric notion of parameter without introducing significant domain-specific machinery, and so satisfies minimalist goals. However, it also provides a potential explanation for the existence of structure in typological and diachronic variation, and so is more empirically viable than a vanilla lexicocentric approach. Part II also suggests a lexicocentric answer to question (ii): focus constructions simply consist of combinations of heads, whose syntactic and semantic specifications may vary and combine in a multitude of ways to produce the diversity seen. Nevertheless, it is not always straightforward to discover these heads, and so I suggest that describing focus constructions as relating expressions to their alternatives can provide a window into their compositional syntactic structure.

However, these answers are far from final. Throughout the thesis, I have attempted to make my claims as explicit as possible in the hope that this may aid later refinement. For instance, the algorithm of part I is incomplete in two respects. Firstly, the inputs it takes already have considerable structure, and so a superior algorithm would extract such representations from more basic data. Secondly, its outputs do not encode all aspects of syntactic machinery, and so it could be improved to assign e.g. feature values and thematic properties. Moreover, aside from some brief considerations in 2.3, the algorithm was largely considered in relation to syntax, and so its applicability to other domains remains an interesting question. The acquisition of semantic and conceptual structure is arguably most important in relation to current concerns, given the key role that such properties play in focus constructions.

The analysis of focus itself can also be refined in many ways – for instance, a better range of diagnostic tests is clearly required to identify specific types of focus. Furthermore, though I have suggested compositional analyses of a few constructions, these analyses would be improved with further formalism, and there remain countless more constructions to investigate. A deeper question can also be asked: what is the range of possible meanings expressible through focus? Finally, the algorithm can also be used to investigate parametric variation beyond the realm of focus, providing new avenues for exploration and explanation.

This approach paints a picture of variation that is highly complex, with the already complex fragment grammars of part III representing only a tiny fraction of the full range of heads and specifications necessary to describe a single language. But this complexity is not innate, but emergent, arising through the combination of powerful domain-general learning processes with an underspecified language faculty. Though it may make the task harder for the linguist, if language truly is a discrete biological system, then we should expect it to show just as much complexity as other such systems exhibit (e.g. Jerne 1993, Fisher 2006). I therefore take the intricacy of the preliminary analyses in chapter 10 to be a good sign.

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