

An Information-based Theory of Topics
and Grammatical Relations

Howard Gregory

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An Information-based Theory of Topics and Grammatical Relations

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in partial fulfilment of the requirements for the degree of
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On a personal note, I always hoped that my Linguistics course would be academically rewarding, but I never expected five years in London to be actually enjoyable (especially after many years in warmer and more exotic places). The fact that they have been is due very largely to the friendly and international character of the SOAS community. I cannot begin to name all those who have shared with me more than languages and made my time here memorable, but they know who they are and how much they mean to me.

In memory of my mother, Margaret Gregory

List of Abbreviations and Symbols

$\mathbf{2}$	The 2-element Boolean algebra
$\mathbf{4}$	The 4-element set of truth combinations (the powerset of $\mathbf{2}$)
$F_{A/B}$, or A^B	The functions from a type B to a type A
$H_{A/B}$	The homomorphisms from a type B to a type A
P_n	The category of n place predicates
T_C	The type for a syntactic category C
T_{P_n}	The type for n place predicates
$\mathcal{P}S$, pow S	The powerset of a set S
powpow S	The powpower set of a set S
ΩX	A topology (set of opens) on set of points X
σ	The semantic content of a (saturated) soa
ψ	The semantic content of an almost saturated psoa
\sqsubseteq	subsumes
\leq	precedes (in some arbitrary partial order)
\Rightarrow	informationally includes (= "logically entails" for objects of type t)
\models	supports
$:=$	is defined as
$>$	is partitioned into (used in type declarations)
\leftarrow	An operator describing dependency between variables (page 155)
\preceq	The "topic binding" relation (page 169)
Abs	Absolutive Case (in Ergative languages)
Acc	Accusative Case
AGR	Agreement
AK4	the approximation Kleene algebra on $\mathbf{4}$
APG	Arc Pair Grammar
BA	Boolean Algebra

CHÔ	Chomeur
CLD	Clitic Doubling
(CL)LD	(Clitic) Left Dislocation
(CL)RD	(Clitic) Right Dislocation
Cond	Conditional
Cop	Copula
CWG	Continental West Germanic
Dat	Dative Case
DO	Direct Object
DOC	Double Object Construction
Erg	Ergative Case (in Ergative languages)
FOC	(Contrastive) Focus
FOL	First Order Logic
Fut	Future tense
Gen	Genitive Case
GB	Government and Binding (or the "Principles and Parameters" framework)
glb	greatest lower bound
GP	Government Phonology
GQ(T)	Generalized Quantifier (Theory)
GR	Grammatical Relation (= "Grammatical Function" in LFG)
HA	Heyting Algebra
ISc	Insular Scandinavian
IO	Indirect Object
LC	Law of Contradiction
LEM	Law of the Excluded Middle
LFG	Lexical Functional Grammar
LI	Linguistic Inquiry (journal)

LK4	the logical Kleene algebra on 4
ME	Modern English
MRS	Minimal Recursion Semantics
MSc	Mainland Scandinavian
MW	measure word / noun classifier
lub	least upper bound
NLLT	Natural Language and Linguistic Theory (journal)
Nom	Nominative Case
Obj	Objective Case
OBL _{θ}	Oblique GR (with suitable θ role)
OE	Old English
PART	particle
Perf	Perfect Tense
Pfv	Perfective (Aspect)
poset	partially ordered set
PPP	perfect / passive participle
(p)soa	(parametrized) state of affairs
pt X	the points of a topological system X
QNP	Quantified Noun Phrase
QUE	Questioned constituent
REL	Relativized constituent
RG	Relational Grammar
RH	Relational Hierarchy
SOR	Subject to Object Raising (= "Exceptional Case Marking" in GB Theory)
SSR	Subject to Subject Raising
SUBJ	Subject
TMCL	Tobler-Mussafia clitic

TOP Topic

WCL Wackernagel clitic

Some frequently-used citations

A&W Ackerman and Webelhuth [3]

B&E Barwise and Etchemendy [26]

B&M Bresnan and Mchombo [52]

B&P Barwise and Perry [28]

H&P Holmberg and Platzack [152]

J&P Johnson and Postal [174]

K&C Keenan and Comrie [185]

K&F Keenan and Faltz [186]

L&P Lappin and Pollard [218]

L&R Levin and Rappaport [223, 224]

P&P Perlmutter and Postal (various)

P&S Pollard and Sag [265]

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Abstract

This dissertation proposes a formal semantic characterization of topichood and an account of the relationship between Topic and core Grammatical Relations. The theoretical framework employed is a form of HPSG (Pollard & Sag (1994)).

The notion of Topic has been widely invoked in descriptions both of sentence structure and of intersentential discourse relations. Despite this a formal characterization of this notion is lacking in the literature. It is proposed here that Topics should be seen as predication targets at an underlying semantic level, and that the Topic-Comment relation is analogous to that between possible worlds (situations) and the propositional contents which they support. A Topic is interpreted as a point whose location has to be fixed in some conceptual space formed by the Comments, and this metaphor is extended to the overall Topic of a discourse sequence. Formally, it is suggested that Topics and Comments can be treated as the points and open sets respectively of a topological space. It is claimed that this captures well-known semantic restrictions on which NPs can be made Topics of a sentence. The proposed treatment is also extended to intersentential Topic relations.

This account of Topics is made the basis of a revision to the relational hierarchy, which underlies many relational theories of grammar. It is proposed that basic predicates in language are maximally binary and sensitive to topichood, their initial Subject being the default predication target or Topic. Predicates of greater valency are treated as composite, and the effects of the relational hierarchy are derived from rules governing the process of composition. A number of cross-linguistic phenomena are examined which bear on the relationship between Topics and core Grammatical Relations, including the double Subject constructions characteristic of Japanese and other East Asian languages, the clitic doubling of Objects which is an areal phenomenon of the Balkans, and the so called "Object agreement" of Amharic. Finally a chapter is devoted to the nature of Indirect Objects, which are argued (against standard views) to rank above Direct Objects. It is claimed that with this approach an important part of the relational basis of syntax can be derived, without losing descriptive accuracy, from the proposed treatment of predication.

Chapter 1

Introduction

1.1 Grammatical Relations

This dissertation takes its starting point from the centrality of Grammatical Relations in characterizing the structure of a language - in a sense a traditional insight, but one which might be said to have been rediscovered in the context of modern linguistics by Relational Grammar in the 1970s (Perlmutter, Perlmutter and Rosen [253, 259]). Work in this framework, and others influenced by it¹, has contended that it is more revealing to describe a variety of syntactic phenomena in terms of operations on Grammatical Relations (GRs) than in terms of transformations on strings or on constituent structure trees. This view, though not uncontroversial, will be assumed without argument in most of what follows, just as the opposite assumption is often made in other work.

Although a few things will be said about the mapping between GRs and phrase structure, this question will not actually be the main focus of interest. It is common within the Relational Grammar tradition to see GRs as syntactic primitives, and for many purposes this may be justifiable. Nonetheless it is also possible to see them as mediating between phrase structure on the one hand and semantic predicate-argument structure on the other², and from this point of view the

¹cf. especially LFG (Bresnan [48]), HPSG (P&S [264, 265]).

²See for example Perlmutter [254], Bresnan [48], Wechsler [319], Ackerman and Webelhuth [3]. In Categorical Grammar, too, GRs are defined semantically, in terms of the order of application of functions; this approach, in a modified form, also plays a role in the present theory.

possibility that they may have a semantic or informational basis is one which keeps recurring in different forms. It is the latter side of the equation - the semantic face of Grammatical Relations - that will be the primary concern of this thesis.

The basic classification of GRs, and the terminology adopted, will largely follow that used in Relational Grammar and its more formalized descendant Arc Pair Grammar, the whole account of GRs being embedded in the more comprehensive typed feature structure formalism of Head-driven Phrase Structure Grammar (HPSG). The framework will be presented formally in Chapter 2.1 below, but an informal introduction may be appropriate here.

Although I will not be formally working within Relational Grammar, the latter framework, with its high level of abstraction, provides a convenient vocabulary for discussing a number of phenomena, and I will make considerable use of it especially when I do not wish to get embroiled in theory-specific issues (such as the polemic between derivational and constraint-based formalisms). This applies particularly in this opening chapter.

The domain of enquiry consists of linguistic objects of various types, each type having various attributes or properties which may involve a specified relation to other objects. Take for example the clause as a basic type of linguistic object. It has a number of properties, each of which may be specified in relation to some other object - often, though not necessarily, a syntactic sub-part of the clause (a constituent). For example it has a predicate, information about which will be provided by looking at the appropriate subpart (say the main verb); this verb is said to bear the GR "predicate_of" relative to the clause³. Each other immediate constituent of the clause similarly bears a particular GR relative to the clause⁴, and the constituents themselves may be so analyzed in turn until an "atomic" object is reached which cannot be further analyzed (or where further analysis is not considered useful).

In Relational Grammar itself the GRs have, besides their label (subject_of, etc.), an additional parameter for the **stratum** in which the relation holds between two objects; the model is a multi-

³This relation is actually a function, as made clear in the Attribute-Value formalisms of LFG and HPSG.

⁴Note that Relational Grammar does not normally assume the VP as a single linguistic object, though this can easily be accommodated in this framework if desired (for configurational languages).

stratal one in which a change in GRs between strata is the main resource for capturing what in GB-based theories (Chomsky [65]) are modelled by transformations. In Passivization, for example, a constituent which bears the GR Direct Object in one stratum (say c_i) bears the GR Subject in the next stratum (c_{i+1}). Strata are numbered from an initial stratum c_1 , reflecting the thematic structure of the predicate, to a final stratum c_n which reflects the surface syntax.

Although in principle the whole range of linguistic information is modelled in this way, the GRs of interest here are the predicate GR and the various argument GRs (“nominal GRs” in Relational Grammar). An inventory of these will be given in Chapter 2.1, and the principled differences in semantic interpretation between the two will be discussed in 3.

Among argument GRs it is important to distinguish - as different generative theories do in different ways - between GRs like Subject and Direct Object on the one hand, and GRs like Topic and Focus on the other. The normal approach to this difference is perhaps most aptly summarized by the terminology used in Relational Grammar, where the former are referred to as “core relations” and the latter as “overlay relations”. In Relational Grammar itself core relations are assigned (and permuted if necessary) in the earlier numbered strata, while overlay relations are added in the final strata. The assignments in the first stratum, which are related to thematic structure⁵, are known as “initial GRs”; overlay relations cannot be assigned in this stratum. The GB tradition too reflects the idea that core relations are more basic while overlay relations are superimposed at some later stage of a derivation. In the configurational encoding characteristic of GB, the positions corresponding to core relations are (in general) where an argument is base-generated and receives a thematic role from the predicate, or else to which it is moved by operations which are (at least classically) motivated largely by thematic properties of the predicate (e.g. inability to assign an external θ -role). The positions corresponding to overlay relations, by contrast, are generated by functional heads representing information which is independent of the θ -assigning

⁵See Perlmutter [254], Rosen [274] for debate within Relational Grammar as to whether they can be directly mapped from thematic roles. More recent approaches tend to support Perlmutter's original intuition that *given a suitable characterization of which semantic features are significant* (which Perlmutter did not have at his disposal), the assignment of initial GRs should be assumed to have a semantic basis. At present there is no universally accepted theory, but I take Tenny [306], Levin and Rappaport [224] and Wechsler [319] as representing significant steps towards providing such a characterization.

head (such as discourse information or “information structure”).

The view of semantics underlying this architecture is that the lexical meaning of the predicate is a relation with one or more argument-places (corresponding to roles to be assigned) - as, for example, in a formula of first order logic. The order of arguments is not intrinsically important, and there is no obvious notion of topic-focus structure associated with it. If the latter notion is desired, it has to be superimposed by various dynamic additions to the semantic theory. Some current approaches to doing this will be discussed below; they have in common that in one way or another they locate topic-focus structure in the process by which the semantic structure for a sentence is obtained, i.e. outside this semantic structure itself.

Starting from the premisses just described, this approach is reasonable and perhaps the only viable one. However there is an alternative to the Fregean notion of a predicate, one which is rather closer to the idea of predicate in traditional philology, but which has also been investigated by the Prague School and was brought back to prominence in generative linguistics in a seminal article by Kuroda [207]. In what follows I wish to suggest that this, or a development of it, can provide a semantics for topichood which does justice to both the declarative and processing aspects of the meaning of a predication. This idea will be elaborated in section 1.2 below.

Following Kuroda I distinguish between affirmations which have a notional Subject and those which do not (**categorical** and **thetic** judgements respectively in the terminology of the Prague School). To take Kuroda’s examples (1.1), 1 is a thetic judgement, comprising an act of recognition of an event type, while 2 is a categorical judgement, recognizing the relation of an event type to a previously fixed individual, which is marked with the Topic marker *wa*:

(1.1) 1. **Thetic** judgement

Inu ga neko o oikatete iru. (Japanese)
 dog NOM cat ACC chasing is
 The dog is chasing the cat. (Look - the dog’s chasing the cat)

2. **Categorical** judgement

Inu wa neko o oikatete iru. (Japanese)
 dog TOP cat ACC chasing is

The dog is chasing the cat. (The dog - he's chasing the cat)

In this example the notional Subject, where there is one, is also the grammatical Subject (the default situation in many languages). However it is clear, as will be discussed below, that the two do not always co-incide, and I will in fact identify Kuroda's "notional Subject" with Topic⁶. Thetic judgements do not have a Topic, in the normal sense of an NP, but the situation being described can itself be regarded as performing an analogous function⁷.

This idea of predication makes possible a different approach to core and overlay GRs. This is because on this view not all the arguments represented in the thematic valency of the verb are predication targets (indeed it is possible that none of them are, as in the case of thetic judgements). Assuming that predication is an integral part of the semantics of a clause, this means that the latter can no longer simply be read off the initial stratum of GRs. The "overlay relations" contribute to intraclausal semantics (through predication), as well as its integration into the interclausal context.

In the next section I examine the controversial overlay relations of Topic and Focus in more detail, before returning to the question of their integration into the theory of core GRs in section 1.3.

1.2 Topic and Focus

At the core of this thesis is thus a proposal for a formal semantics of Topichood, and an attempt to connect this with Grammatical Relations within the clause, as well as with certain intersentential phenomena. The formal theory will be presented in Chapter 4.

Chafe [62] draws attention to the lack of rigorous definition of the idea of Topic, the title of his article highlighting the many different factors that are often invoked in this connection. While he may have helped towards his main objective of "clearing the air of proliferating obfuscation", it

⁶Kuroda eschews this term as too vague - a question which is to be addressed in the next section.

⁷Shir [104, p.26] describes these as "stage topics", which has the advantage of exploiting their association with "stage level" predicates. Only stage-level predicates can have stage topics. (However the converse is not true, so the association can be misleading). In any case my present purpose is rather different from Shir's, and I retain "situations" as the relevant term, because of its importance in the formal semantics I will be using.

could be said that a positive formal account of Topic is little nearer now than it was then⁸. This may be because, as has been suggested, this notion is not amenable to formal semantic definition - in which case the leading idea of this thesis is simply misguided. However, the attempt to find a model-theoretic basis for Topic-Focus structure may be defended, at least *prima facie*, by the following considerations.

First, sentences differing only in topic-focus structure are known to have different truth conditions in the presence of certain focus-sensitive elements such as *only*. For example the following contrast occurs in the presence of focus intonation (Rooth [273]). (Assume a domain including *john, kaiti, lena, mary*).

- (1.2) 1. John only introduced *Lena* to Mary. - *false* if John introduced Kaiti to Mary.
 2. John only introduced Lena to *Mary*. - *false* if John introduced Lena to Kaiti.

However, the same contrast is also forced when one of the non-subject NPs is topicalized in the syntax (hence constraining which elements can be construed as Focus):

- (1.3) 1. Mary John only introduced Lena to. - *false* if introduce(j,k,m)
 2. Lena John only introduced to Mary. - *false* if introduce(j,l,k)

Truth-conditional differences are also apparent in contexts where situations or events are quantified over by adverbs or modals (Chierchia [63], Rooth [273]).

- (1.4) 1. Doctors always examine patients. (False if a doctor fails to examine a patient)
 2. *Doctors* always examine patients. (False if a patient is examined by a nurse)

- (1.5) 1. Dogs must be carried.⁹

⁸I am referring to the provision of a principled denotational semantics, not the specification of algorithms for particular computational processes. A popular example of the latter is Centering Theory (Grosz et al. [131]), which formalizes the idea of (transitions between) attentional states but without elaborating on the semantic interpretation of the entities used.

⁹This well known example is due to Halliday [134]. Sperber and Wilson discuss it as an example of a pragmatic contrast [298]. Nonetheless it seems hard to deny that there are different types of counter-examples (situations where the modal is not satisfied) in the two cases, which is a truth-conditional difference. Thus a person not wearing shoes will be a counter-example to the state of affairs prescribed by the second sentence, while a person not carrying a dog will not be a counter-example to the first. The force of the Topic status of *dog* in the first can actually be partly characterized by making it the antecedent of a conditional (see chapter 5 below), thus capturing the contrast semantically. I do not question that pragmatics is involved in obtaining the interpretations.

2. *Shoes* must be worn.

A similar argument is provided by generics. (If generics are treated as implicit quantification, then it collapses into the same argument). The example below is from Pinker [261].¹⁰

- (1.6) 1. Beavers build *dams*. (*true*)
 2. Dams are built by *beavers*. (*generally false*)

Finally, the truth-conditional evaluation of a sentence can be problematic if a Topic fails to refer, whereas this is not the case for a non-Topic. Since this example is directly relevant to this thesis, this will be discussed in more detail in Chapter 4. Briefly, however, for the first two sentences of (1.7), it is debated whether the truth value is false or undefined (I will be following Strawson [302] in claiming that it is undefined). The other two sentences, where “the King of France” is a non-Topic, are straightforwardly false.

- (1.7) 1. The King of France visited the *Pope* at the Vatican.
 2. The King of France the Pope received at the Vatican.
 3. The Pope received *the King of France* at the Vatican.
 4. The Pope *the King of France* visited at the Vatican.

I conclude that there is scope for a formal semantic interpretation of Topic-Focus structure. However one major obstacle is the lack of agreement in classifying the phenomena and in the terminology used. The remainder of this section will be devoted to clarifying what I understand by Topic (and incidentally by Focus). Chafe draws attention to the association between Topics and five related concepts: *givenness, contrastiveness, definiteness, subjects, and points of view*. This will provide a convenient place to start the discussion.

The relationship of Topics to Subjects is an old insight. First it has to be recognized that Subject, as a descriptive term, has been used in at least three clearly distinct senses, which it is convenient to distinguish using the terminology of Relational Grammar. (i) First it can refer

¹⁰I assume the main effect of passivization in this example is to change the Topic.

to the “grammatical subject” - in RG terms the constituent which bears the Subject GR in the final stratum and hence enjoys a number of grammatical privileges. (ii) Second it can refer to the “logical subject”¹¹, the bearer of the same GR in the initial stratum, which has also a close relationship to the semantic role of Agent or Actor¹². (iii) Finally it can also be used of what is referred to as a “psychological” or “notional subject”, and it is in this sense that it is very close to the modern linguistic notion of a Topic.

Chafe himself picks up the traditional idea of “aboutness” being the key characteristic of a Subject; clearly here he is talking about the third sense of Subject listed above, and he develops the idea along lines which have been productive in more recent work but generally in connection with Topic; it is the “hitching post” [62, p.44] to which new knowledge is to be attached (a metaphor replaced in later work by file-cards), and is the key element in what as far as I know is the first theory of “packaging”. Clearly this cannot refer to any of the other ideas of Subject, as the nominal which plays this role can be an initial (or even final) Object - or, as in the case of “hanging topics” in East Asian languages, appears to be outside the thematic structure of the verb all together.

The Topic of a sentence is thus, from one point of view, exactly what is often referred to as the “notional Subject” (Marty [229], Kuroda [207], Rothstein [275], Kiss [192]). However, clearly this is a *semantic* notion, while Topic was introduced above as a *Grammatical Relation* (GR) borne by a particular constituent of a sentence. Just as the interface between Initial Subjects and thematic roles has prompted intense empirical investigation, the same is required for the empirical relationship between the GR Topic and the semantic notion of Topic which will be defended here. Some of these empirical issues will be discussed in later chapters. However, I give some examples of the cross-linguistic range of grammatical phenomena which are normally treated as instances of Topic (and will be so treated here). In the English examples, the constituent assumed to bear

¹¹This use of the phrase goes back to the early work of Chomsky. The uneasy conflation of syntactic and semantic levels implied by this terminology has often been pointed out in the literature, and it will be avoided in the rest of this thesis in favour of “Initial Subject”. In a similar context Bresnan [50] points out problems with the assumption that syntax should show any kind of isomorphism with the logical structure assumed in first order predicate-argument representations.

¹²Throughout this work, thematic labels of this kind are used purely descriptively and are given no theoretical status.

the GR Topic is italicised.¹³

(1.8) Topicalization:

The difficult, we do at once.

(1.9) Left Dislocation:

Mary, we saw her sunbathing the other day.

(1.10) Clitic Left Dislocation:

tin kopela tin-kseroume. **Greek**
 the,Acc girl,Acc CL,Acc,f-know,1pl
The girl, we know.

(1.11) Right Dislocation:

I told him, *the idiot*.

(1.12) Hanging Topic ("Nominativus pendens"¹⁴):

Yama wa ki ga kirei desu. **Japanese**
 mountain Top tree Nom beautiful Cop
The mountains - the trees are beautiful. (In the mountains the trees are beautiful).

These examples illustrate some of the syntactic and semantic issues that will arise. First, Topics tend to occur at the periphery; normally the left periphery. I will also examine the possibility of having *in situ* Topics, just as many languages have *in situ* WhP's, with the relevant semantic dependency being treated as a non-local dependency separate from that which characterizes extraction.

The relation of Topics to other elements which can occur on the left periphery, especially certain adverbials, also requires clarification.

¹³Note that commas have been used, sometimes contrary to normal English conventions of punctuation, to indicate the characteristic intonation contour of the end of a Topic phrase (Jackendoff's [162] "B-accent" - a falling-rising contour, followed by a slight pause).

¹⁴This traditional name is, of course, rather misplaced in the present context. In Japanese the Topic marker contrasts with Nominative Case.

The other issue raised here is the relationship between the Topic and the argument-structure of the Comment. In (1.8), the topicalized constituent fills one role assigned by the predicate, by means of a straightforward non-local dependency in the syntax. In (1.12), the Comment is a complete proposition and there is no unsaturated role for the Topic to fill. Nonetheless, as will become clear, the relationship between the Topic and the argument-structure of the Comment is not free; it is subject to semantic constraints, which I attempt to specify and to characterize in a unified manner. In the other examples the relevant argument slot is filled by what appears to be a pronoun (uncontroversially in the English cases), with whose referent that of the Topic is identified.

Before continuing, some of the alternative proposals for a semantic characterization of topichood will be briefly discussed. The first is the characterization of Topics as “old information”, the inadequacy of which is already discussed by Chafe. The intuition, of course, is that in a sentence like (1.13), the unmarked interpretation is that new information is being offered about an already-known entity.

(1.13) Mary is wearing *a new coat*.

While one might suppose that the *information* offered by the “comment” part of the sentence is new¹⁵, even this part of the sentence can equally include references to known objects - as, for example, in the minimally different (1.14). The example in (2), due to Chafe, makes the point more vividly. We can assume that the referent of “your wife” is known to the speaker and especially to the listener.

(1.14) Mary is wearing *her new coat*.

(1.15) I saw *your wife* at the party.

The effect of this is surely to undermine the usefulness of the given-new opposition, at least in this simple form, in characterizing Topics. In fact it is possible to go further. The examples in

¹⁵Though even this is simplistic, given the wide range of communicative functions that can be performed by a sentence of this type.

(1.16) are of a type much discussed in Jackendoff's work on cognitive semantics [163, 164, 165]. They describe the location of the referent of the Subject with respect to a fixed reference point. The Subject is clearly also the Topic; but crucially, it is the Object, or prepositional Object, that has to be a known (and salient) entity for the sentence to convey information.

- (1.16) 1. The plane is at the end of *the runway*.
2. The submarine is off *Land's End*.
3. The space probe is orbiting *Saturn*.

The traditional model invoking old and new information will be replaced here by a completely different model, for which the sentences in (1.16) can be thought of as paradigmatic. The Topic can be thought of not as "given" information but as the object of enquiry, whose location in a given conceptual space is to be defined by the Comment. In these terms it is the latter, and not the former, that provides a fixed frame of reference¹⁶. It is helpful here to think in terms of the denotations of Comments as being sets, and the meaning constraints on these Comments (for example informational containment) being set-theoretic relations such as the subset relation. The Topic can then be thought of as denoting a point whose location in this space is to be pinned down.

To change the visual image slightly, the sets can be thought of as a grid onto which the point represented by the Topic is to be plotted. (The two-dimensional image of a grid is perhaps easiest to visualize). For example the rational numbers arranged on two axes can be used to construct such a grid for a plane, with reference to which the position of any point on the plane can be pinned down with a greater or lesser degree of accuracy. Note that the absolute location of such a point is never assumed to be known; it is only **approximated** by the information in the grid. To use a metaphor which goes back to Wittgenstein, the grid is like a net, with different sized meshes, in which information about the world can be caught but the world itself always slips through (Landman [210, p.19]). In Topology such a grid is known as a **basis** [295, p.99f], and is used for

¹⁶At least it will be assumed for the present to be "fixed", though the possibility of changing it during discourse will be brought up later.

“catching” real numbers, or in this case real points on a plane. It will be necessary to construct a similar basis out of propositions or observations to catch Topics. This will be described in later chapters.

Another important notion often connected with Topic is that of *contrast*. Topicalization in English is said to be contrastive, and it may be accepted that this is normally (though not always) so. Likewise one of the two main uses of the Japanese topic marker *wa* is to signal contrast (Kuno [204], Clancy and Downing [70], Iwasaki [161], Ueno [313]). “Hanging topics” and post-topics, on the other hand, never seem to be contrastive.

There is however scope for confusion here, because contrastiveness is also a characteristic of a certain type of focus (“contrastive” as opposed to “presentational” focus)¹⁷. My usage of these terms will be as follows. Presentational focus simply designates that part of the sentence which is not Topic, as described above. By default (notably when the Subject is Topic), the VP is often marked by focus intonation at its right edge (cf. Jackendoff [162]). In a “thetic judgement” the whole sentence may form a single intonational domain with the same focus intonation. Presentational focus is discourse-neutral, in the sense that it is not assumed to be the answer to a question or to be excluding any particular alternatives (and its intonation, though having the contour described, is free of any “marked” emphasis). The use of the word “focus” here is thus possibly misleading, deriving perhaps chiefly from the traditional perception that Topic and Focus are complements and that therefore whatever is not Topic is “Focus”.

Contrastive focus I take to be assigned to a constituent which is the answer to a Wh question or which is replacing an alternative, say as a correction. When a VP-final constituent is focussed in this way, the resulting intonation is similar to that described in the preceding paragraph¹⁸, though when another constituent is focussed (as in (1.17.1), the intonation is clearly distinct. In English the semantic effect is roughly equivalent to that of clefting¹⁹:

¹⁷Chafe's own discussion of contrastiveness seems entirely devoted to what I would claim are examples of focus.

¹⁸Jackendoff [162] associates focus with a characteristic falling intonation (A-accent), which is assigned as a phonological feature and passed up, in this case, to the VP node, while the associated semantic feature affects only the interpretation of the relevant sub-constituent.

¹⁹In English, the semantic effect of contrastive focus based on intonation alone is said to be weaker than that of clefting. The similarity is perhaps closer for contrastive focus associated with a particular focus position (Rooth

- (1.17) 1. *Mary* ate your chocolates.
2. It was *Mary* who ate your chocolates.
3. We were drinking *tomato juice*.
4. It was *tomato juice* (that) we were drinking.

Despite the apparent similarity between the two kinds of "Focus" there are many reasons, both syntactic and semantic, for distinguishing systematically between the two, and it may be questioned whether they should even be treated as a natural class. Semantically, NPs with weak determiners occur naturally with presentational focus (postverbally in "there" existential sentences for example), whereas NPs bearing contrastive focus normally have the function of identifying individuals, thus often requiring strong determiners (this idea will be discussed more formally later). Syntactically, it would seem that only contrastive focus can be associated with the characteristic focus position or focus markings in focus-oriented discourse-configurational languages.

Hungarian, for example, is well known as a language with a clearly defined "Focus position" immediately preceding the verb²⁰. However only constituents bearing contrastive Focus can appear in this position (Kiss [193, p.212-3]), while NPs in presentational focus (along with, for example, those that form part of Verb-Object idiom chunks) have to appear in the post-verbal field (in which they are claimed to be base-generated).

Focus in Greek is somewhat similar to Hungarian in this respect, the main exception being that the "movement" of an NP bearing contrastive Focus to pre-verbal position is optional²¹. The data in (1.18) show that in the discourse-neutral context which was claimed above to characterize presentational focus, appearance of the "focussed" NP in the pre-verbal Focus position is ungrammatical.

- (1.18) 1. Contrastive Focus

[273, p.296]).

²⁰The classic study of Focus in Hungarian is Horváth [155]. Brody, e.g. [55, 54], treats the Focus position as the Spec of a Focus Phrase (the verb raising to F⁰), while Kiss [193] argues that it is Spec VP. This will not be debated here in these terms, but the relationship between Focus and predicate-argument structure will be returned to later.

²¹For GB analyses of Focus in Greek along the lines of Brody's work on Hungarian, see Angouraki [16], Tsimpli [310]. For critical discussion see Tsipplakou [312, Ch.3].

- (a) *Meta ti idhate?*
 after what,Acc see,Past,2pl
 Then what did you see?
- (b) *Ena OUFO idhame / idhame ena OUFO*
 a,Acc UFO,Acc see,Past,1pl / see,Past,1pl a,Acc UFO,Acc
 We saw a UFO.

2. Presentational Focus

- (a) *Meta ti eyine?*
 after what,Nom happen,Past,3sg
 Then what happened?
- (b) *Idhame ena OUFO / * ena OUFO idhame.*
 see,Past,1pl a,Acc UFO,Acc / * a,Acc UFO,Acc see,Past,1pl
 We saw a UFO.

So having separated contrastive Focus from presentational Focus, how does contrastive Focus differ from contrastive Topic? And on the other hand, what is this property of “contrastiveness” that they have in common (and which leads to them being so often confused)?

As part of the characterization of Topic in Chapter 4, I propose a “semantics of contrast” based on possible worlds (the relationship between this and the use of topology will be discussed in due course). On this approach, Topics play the role of worlds (or situations), in that they set up a deictic context with respect to which the proposition represented by the Comment is evaluated. The effect of *contrast* arises from the partition of the set of worlds accessible at the point of evaluation. Thus the sentence in (1.19), with its two contrastive Topics, will be given the semantics suggested (informally) by the paraphrase.

(1.19) 1. *Mary* I like, but *her friends* I think are crazy.

2. The accessible individuals are partitioned into *mary* and *mary's_friends*, and considering one the proposition “I like this person” holds, and considering the other a proposition holds which entails “I don’t like this person”.

Topics have been compared to the protasis (antecedent) of conditional sentences (Haiman [133]), and it may be noted here that this possible-worlds semantics is close to one well-known

way of looking at conditionals. The example in (1.19) may be compared with the following analysis of a conditional sentence involving contrast:

- (1.20) 1. If the sun shines we will go punting, but if it rains we will stay in bed.
2. The accessible situations are partitioned into those in which the sun shines and those in which it rains. In the former one proposition holds, in the latter a contrasting (presumably incompatible) proposition.

Contrastive focus is not “contrastive” in quite the same way. It does not involve the simultaneous assertion of two contrasting propositions in worlds which are both accessible, but rather narrows down the possibilities, asserting one of a set of alternatives and excluding others so that they are no longer accessible. It could be said that while Topic opens up worlds (the effect of contrast arising in the particular case where it opens more than one), the function of Focus is to close them down. It is sometimes said that Focus is the complement of Topic, but from the present perspective it would seem to be not so much its complement as its inverse. Let us briefly look at how this can work in terms of the account of Topic suggested above.²²

The Topic-Comment sentences in (1.16) above, repeated as (1.21), were analyzed in terms of fixing the location of an object in space (the idea to be generalized to *conceptual* spaces).

- (1.21) 1. The plane is at the end of *the runway*.
2. The submarine is off *Land's End*.
3. The space probe is orbiting *Saturn*.

It is also possible to invert the problem, so that the presence of an object in a given location is known or suspected, but the nature of the object is otherwise unknown. (More generally, it may be the case that we are discussing a certain property, but nothing is known about the identity of objects having that property). The question then becomes one of identifying these unknown objects. The change in perspective is not unlike the “Gestalt shifts” between figure and ground discussed by Jackendoff in the works cited above.

²²cf. Shir and Lappin [105] for a similar view of contrastive focus.

- (1.22) 1. *The plane* is at the end of the runway.
 2. *The submarine* is off Land's End.
 3. *The space probe* is orbiting Saturn.

What is sought may not be an outright identification but just a constraint on the properties of the object. It is important that in this case there is no existential presupposition, and even the existence or otherwise of the object in question is relevant information.

- (1.23) 1. A *plane* is at the end of the runway.
 2. A *submarine* is off Land's End.
 3. A *space probe* is orbiting Saturn.

- (1.24) 1. *Nothing* is at the end of the runway.
 2. *Nothing* is off Land's End.
 3. *Nothing* is orbiting Saturn.

Turning to the other perspective suggested, using possible worlds and the analogy with conditionals, it is noteworthy that conditionals can be "reversed" so that the protasis or antecedent gives the focussed information rather than setting the stage. Although this is not purely a matter of order, this is often most clearly seen when the two halves of a conditional are inverted:

- (1.25) 1. We will go punting *if the sun shines*.
 2. We will stay in bed *if it rains*.

In these sentences the condition seems to be narrowing down the situations in which the proposition represented by the apodosis (consequent) will hold. Note that, unlike (1.20), it is unnatural for the sentences in (1.25) to be used together as a contrasting pair. This seems to mirror exactly the situation noted above for "contrastive" Focus, and for the same reason: the function of the condition here is to close down possibilities, not to to open them up. In fact it is natural to supply the focus-sensitive adverb *only* to the conditions, which would not be natural in (1.20).

In this sense the word “contrastive”, as applied to Focus, might usefully be glossed as “identificational” (cf. Kiss [193]), with the proviso that an absolute identification of the object is not necessarily involved. “Restrictive” might be a still better designation. Its function in general is to restrict the individuals or situations which satisfy a given piece of information.

I conclude this section by sketching how this approach could be used to analyse the discourse fragment in (1.26). The latter exemplifies a type of “multiple contrast” which recurs in the literature, often in the context of showing the difficulties of distinguishing Topic and Focus.

(1.26) No, *Peter's* taking Mary. David's taking *Louise*.

The italics indicate the emphasis and falling intonation characteristic of Focus. The problem is that the parallelism between the sentences seems to suggest that if Peter is Focus, then so should David be, though taking the second sentence in isolation David would seem to be Topic. An account of the contrast apparent in the two sentences is also required. Of course the idea of old and new information will not help much here, since the four people named can be assumed to be equally “known” (although the relations between them need a little sorting out).

In the first sentence Peter bears contrastive Focus, excluding the idea that anybody else is taking Mary. On the basis of the previous discussion, I assume that the relation between individuals and the property of taking Mary is analogous to that between a possible world and the information which it supports. I will adopt the shorthand of speaking of such individuals as if they *are* possible worlds. The effect of the contrastive Focus is to narrow down the possible worlds to Peter. In the next sentence David, as Topic, introduces another possible world, of which the information about taking Mary is said to hold. The properties of taking Mary and taking Louise are incompatible, given certain basic assumptions about chivalrous behaviour, so that the two “worlds” Peter and David form a contrasting pair of accessible worlds, partitioning the set of male individuals about which the discourse offers information. This accounts for the contrast.

This will be accounted for more formally below. However it may be instructive here to consider the analogy between this discourse and (1.27), in which individuals and properties are replaced by times and propositions holding at them (for which modal logic is a widely accepted treatment).

(1.27) 1. No, we're going to Athens *today*. Tomorrow we're going to *Rome*.

2. P = we're going to Athens. Q = we're going to Rome.

First the world supporting P is narrowed down to "today". Then one of the worlds so excluded ("tomorrow") is said to support proposition Q, which we can take as incompatible. "Today" and "tomorrow" thus form two contrasting worlds (accessible worlds supporting incompatible information).

The important point is that for the pair Peter and David (and for the pair "today" and "tomorrow") the first member is taken as Focus and the second as Topic in their respective sentences, just as the intonation would indicate. However because of the way Topic and Focus are understood, they turn out to be objects of the same kind at the semantic level (namely worlds), preserving the parallelism at that level and enabling a reasonable treatment of the effect of contrast.

On the matter of terminology, in those works which use the term "notional Subjects" for Topics, there is often (logically enough) a corresponding term "notional Predicate" for Comments. I avoid this notional (or psychological) Subject-Predicate terminology in this thesis, because the suggestion of a notional or psychological level of representation, apparently distinct from normal semantic content, is difficult to reconcile with the approach taken here.

It is convenient to have a term for that part of a sentence which is the complement of the Topic. Often this is taken as being Focus. If contrastive Focus is meant, I have argued that this is not an accurate picture; there are certain respects in which Topic and Focus, in this sense, can pattern together as contrastive elements as against "neutral" elements in the sentence which are not contrastive. Presentational Focus is much closer to the required notion, but it has often been observed that "focus" often properly applies only to some of its constituents, while others attract less emphasis. I will continue to use the traditional term Comment as the appropriate descriptive term, and will assume (an assumption which I will justify in the next chapter) that it also designates a GR, parallel to Topic. The semantic object which is the *denotation* of a Comment, which plays a central role in this theory, will be referred to as an **observation**.

Using the topological metaphor, (which will be treated more formally in chapter 4), **observations** will play a role analogous to that of the rational numbers in the illustration used above, in providing the frame of reference against which the referents of Topics are to be located.

In exploring the function of Topic a crucial role was played by the parallels drawn between topics (assumed in the examples to be primarily NPs, whose interpretation is based on entities in a domain of discourse) and possible worlds or situations. This is a central claim of the theory, though it may seem a surprising and counter-intuitive one at first. I will in fact be claiming precisely that the domain of situations and the domain of entities exhibit the same structure and therefore can be treated as identical in the relevant respects. The formal justification of this will be attempted in Chapters 2.1 and 4.

1.3 Predication and the Relational Hierarchy

One of the most influential ideas of the Relational Grammar tradition is the Relational Obliqueness Hierarchy (Keenan and Comrie [185], P&P [257], Johnson [168]), which proposes an ordering for the core GRs and claims that numerous grammatical phenomena are sensitive to this ordering. Specifically it is one of the main ideas from this tradition to be adopted by HPSG (P&S [265]). In its lexicalized form, in which it is read off the list-valued SUBCAT feature of the head verb, it underlies much HPSG work on phrase structure, valency alternations and binding (which is governed by the principle of relative obliqueness or “o-command”, rather than the tree-structural relationship of c-command (P&S [265, Ch.6])). Although this approach has proved productive, it rests on certain assumptions whose status is unclear. In this section²³ I argue that the theory proposed in this dissertation helps to clarify (and in some cases correct) a number of these assumptions, with the aim of making its underlying ideas even more useful and plausible.

(1.28) Part of the Relational Hierarchy (K&C [185])

1 (SUBJ) > 2 (DO) > 3 (IO) > OBL >....

²³Based on an earlier abstract [126]

Note that the “Goal” or “Benefactive” argument in Double Object Constructions (DOC) is assumed to be a final 2, corresponding to its treatment in most generative theories. This is supported by appeal to binding phenomena and to the interaction of DOC with Passive. In contrast to this I will support the view (more in keeping with traditional grammar, but also supported by some linguists (Hudson [157])), that it is a 3, while the corresponding argument in the “Dative” construction is an OBL. Detailed argumentation on this point will be given in Chapter 7.

(1.29) 1. Double Object Construction

John gave Mary flowers.

2. “Dative” Construction

John gave flowers to Mary.

The Relational Hierarchy (RH) has generally been regarded, like the GRs themselves, as a syntactic primitive. As discussed above, Topic-Focus structure is not represented at the level of core relations but only as an “overlay” at a superficial level of derivation.

1.3.1 Basic predicates and the “canonical association” between Subject and Topic

I start by considering monadic and dyadic predicates, which I will term **basic predicates**²⁴. As is well known, monadic predicates can be divided into two classes, in one of which the single argument originates as a DO (initial 2) (Perlmutter [254], Hoekstra [151], Burzio [56], L&R [224]). These are **unaccusative predicates**²⁵. In other monadic predicates the sole argument is an initial (and final) 1.

Various proposals have been made to distinguish these two classes in semantic terms. The arguments of unaccusative verbs often bear a thematic role which is classified as **theme**²⁶, whereas

²⁴I will propose shortly that predicates of greater arity are semantically composite.

²⁵I retain the original terminology of the Unaccusative Hypothesis in RG [254]. Following Burzio's classic re-formulation of it in GB terms [56] it has become common to describe these phenomena as “Ergative”. In this dissertation, the word “Ergative” will only be used in the context of *Ergative languages* (see Dixon [89, 90]).

²⁶This term is used in different ways in different theories - in many cases as a virtual equivalent to Topic, which

arguments of intransitive verbs which are initial 1's are generally the Agent or Cause of an action. The inability of approaches based on thematic labels of this kind to provide a principled account of argument structure has been emphasized repeatedly in the literature, although they do provide some decriptively interesting observations which will be returned to. Other mapping theories which are relevant here, not invoking θ -labels, are those of Levin and Rappaport [224], which is based on an analysis of different types of causation, the Aspectual Interface Hypothesis of Tenny [305, 306] and a number of works arguing for the projection of syntactic structure from a level of Lexical Conceptual Structure, e.g. Pinker [261], Jackendoff [164]).

I propose to take a rather different starting point - not surprisingly, that of Topic-Comment structure. From this point of view the interesting point about unaccusative arguments or **themes** is that they are *essentially* arguments of stage-level predicates, which do not require that any of their arguments be Topics (they can equally well have a **situation** as Topic). Although there is a grammatical requirement for their argument to be promoted to Subject²⁷, there is no such requirement for it to assume the Topic properties which are associated by default with final 1's (though they may do so in a suitable discourse context).

Corroboration of this idea comes from the following Japanese data (1.30) . In discourse neutral contexts the Subject of a Japanese sentence often takes the Topic marker *wa*²⁸. However a number of Japanese verbs show an Anticausative alternation, with the transitive and unaccusative alternants found in many languages. Unusually for Japanese, in the unaccusative case the argument of the verb is not marked with *wa* in discourse-neutral contexts.

- (1.30) 1. *Miho -wa mado -o akimashita.*
 Miho Top window Acc opened
 Miho opened the window.
2. *Mado -ga (?-wa) akemashita.*
 window Nom (?Top) opened
 The window opened.

could cause a certain amount of confusion here. I will use it consistently in the sense of Gruber [132] and Jackendoff [163, 164], to denote an entity of which some location or temporary state, or change therein, is predicated. Note however that while I find this useful as a descriptive term, it will not have any theoretical status.

²⁷In Relational Grammar, the Final 1 Law (P&P [257])

²⁸This is what Kuno calls the "thematic" (i.e. non-contrastive) use of *wa* [204].

The only distinguishing feature of these verbs is their unaccusativity. This suggests that Topichood interacts with the assignment of initial GRs, and that it is not naturally associated with initial Direct Objects.

If the crucial point about Initial 2's is that they need not be Topics (predication targets), then this correlates with another common observation - that they are frequently NPs with weak determiners (these will be discussed in more formal terms below, but generally speaking these comprise non-specific cardinal GQ's of the kind found in existential sentences (Milsark [234], Lapin [213])). To anticipate, such NP's have the characteristic that they do not pick out individuals which could be predication targets. Correspondingly, their referents are generally not assumed to exist independently of the event (though they may) - in fact their introduction is often a means of "measuring out" the event (Tenny [306]).

In this case it will be expected that the "canonical association" between Topic and initial Subject referred to above will consist in the fact that the latter is by default a predication target. In this connection the significant semantic property of initial 1's or "Agents" will not be their agentivity but, for example, the fact that they are assumed to refer to entities independent of the eventuality being described (cf. Dowty [94, 95], Keenan [183]). This means primarily definite NPs (also *specific* indefinites, in the sense of Enç [99], and generics). In Chapter 4 it will be claimed that NP's with this property are precisely the complement of those described in the previous paragraph; they are also those NPs which can occur in Topic constructions (such as topicalization in English and Clitic Left Dislocation in Greek).

Of course it is not the case that all grammatical Subjects (i.e. final 1's) in English are NPs of this kind, though such constraints do exist in some languages, such as Mandarin Chinese (Li and Thompson [225]), Tagalog and Malagasy (Keenan [182]) and possibly some forms of French (according to Lambrecht [208]). It is therefore necessary to posit some specifiable operation by which an English sentence is not predicated on the referent of its grammatical Subject, but either on some other entity or on a (spatio-temporal) location parameter. (In the latter case, of course, this will make it a **thetic** judgement).

To conclude, basic predicates have an asymmetry between the initial 1, which is a predication target, and the initial 2 which is not (either or both of these may be missing in the initial stratum). An initial 2 may be made into a predication target (if it satisfies the semantic requirements), notably by overt topicalization (though *in situ* topicalization is also possible). (Passivization also is often one means of effecting a change to Topic status). An initial 1 can cease to be a predication target if replaced by another argument or if the clause is converted into athetic judgement.

1.3.2 Composite predicates

The inbuilt asymmetry between the arguments of a basic predicate is responsible for the inequality $1 > 2$. I will now argue that it is possible to derive the whole relational hierarchy through a process of predicate composition, the concatenation of their arguments. (This is reflected in the overt syntax of languages with serial verbs).²⁹

In the case of Obliques (Obl) this is relatively straightforward. Taking *put* as a typical example of a verb with a subcategorized Obl argument, I assume a structure with a secondary predicate of directional motion (normally represented by a preposition of motion in English). The latter is a dyadic predicate whose Subject is identical to the Object of the main predicate, with which it is collapsed by the process of argument concatenation (represented schematically in (1.31)).

$$(1.31) \langle \text{Agent, Theme} \rangle \oplus \langle \text{Theme, Goal} \rangle = \langle \text{Agent, Theme, Goal} \rangle.$$

In other words an Oblique is simply a prepositional Object, the preposition acting as an extension of the main predicate (for the semantic basis of this notion see Keenan and Faltz [186], also Chapter 3 below). The asymmetries in the two basic predicates combine to give the expected ordering $1 > 2 > \text{OBL}$.

The case of Indirect Objects is more complicated, and as already mentioned, the treatment here will depart from assumptions which have been commonly (though not universally) accepted in most generative frameworks, namely that the DOC involves the $3 \rightarrow 2$ advancement of the Goal

²⁹This approach is based on the RG idea of clause union, which in turn is reformulated in HPSG by Hinrichs and Nakazawa as argument attraction. For references and discussion see the next chapter, page 54.

argument, and that the Relational hierarchy for all purposes follows the order $1 > 2 > 3 > \dots$. The basic assumption that will be made here is that the Goal argument in a DOC construction is a 3, and that this GR arises in exactly the same way as described for Obl, with the simple but crucial exception that whereas the OBL is the Object of the relevant secondary predication, the 3 is its *Subject*.

It is now possible to obtain two orderings for the RH by list operations. If it is stipulated that the arguments of the primary predicate must always precede those of the secondary predicate, then we would obtain the standard hierarchy $1 > 2 > 3 >$ by straight concatenation. It is possible that this may be useful for some purposes. By dropping this assumption, however, we obtain the more interesting hierarchy in (1.32). Again the two occurrences of the Theme argument are collapsed by the list operation, but the inequalities $1 > 2$ and $3 > 2$ combine to give the ordering $1 > 3 > 2$.

- (1.32) 1. $\langle \text{Agent, Theme} \rangle \oplus \langle \text{Theme, Goal} \rangle$
2. $1 (\text{Agent}) > 2 (\text{Theme}), 3 (\text{Goal}) > 2 (\text{Theme})$
3. $1 (\text{Agent}) > 3 (\text{Goal}) > 2 (\text{Theme})$

This position will be argued in detail in Chapter 7, but the justification can be sketched here. The main arguments for the traditional position are: (i) that the DOC feeds Passive, so that if the DOC involves $3 \rightarrow 2$ advancement, this considerably simplifies the relational rule for Passive; (ii) the Goal argument in a DOC appears to be more prominent than the Theme, particularly as regards Binding (Barss and Lasnik [22]) and Control (Koster [198]). Note however that if the ordering of the RH is altered as in (1.32) the second of these arguments loses its force, because the present theory equally predicts the right results. As regards Passive, I will argue that the passivization of a DOC has to be treated as $3 \rightarrow 1$ advancement³⁰

This amounts to treating the GR 3 as a default Topic, along with the 1, of a ditransitive clause. In fact the idea that it is a co-subject (Herslund [142]), or VP-internal analogue of a

³⁰As also argued, for completely different reasons, by Larson [221]. As already mentioned, Hudson [157] also argues against the idea of the Recipient being a Direct Object.

Subject (Larson [221])³¹ has been suggested in the literature. However a number of writers (Kuno [205, 206], Shir [104]) have argued that the binding and scope phenomena used to support this purely syntactic characterization are sensitive to discourse considerations and should really be regarded as Topic-related, and this is the line that I will follow here.

It has often been noted that Double Object constructions (DOC) in English are only fully acceptable if the first Object is a Topic (or, with marked intonation, contrastive focus, but not presentational focus). The italics below denote focus intonation representing presentational focus.

- (1.33) 1. John sent Mary *a triffid*.
 2. ? John sent *a triffid* to Mary.
 3. ? John sent *five girls* valentines.
 4. John sent valentines *to five girls*.

On the present theory, in which the "first" Object (in linear terms) is a 3, the relational structure of these sentences has only one stratum (the initial one). Thus the core GR Indirect Object, like other core GRs, appears to interact with topic-focus structure.

1.4 A comparison with some alternative approaches

The approach to be adopted here may be compared with a number of recent theories which address the semantic implications of Topic-Focus structure³². In general these have the characteristic, as mentioned above, that they seek to locate Topic-Focus structure not in the semantic content but in pragmatic or processing factors. The two examples which will be discussed here are Vallduvi's [315] theory of Information Structure and Kempson et al.'s [190] theory of Labelled Deductive Systems for Natural Language (LDS_{NL}).

Vallduvi's original work on information structure [315, 316] explored the link between information structure, constituent structure and phonology using a GB framework. Subsequently Engdahl

³¹In the sense that the derivation of the DOC is treated as a Vp-internal analogue of passive.

³²I exclude here theories which are primarily concerned with its phonological or syntactic reflexes.

and Vallduví [100, 101] (henceforth E&V) have proposed a particular way of representing its insights within HPSG. One side of their proposal concerns constraining the relationship between focus structure and surface expression (constituent structure in Catalan, intonation in English, and by implication morphological marking in other languages). This area is outside the scope of the present work. However, even in characterizing the semantic side of their information-structure (IS), the purpose of their proposal is rather different from the present one, attempting a graph-theoretic characterization in terms of features rather than an explicit semantics. Apart from this difference (or perhaps not unconnected with it, as they assess rather differently the body of data cited which claim model-theoretic semantic effects associated with information structure), they prefer to adopt an architecture in which IS is represented by a new feature bundle under CONTEXT, thus squarely in the domain of pragmatics [101, p.11]. The approach adopted here is based on a feature geometry which differs somewhat from standard HPSG; this is introduced in chapter 2.1. To anticipate, however, within this framework I place information structure in a *relational* substructure of SYNSEM which is neither under CONTENT nor CONTEXT but interacts with both, while this same relational structure also determines (as in all RG-based theories) language-specific surface encoding.

The Labelled Deductive Systems (LDS_{NL}) approach of Kempson et al. [191, 189, 190] is very different from the other approaches considered. It is based on a model of language processing as mapping the information provided by a string dynamically onto an underspecified semantic representation which feeds model-theoretic interpretation, the semantic representation and the process by which it is derived being the focus of linguistic interest. The distinction between syntax, semantics and information structure is not understood as a multiplicity of levels (such as might be taken to correspond with different feature bundles in HPSG [265]), but with different effects associated with the way this single representation is obtained. At an earlier stage in the development of the LDS_{NL} framework, Topic was treated as a database label, on the analogy with time indices, while the database itself gives the derivation of the clause (in this context, the Comment). This approach was elaborated for Topic-Focus structure in Greek (including clitic

doubling) by Tsiplakou [312]. This formal treatment, though it has been superseded in more recent forms of the framework, played a major role in one of the central claims of the present work, namely that Topics belong in the same ontological class as times (and hence world indices in general).

Despite this and other strong influences, the LDS_{NL} has not been adopted for this research primarily because it goes further than I would currently wish to in locating Topichood in the process of obtaining semantic representations rather than in the denotational semantics eventually obtained. The arguments on page 6 give some of my reasons for not adopting this approach: what appear to be real truth-conditional differences are made to appear epiphenomenal (though it should be said here that Kempson et al. have not yet fully elaborated their treatment of these issues); and the parallel with worlds suggests the appropriateness of a denotational rather than a procedural treatment.

On the question of the actual ontological status of the semantics I am proposing, I should qualify the above remarks by saying that I attempt to find a middle course between representationalism and the realism of the classic formalisms of situation semantics (Barwise and Perry [28])³³. Following Landman [209, p.3f] and ultimately Frege [111], I assume that the world of information (and thus of semantics) is at a level intermediate between representations and processes, on the one hand, and the “real world” on the other. The difference is analogous to that between an algorithm, a function and a graph. Two algorithms may compute the same function, and two functions may have the same graph. Similarly two representations may denote the same semantic object, while two semantic objects (as conceived here) may correspond to the same bit of the real world. For technical reasons, the tools available for the kind of semantic analysis I am attempting tend (because of their reliance on set theory) to conflate functions with their graphs, or semantic objects with “real” objects. It is hoped that the recent development of new semantic tools by Lappin and Pollard [218] will help to avoid this deficiency in future developments of this

³³Not all practitioners of situation semantics are so uncompromising. Thus in Fenstad et al. [108], one of the seminal works in the application of situation semantics to linguistic formalisms, an intermediate level of “situation schemata” is used which it is natural to see as representations; the authors even envisage the possibility of defining a proof theory over them, though as far as I know this idea was never taken up.

research. These issues will be the subject of further comment in chapter 3 and in the conclusion. For the present I simply note the difference in purpose between this thesis and some of the other approaches mentioned.

1.5 Conclusion

This chapter has presented an informal overview of an approach to Grammatical Relations in which core GRs and overlay GRs are integrated in a way which contrasts with most generative approaches. The key to this integration is a particular approach to the idea of predication, which is related to the fixing of entities in a model which are able to satisfy information-bearing propositions. The semantic underpinnings of Core relations are considered with this point of view in mind, and not only from the point of view of the descriptive content of the thematic roles they assign.

The chapter discussed a set of widely observed "canonical associations" between overlay and core GRs; primarily between Subject and Topic and between (presentational) Focus and Direct Object. Though these associations are sometimes elusive in English, they are supported by a range of cross-linguistic data some which include more tangible syntactic and morphological evidence.

One effect of this approach is to bring discourse considerations into an area which is normally regarded as being right at the heart of syntax. However the study of discourse notions like Topic and Focus is itself still beset by considerable confusion. The discussion in the course of this chapter has at least clarified how these concepts will be used in the remainder of this thesis, and given a preliminary indication of how they will be formalized.

This concludes the informal introduction to this dissertation. The next chapters will introduce the theoretical framework to be used. They fall into two main parts, the first of which discusses HPSG and the second semantics. Chapter 4 presents the formal theory of Topics, particularly in its intra-sentential aspect. This is then tested against various discourse issues in Chapter 5, and compared with some other approaches. The concluding chapters provide a cross-linguistic

examination of some areas of interaction between Topic and (“term”) GRs: chapter 6 discusses Direct Object clitic doubling in Balkan languages and Topic shift in Amharic; and chapter 7 examines the GR Indirect Object in connection with “dative Subject” phenomena in the Germanic family.

Chapter 2

The Theoretical Framework

2.1 The Grammatical Framework - a typed feature formalism

The theoretical framework adopted here belongs to the HPSG family of formalisms, in which information of different kinds is modelled using typed feature structures (P&S [265], Carpenter [61]). It differs from the framework of [265] (henceforth standard HPSG) in certain important respects, whose nature and motivation will be discussed during the course of this chapter¹. Like most HPSG-based frameworks it incorporates insights from a variety of sources, not necessarily those exploited in more familiar forms of the framework. This version is particularly characterized by a reliance on ideas from Relational Grammar (RG) (Perlmutter et al. [253, 259]) and Arc Pair Grammar (Johnson and Postal [174]). As already emphasized, most of the syntactic processes of interest to this thesis are, it is claimed, best characterized in relational terms, and this area of the grammar is brought into focus, somewhat at the expense of the Phrase Structure component². It is very close to the framework of Ackerman and Webelhuth [3], which is also a form of HPSG but strongly

¹In certain other respects, it adheres rather conservatively to [265], in that it does not follow a number of the subsequent proposed improvements.

²For this reason it might be more accurate to refer to this version of the theory as Head-Driven Relational Grammar (HRG).

influenced by LFG, particularly in its separation of grammatical relations from considerations of constituent structure (including even categorially based features like SUBCAT). It is noted by Pollard and Sag that the approach adopted here was one possible way of developing HPSG, and many subsequent versions have introduced elements of it. In this sense I have merely taken up a position at one extreme of a broad spectrum.

In this chapter particularly, technical terms which are used extensively in the rest of the thesis will be written in **bold face** when introduced. Some familiarity with HPSG and the main concepts of RG is assumed³.

2.2 General Introduction

2.2.1 Feature structures

HPSG grammars use **typed feature structures** to model relations between objects in the linguistic domain. The set of (token) domain objects Q is typed by a total typing function θ from Q into a set of types T , itself partially ordered by the subsumption relation \sqsubseteq . Feature structures are rooted directed graphs with nodes labelled by objects in Q and edges labelled by elements of a set of features F . These edges are understood as functions from the node at their tail to the (unique) node at their head; the functions may be composed into feature **paths** comprising successive edges. Crucially, these graphs allow re-entrant configurations, in which several paths converge on the same node. This token-identity of the values of several paths is known as **structure sharing**.

The subsumption relation \sqsubseteq may hold not only between types but between feature structures. If two feature structures are mutually subsuming, then they are informationally equivalent (alphabetic variants). Following a result of Moshier's [242], the relevant notion of information content can be captured by just the typing information plus information about which paths' values are structure-shared (an "abstract feature structure") (Carpenter [61, p.43ff]); it is these abstract

³The best introduction to HPSG is probably still P&S [265]. Simpler introductions are available in Sag and Wasow [283] and Borsley [45, 46]. RG is well explained in the papers in Perlmutter et al. [253, 252], and there is also an introductory textbook with critical discussion in Blake [41].

feature structures that are represented in HPSG diagrams. The \sqsubseteq ordering on abstract feature structures (as equivalence classes of feature structures) is a partial order⁴, and gives a least upper bound $\sqcup F$, for any set F of compatible feature structures, representing their **unification** (informational conjunction).⁵

Feature structures are normally represented in HPSG as Attribute Value Matrices (AVMs) (2.1). Each matrix represents an object with a numeric tag⁶ and a type (in italics) written to the left. Because the grammar operates over abstract feature structures (generalizing over tokens of linguistic events), the tag is suppressed except in cases of structure sharing. The matrix contains those features for which the object is defined (its attributes) and their values; the latter will be further feature structures (tag [2] in the example), which may thus be recursively embedded. (An **atomic** feature structure, for which no features are defined, is normally represented by its type alone - in the example, the value of ATTRIBUTE_j illustrates such a structure).

$$(2.1) \quad \textit{type} \ \underline{1}: \left[\begin{array}{l} \text{ATTRIBUTE}_i: \textit{type}_i \underline{2}: \left[\dots \right] \\ \text{ATTRIBUTE}_j: \textit{type}_j \end{array} \right]$$

HPSG formalisms impose strong appropriateness constraints on feature structures, which are required to be "totally well typed and sort resolved" (P&S [265, p.21]). Each feature f is introduced by a single most general type $\text{Intro}(f)$ and inherited by (all and only) its subtypes; the appropriateness constraint also specifies the type of its value. Any object of a given type must be defined for all and only those features which are appropriate for that type. Furthermore the type assigned to each object in a complete feature structure must be maximally specific (with no proper subtypes).

The use of feature structures requires an HPSG grammar to specify a principled inventory of linguistic objects and the relations that are allowed to hold between them. The appropriateness conditions impose further stringent constraints on the form of the grammar.

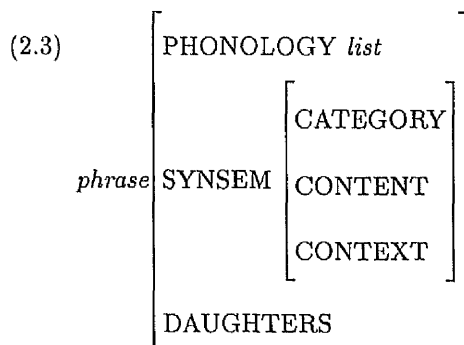
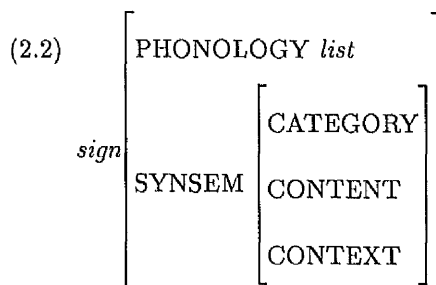
⁴In fact a semilattice.

⁵The subsumption ordering is assumed to proceed "upwards" from a most general element \perp , in order of increasing informational content (following Carpenter [61], but in contrast to much of the HPSG literature).

⁶The tag should not be confused with the object itself; it is simply a notational device for referring to it.

2.2.2 The HPSG feature geometry of signs

HPSG grammars are based on the idea of the utterance type as a **sign** representing a relation between form and content (cf. Saussure [285]). The top level features of a **sign** integrate the main kinds of linguistic information; phonological, phrase-structural, categorial, semantic and contextual. However the last three are grouped together as the value of a top-level feature **SYNSEM**. The motivation for this is the generalization that only these kinds of information can be accessed when a head selects its complement (as also in certain other contexts, such as selection of a head by an adjunct). Encoding this in the feature geometry imposes a strong locality constraint on grammatical processes.

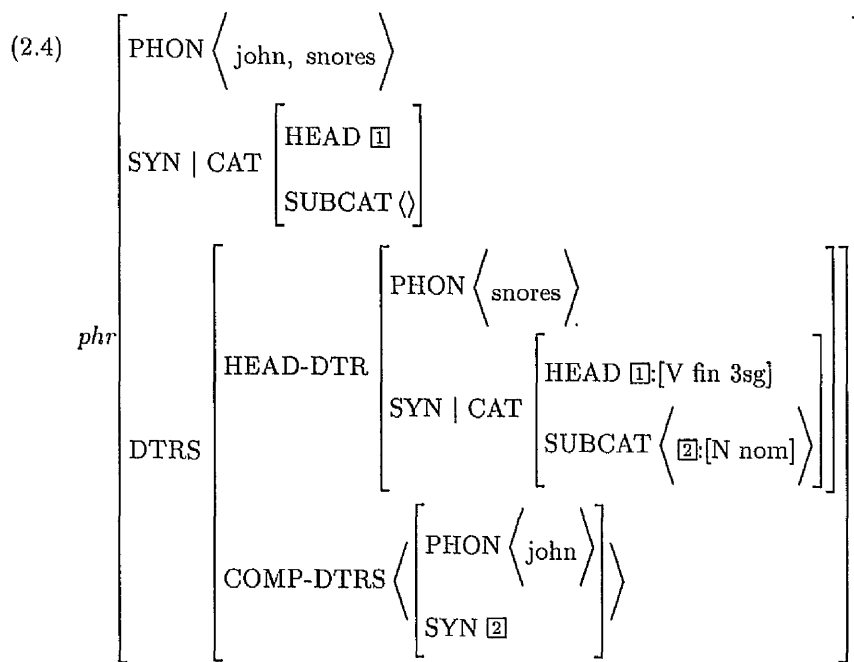


Phrase structure is encoded by the **DAUGHTERS** (**DTRS**) feature, defined only for phrasal signs (2.3). Phonology is often treated as a list of phonemes.^{7 8}

⁷It is only relatively recently that serious work has been done on HPSG phonology, or rather on developing an approach to phonology which is compatible with HPSG (Bird et al. [38, 39, 37, 40, 36], Scobbie [290], Russell [278]). The substantive phonological theory favoured by all these except the last is a form of Declarative Phonology (cf. Coleman [72]). Russell [278] uses Government Phonology (Kaye et al. [181]), an approach also argued for in Gregory [125].

⁸Generally speaking most grammatical processes of interest are in fact defined between *synsem* objects and their substructures. According to a recent proposal of Sag's [279, 281], **DTRS** features should in fact be eliminated from the unified graph structure. If the approach in [125] were adopted for phonology, then the **PHON** feature may also be eliminable, as it is argued in Government Phonology that phonological objects should not be thought of as parts of lexical entries or syntactic trees but rather as a system of addresses for accessing lexical information (Kaye and Vergnaud [180], Jensen [167]). Thus it is possible that the structures in the grammar could be reduced entirely

Information under the CATEGORY feature is divided into HEAD features, which are passed up through structure sharing from a categorial head to its mother, and valence information. In the standard theory the latter takes the form of a SUBCAT list whose members, the *synsem* values of the complements, are cancelled as the head combines with complements in the syntax. The list ordering is taken to reflect the relational obliqueness hierachy. Subjects are treated as a particular kind of subcategorized complement, and their *synsem* value appears at the head of the SUBCAT list. This treatment of valency has been modified in much subsequent work, and will be discussed further below.



The nucleus of the semantic content, leaving aside quantification, is of two types. That of a predicate is a *psoa*, comprising a relation and one or more *role* features. A nominal is defined for an *index* and a set of restrictions (each restriction being a *psoa*⁹ - see the next section.). Each *ROLE* feature of a *psoa* is assigned to the index of some nominal object. Because the semantic *content* is a substructure of *synsem*, this is effected by subcategorization. The *index* of a subcategorized complement is specified as being the same as the value of one of the *ROLE* features

to *synsem* objects, giving a natural explanation of their importance in grammatical processes. This is at present rather speculative, and belongs to future work. However, the approach adopted here is focussed almost entirely on certain substructures of the *synsem* complex.

⁹Parametrized state of affairs

in the head's semantic content.

The *context* structure contains semantic information which is not contributed by the utterance but by the context. This is normally taken to include indexical features which anchor any deictic elements in the utterance (C-INDICES), and presupposed information (BACKGROUND-PSOAS). The different roles of content and context have to be understood against the background of the situation-theoretic view of situations and utterances.

2.2.3 Situations and utterances

A full HPSG account of utterances, which includes both grammatical and extra-grammatical aspects, can be viewed situation-theoretically as a system of constraints governing relations between linguistic events and situations (partial worlds). The situations primarily concerned are the **utterance situation** (including the utterance, its deictic parameters and the information states of its participants) and a **described situation** about which the utterance purports to provide information. The utterance, in the context of the utterance situation, imposes a set of constraints (sometimes modelled as a "situation schema" (Fenstad et al. [108])), of which the described situation is the (not necessarily unique) satisfier.

The basic unit of information which may be supported by a situation is a type of object called a (parametrized) state of affairs ((p)soa), whose nucleus is a semantic **relation**, with **role** and **location** parameters which have to be anchored to suitable objects in the model. In many versions of situation theory a soa is also known as an **infor** (Devlin [86]). In this thesis the term **infor** will be reserved for an equivalence class of soas formed by mutual informational containment, making a more abstract "unit of information" independent of its internal structure (see Chapter 3 below).

The grammar proper is the system of constraints governing **signs**, the composite entities relating sound to meaning - i.e. relating a feature of the utterance situation (the phonological object representing the utterance) to the semantic content of the described situation. The relationship between the latter and the utterance situation - which is not mediated *only* by the utterance - allows the real-world interpretation of the semantic content to take account of pragmatic factors,

which are not assumed to be part of the grammar.

2.3 The treatment of Grammatical Relations

2.3.1 Grammatical Relations in HPSG

Standard HPSG adopts a non-configurational approach to Grammatical Relations (GRs), along with the idea of the Relational Hierachy (K&C [185], P&P [257]) as discussed in Chapter 1. However rather than regarding them as primitive features in their own right, in the tradition of Relational Grammar or LFG, it encodes them by their position on a SUBCAT list ordered according to increasing obliqueness. Operations involving relational reevaluation (NP movement in GB terms) are treated as operations on the SUBCAT lists of heads, involving order permutation (Passive, DOC) or control relations between arguments one of which is an unsaturated constituent and the other is non-thematic in the matrix clause (Raising) (P&S [265, Ch.3]).

Subsequent work has led to the widespread adoption of important modifications to this scheme. While the ordered SUBCAT list is retained (often under the name of an ARGUMENT-STRUCTURE feature), the actual realization of arguments in the syntax is effected by primitive valence features. In particular the Subject is distinguished by means of a SUBJ feature (P&S [265, Ch.9]). In this scheme the ARG-STR list seems to correspond to some extent to the RG notion of "initial grammatical relations", one productive area of current debate being the mapping between this and the unordered set of semantic roles (Wechsler [319], Davis [84]).

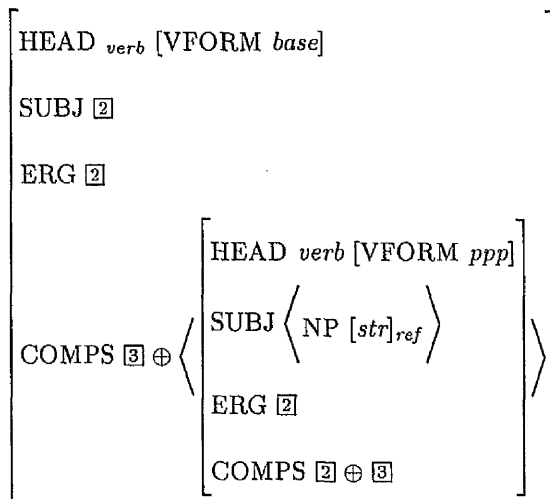
In some analyses, however, it has been found useful to extend the use of specific GR labels to features picking out particular elements in the ARG-STR list. This amounts to re-introducing the idea of initial GRs.

A good example is the series of articles in Nerbonne et al. [244] dealing with the German Passive. Significantly, the phenomenon of impersonal passives in German played a central role in Perlmutter's [254] original formulation of the Unaccusative hypothesis, arguing for an underlying syntactic (and not only semantic) distinction between the arguments of unaccusative and ordinary

intransitive predicates. The impersonal passive accepts as its input intransitive verbs but not unaccusatives. Transitive verbs which have already been passivized are, as derived unaccusatives, excluded from further undergoing impersonal passivization. Thus the problem is how to distinguish intransitive verbs whose Subject is “originally” a Subject from those where it was originally an Object.

The HPSG treatments cited have had to invoke similar ideas to the solution proposed by Perlmutter. Suggested mechanisms include an extra valence feature ERG, picking out the argument of an unaccusative verb (along with initial transitive DOs) (Pollard [262]), or alternatively a feature DA (designated argument) intended to capture the idea of a most prominent or “external” initial argument (Heinz and Matiassek [141]). Thus in Pollard’s [262] treatment (see (2.5)), the Passive SUBJ must be identified with the ERG value, which records its status as an initial 2. In the case of a personal passive the ERG value will contain a synsem value, that of the initial Object, and the SUBJ feature unifies with it. Impersonal passives, which are treated as subjectless, are derived from intransitive verbs whose sole argument is an initial 1; the value of ERG and that of SUBJ will both be the empty list. However, impersonal passives cannot be formed from unaccusatives, including verbs already passivized, because in those cases the ERG value is non-empty while the SUBJ value must be empty.

(2.5) German passive auxiliary *werden* with ERG feature [262, p.291]



It should be noted here that the value of ERG is a SYNSEM object, not just an INDEX; this

implies that it is an underlying syntactic object as well a semantic one. This contrasts with the treatment of Passive in P&S [264, 265], where the idea that the Passive Subject is an underlying DO is captured purely by the structure sharing of its INDEX with the appropriate semantic role. Pollard's treatment suggests that this rigidly monostratal approach does not in fact capture all the phenomena (exactly as had already been argued in RG (Perlmutter et al. [258, 255])).

The solution adopted by Heinz and Matiassek [141] is (in this respect) essentially complementary to the Kathol-Pollard approach in (2.5), this time picking out not the Initial 2 but the Initial 1 (by means of the feature DA). The details will not be discussed here, but this manoeuvre is argued to be illuminating both for Passive and other Case-related phenomena in German.

The point to be emphasized here is that it has been found empirically desirable to restore in some form the distinction between "initial Subjects" and "initial Direct Objects". It is possible that this could be encoded simply using an ARG-STR list, leaving empty slots (cf. Grimshaw's formalism for argument structure [128]), but the devices introduced by Pollard [262] and Heinz and Matiassek [141] appear to be more convenient ways of accessing the required information. Whichever method is chosen, it amounts to explicitly or implicitly re-introducing initial grammatical relations as primitives, just as the SUBJ feature already explicitly re-introduces primitive final GRs.

Another RG primitive which is once again being given serious attention in recent HPSG work is the Predicate. In the detailed study by Ackerman and Webelhuth [3], it is argued that syntactic generalizations can be captured using this concept which cannot be satisfactorily handled by reference to categories. Some of their examples they cite are deferred for discussion below (Section 2.3.2); they include word order, agreement, and the structure of complex predicates. The latter discussion arises from the authors' concern to maintain a lexicalist account of valence-changing operations. It is concluded that such an account has to envisage the formation of complex predicates within the lexicon, each such predicate being a unitary head of the relational structure of its clause despite not being projected as a single lexical category in the surface syntax. In this sense "head-driven" may be glossed as "predicate driven", as the information which drives clause

structure is not confined to its categorial head. These considerations seem to necessitate a higher degree of abstraction from categorial structure when considering Grammatical Relations than is envisaged in the standard theory.¹⁰

I conclude from this that while the original HPSG encoding of GRs as a list of categories subcategorized for by a head category is insufficient, subsequent piecemeal modifications of it merely highlight the problem rather than providing a principled solution. The considerations discussed will serve as motivation for a wholesale re-introduction of the RG inventory of GRs, making fuller use of the traditions, like RG and LFG, in which they are treated as primitive.

Here, however, a number of technical questions arise. One obvious one, which is perhaps however a red herring, is whether these modifications compromise the monostratality of HPSG. (If so it could be said that the separation of valence features from the ARG-STR list already compromises it to the same extent). However it is not clear that information about a feature having different values in different strata cannot be stated in a way that is representational and declarative. APG [174] is an example of such an approach; and a series of recent articles by Johnson and Moss [171, 172, 173] have demonstrated the feasibility of reformulating it as an HPSG-like feature grammar. Their solution (the parametrization of features with respect to strata) will not be adopted here (largely to avoid introducing a complication into the feature logic), although the proposed approach to multistratality will be based on APG.

In the following section I will elaborate an alternative suggestion, intended to combine an apparently multistratal relational theory with a strictly lexicalist framework. I assume that the most fundamental tenet of the latter is that syntactic information is projected from a head with its (final) relational structure structure already determined (2.6). Thus a natural interpretation of the RG / APG constraints on relational networks in a lexicalist framework is as constraints on the formation of predicates in the lexicon.

(2.6) Direct Syntactic Encoding

“No syntactic rule may replace one function name by another.” (Kaplan and Bresnan [179,

¹⁰(i.e. standard HPSG).

p.180])

“The principle of direct syntactic encoding prevents rules of syntax from replacing one function with another, and so guarantees that the syntactic encoding of grammatical functions in a language applies directly to surface structures without the mediation of a syntactic or functional derivation.” (Bresnan [49, p.6])

There is thus no question of any relation-changing operations being kept track of in the syntax. This, however, is what seems to be being mimicked in several of the approaches just described, even though the relevant processes are collected in the SYNSEM of the head rather than actually defined over clauses. I assume that what a relational network describes is rather the relationship of a given head to other lexical entries with a systematically related relational structure. On this view the information that the SUBJ of “John was kicked” is an initial DO is not part of the entry for “was kicked”, but rather an inference based on its systematic relationship with the lexical entry “kick”, which preserves the “initial” assignment of GRs. The question thus arises whether it is necessary to record this lexical “derivation history” in the feature structure of the derived predicate, assuming that grammatical processing can access any relevant part of the lexicon.

2.3.2 Re-instating Grammatical Relations in a Head-driven framework

The theory of Grammatical Relations adopted here is based primarily on RG and APG, with certain modifications from LFG and standard HPSG. GRs are primitive features (arc labels) relating linguistic objects, those of primary interest here being clauses and the objects which serve as their predicate and arguments (I will use **argument relations** in place of RG’s “central relations”). Argument GRs comprise the three **term relations** SUBJ, DO and IO together with the relations OBL_{θ} (role-assigned non-terms) and $CH\hat{O}$ (*chômeurs* or ex-terms whose GR has been assumed by another argument)^{11, 12}

¹¹It is the re-instatement of the $CH\hat{O}$ relation in particular that marks the present theory as a derivative of RG, in contrast to the use of GRs in standard lexicalist frameworks. It is also the feature that triggers the apparent head-on collision with monostratality in its clearest form.

¹²Non-argument GRs will be discussed below. For an inventory and classification of GRs, see P&P [257, p.86] or J&P [174, p.198].

In APG, possible relational networks (R-graphs) are (i) classified by configurations of arcs and (ii) constrained by the second level relations SPONSOR and ERASE. These serve the function of linking well formed R-graphs with logical representations (L-graphs) and a surface level (S-graph) which interfaces with the phonology¹³. SPONSOR can be interpreted as a licensing condition linking the presence of an object in the syntax to the underlying predicate-argument semantics, while ERASE determines the final constituent structure tree¹⁴. In the present approach, constraints on the production of lexical forms and their argument structure will be treated in much the same spirit, though without actually reifying the SPONSOR and ERASE relations within the feature structure¹⁵. Rather the underlying ideas behind them will be reflected in a set of constraints governing possible lexical rules. The idea of classification of arc configurations will be retained and extended to cover such phenomena as headedness.

The basic classification of arc configurations of APG is as follows. Arcs sharing the same tail are **parallel**. Arcs sharing the same head are **re-entrant**. Arcs which are both parallel and re-entrant are **overlapping**. Arcs which are re-entrant but not parallel are known as **immigrant** arcs. In general, because of the more complex nature of HPSG feature geometry, these notions will often be defined here over paths rather than single arcs.

Discussion of GRs will begin with the Predicate relation. A clausal node may be defined as the tail of a Predicate arc, and the class of Argument GRs (central GRs in [253]) may be defined as those arcs which are **parallel** to a Predicate arc in the sense just defined. By contrast, a key principle of APG is that overlay relations must be immigrant arcs. The node at their head is one which also bears an argument GR; however their tail is not a clausal node but a distinct node above the clause (in the sense that the clause itself bears a Grammatical Relation to it). This is of course a relational concept, not necessarily implying a higher syntactic position as in the GB theory of functional heads, though possible relations between the two will be explored. For the moment the node will simply be called Node X_{GR} (the subscript representing the relevant

¹³This is in contrast to RG, where they are treated as autonomous syntactic structures.

¹⁴In many cases ERASE can be regarded as analogous to the GB concept of the binding of a trace by a surface constituent.

¹⁵I am grateful to Ivan Sag for discussion on this point.

overlay relation, as it has not been shown to be an identical node for all overlay relations). The clause node itself also bears a GR relative to Node X_{GR} , which in general I will follow J&P [174] in calling GR_x . In the case where the overlay relation concerned is Topic, I will anticipate later discussion by informally referring to GR_x as Comment. Thus a clause bears the GR Comment to the same node X_{Top} to which some nominal bears the GR Topic.

2.3.3 Predicates and predication

When it was said above that the predicate is one of the most important Grammatical Relations, it is important to note that "predicate" is widely used in a number of different senses. For want of adequate technical terms it will continue to be so used here, but it is vital to clarify these senses and to provide means for distinguishing between them.

A working definition of predicate is given in (2.7).

(2.7) A **predicate** is the part of an expression which describes what is being claimed to be true of a given number of entities ($n \geq 0$).

The content of a predicate is essentially descriptive, and it should be distinguished from the act of making such a truth claim *using* a predicate. The latter will be termed a **predication**; it is associated, in traditional logical analyses of natural language, with copulas and similar elements, or in more recent analyses with (finite) inflectional elements (any remaining descriptive content having first been abstracted away). The semantic **type** of a predicate is a set of functions taking their value directly or indirectly in the set of truth values (see Section 3 below).

In Aristotelian logic the content of the predicate would be taken as including everything in the sentence¹⁶ which was not the Subject. In modern terms, it could be said that the predicate is the VP.

In the work of Frege¹⁷, the notion of a Subject loses its privileged status and is replaced by the notion of an **argument**. The latter may be any entity-denoting term in a sentence, and a

¹⁶At least the "core" sentence, excluding certain adverbials

¹⁷See Dummett [96].

predicate is what is left when any or all such arguments have been abstracted away (again, leaving aside certain adverbials).

It thus becomes necessary to distinguish the "same" predicate in different degrees of **saturation** (several of which have significance in the present theory). The completely saturated predicate is, in Frege's system, a proposition - in the present framework a **soa** (saturated **psoa**). A particular significance will also be attached to predicates which are saturated except for one argument - an **almost saturated psoa**. This resembles the Aristotelian predication except that the argument concerned is not necessarily the grammatical Subject. In this work it will be in effect identified with Topic (see Chapters 1.2, 4). Finally there is the completely unsaturated or "irreducible" predicate¹⁸.

It should be clear that when discussing Predicate as a GR¹⁹ it is the third of these senses that is meant - what Ackerman and Webelhuth term the **irreducible predicate** or the "basic informational core of the clause" (see A&W [3, p.39] for discussion).

Ackerman and Webelhuth (A&W) discuss a number of arguments for the re-instatement of a GR Predicate, and the separation of this from categorial notions such as Verb. For example it forms the basis of word order generalizations in a number of languages. The ordering rules for basic clauses, in several typologically different languages, can be stated more accurately using the concept Predicate than Verb; this is argued for Philippine languages (PSO), Choctaw (SOP), Hungarian (SPO) and Tzotzil (PSO). Similarly in the formation of yes/no questions in Russian, the Predicate (regardless of category) precedes the interrogative particle (Perlmutter [251], Aissen [5], A&W [3, p.42f,73-5]). Not surprisingly, the rules for several different kinds of Agreement also require reference to the Predicate (evidence is given from various, mostly Uralic, languages (A&W [3, p.44ff])). It is also possible to invoke a range of studies in LFG which make the interaction and possible mismatch between categorial and functional (i.e. relational) heads the basis of analyses of several languages (e.g. Mohanan's well-known analysis of Malayalam [236]). The predicate so defined co-incides with the above notion of "basic informational core of the clause" - that which

¹⁸ Ackerman and Webelhuth attribute this terminology to Kamp and Reyle [178].

¹⁹ Note the capital letter, a convention which is adopted here for all GR's.

determines its relational and semantic structure - crucially provided that such a Predicate can be defined independently of the notions of categorial head or even of lexical integrity (if the latter is defined in terms of the leaves of a categorially-labelled syntactic tree). Thus a categorially complex predicate, comprising a verb plus auxiliaries or plus an adverb or preposition, can constitute a single relational entity bearing the single GR Predicate, and will be a single object in the graph where these relations are stated (the R-graph in APG terminology).

Schematically the relationship between the different kinds of information may be represented as in (2.8). The feature geometry here adopts some important elements of A&W's framework (except that the terminology is chosen to reflect APG rather than LFG)²⁰.

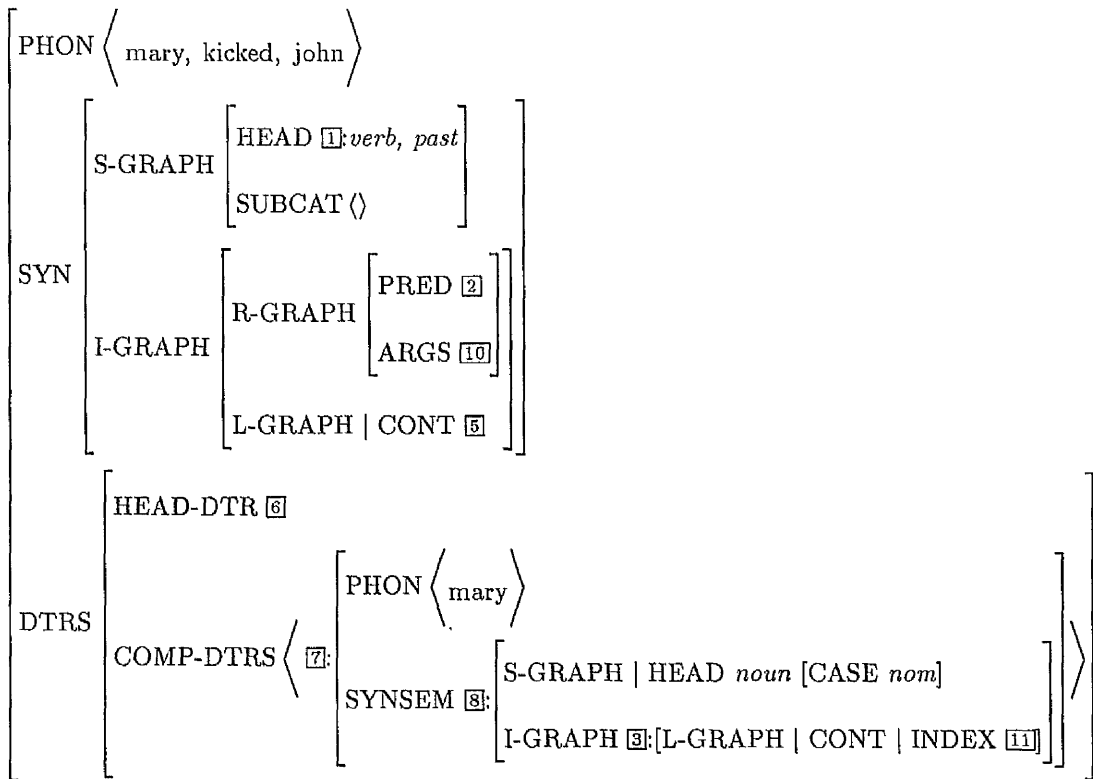
$$(2.8) \quad \left[\begin{array}{l} \text{S-GRAPH} \\ \text{I-GRAPH} \end{array} \left[\begin{array}{l} \text{HEAD } head \\ \text{SUBCAT } list(synsem) \\ \left[\begin{array}{l} \text{R-GRAPH} \\ \text{L-GRAPH} \end{array} \left[\begin{array}{l} \text{SUBJ } i_graph \\ \dots \\ \text{CONT } psoa \\ \text{CXT} \dots \end{array} \right] \end{array} \right] \right] \right]$$

This feature geometry is set up to capture the role of GRs in mediating between semantic role assignment and categorially based subcategorization (A&W [3, p.92-6]). The value of any GR feature (SUBJ in the example) is an *i-graph*, which makes no reference to category information (hence need not be realized by a category). However it does refer to semantic information, which will include role assignment; thus content information is bundled with relational information under the *i-graph* node. Subcategorization operates on *synsem* objects just as in [265], which will include an *i-graph*, so that each argument realized in the syntax must have a GR, and must also bear an *index* which is ultimately relatable to a semantic ROLE.

²⁰In APG the R-graph denotes relational information (cf. the "relational networks" of RG); the S-graph denotes surface structure (including constituent structure); the L-graph denotes the "logical" (predicate-argument) structure. The I-graph is based on A&W's I-STRUC feature, which integrates relational and semantic information (contr. Standard HPSG, where relational information is normally encoded under the CATEGORY feature).

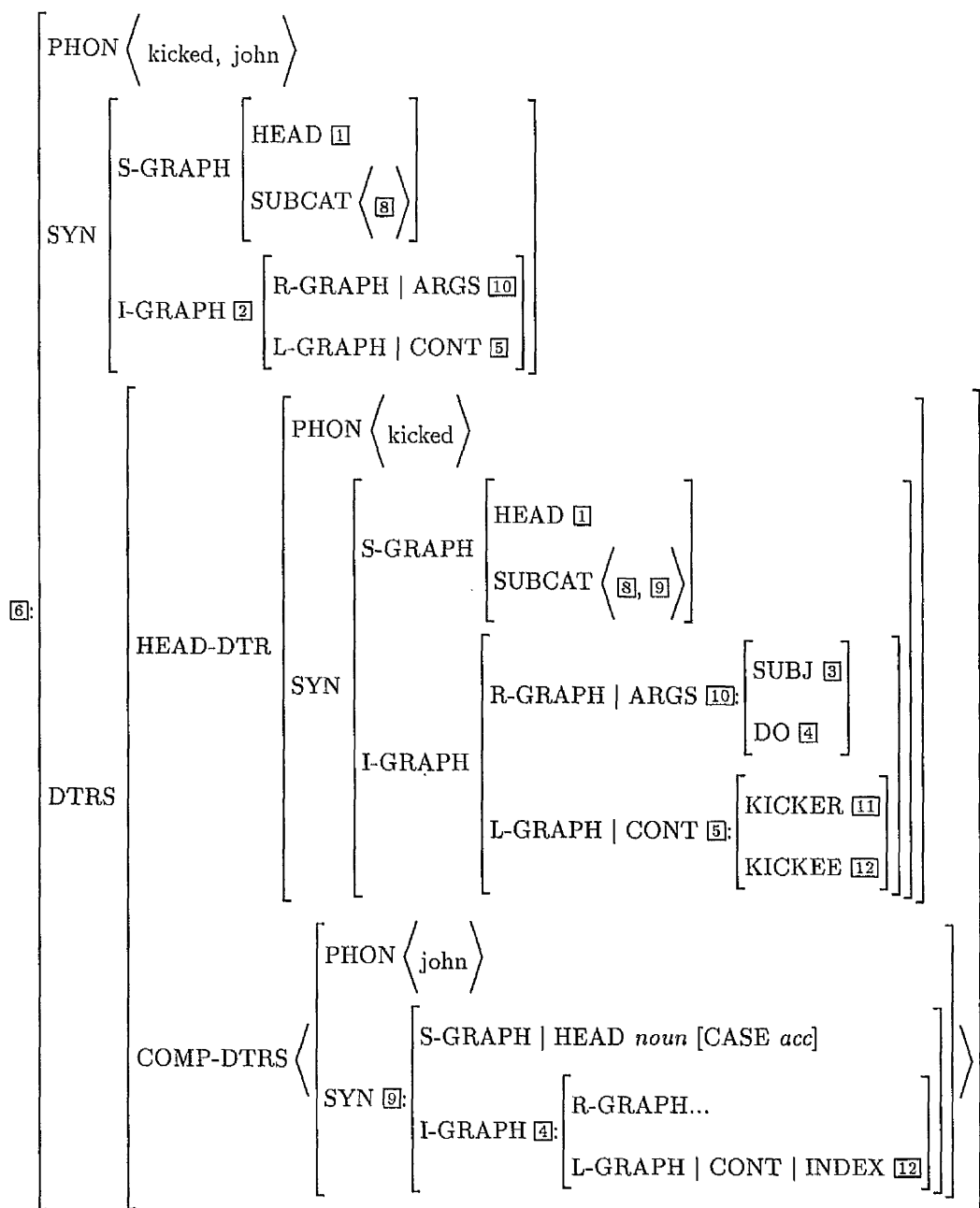
The examples in (2.9) show how this structure works out for the simple sentence "Mary kicked John".²¹

(2.9) 1.



2.

²¹As will often be done with large AVMs, this is broken down into two AVMs, the first representing sentence level and the second VP level.



These structures are minimally different from those familiar from P&S [265]²². In particular a unitary SUBCAT list takes care of subcategorization and maps onto phrase structure exactly as in P&S. Elements of the SUBCAT list are constrained to bear a GR by the fact that they have an *i-graph* value as a substructure. This *i-graph* structure in turn contains an *index*, and thus has access to (but is not determined by or identified with) information about the semantic role.

²² A&W make other changes which I do not adopt, or which are not relevant to the present discussion.

In many current versions of HPSG, the GRs are encoded by valence features under CAT, which then need to be composed by a valence principle to reproduce the effects of the standard theory's SUBCAT list. Here, by contrast, the relevant features are part of the content-theoretic component I-GRAPH, where they do not feed into subcategorization. The hierarchical relationship between them still has to be captured for various syntactic purposes such as binding; how this is done will be discussed below. Since it was argued above that the Relational Hierarchy is derivable from considerations of predication as well as role assignment, it is a convenient result of A&W's theory that GR features are located just where they have access to this semantic information.

Since the values of R-GRAPH features are invariably *i_graph* objects, it follows that the whole graph of relational and semantic features together can be treated in isolation from considerations of constituent structure, just as has always been maintained in the RG tradition. Just this strategy will indeed be followed in most of the following sections.

Having considered Predicate as a GR (in the sense of "irreducible predicates" as discussed above), it is now necessary to relate this to the other, Aristotelian sense of predication. To do this it is necessary to recall what HPSG (following Situation Semantics) understands by a proposition. This is not simply, as on other views, a *soa* (a propositional content with no parameters left unsaturated), but the relation that holds between the latter and a situation which supports it (i.e. an **Austinian proposition** (Austin [18]; cf. Robin Cooper [78] for discussion.).

It has become common in recent HPSG studies (following Richard Cooper[75], P&S [265, p.339-340]) to represent the semantic content of a clause as being not a *soa* but an Austinian proposition, with the situation (and the supports relation) explicitly represented in the graph. It is possible to question this approach from a number of angles.

First, it no longer seems clear on this view how the structure sharing of the semantic content of the clause with that of its head is to be understood. The semantic content of the head (the object bearing the GR Predicate, as just discussed) does not seem to have such a relation as part of its content; and the content of the clause is simply this with its parameters satisfied by indices of arguments.

A second objection is that it appears to undermine the conception of the grammar as defined over *types* - i.e. as a relation between utterance types and types of described situation. The assertion of a supports relation between a situation and a *soa* would seem to be appropriate only to utterance tokens, taking into account extra-grammatical information from the utterance situation, and should not be part of the content of a sentence considered as an utterance type.

For these reasons I do not follow the currently fashionable move of making Austinian propositions the semantic content of sentences; I do, however, adopt the situation-semantic view that such propositions are the *denotations* of sentences. Once the utterance situation is brought into the picture, then all the deictic parameters (including situations) can be anchored, and the sentence can be assigned a truth value. This, from one point of view, is what is meant by predication - the abstract information contained in the sentence is applied to a concrete object which enables it to be assigned a truth value. The objects concerned (whatever their nature) may be described as predication targets - the domain of a class of functions whose range is truth values.

The next thing is to provide a principled account of possible predication targets. On what I have called the Aristotelian view, the referent of the Subject NP is the predication target. In this case, the predicate is equivalent to a property of individuals. On the Fregean view, the predicate will be a relation, targetting ordered n-tuples of individuals. It is easy to obtain an Aristotelian predication from such a relation by currying, and by changing the order of application a non-Subject Topic can be obtained as target. From yet another point of view, that of modal logic, an entire proposition can be considered as a predicate, with possible worlds acting as predication targets. A less trivial version of the same thing applies in situation semantics; the equivalent of propositions are *soas*, which take situations as their targets to obtain a truth value. In the two latter approaches, confusingly, formulas which can from another point of view be regarded as propositional (they are saturated with respect to entity-denoting arguments) perform the role of predicates, as they do not have truth values in themselves.

The aim here will be to unify aspects of all these approaches to predication. It will be proposed that both situations and those entities denoted by Topics (in the default case, Subjects) perform

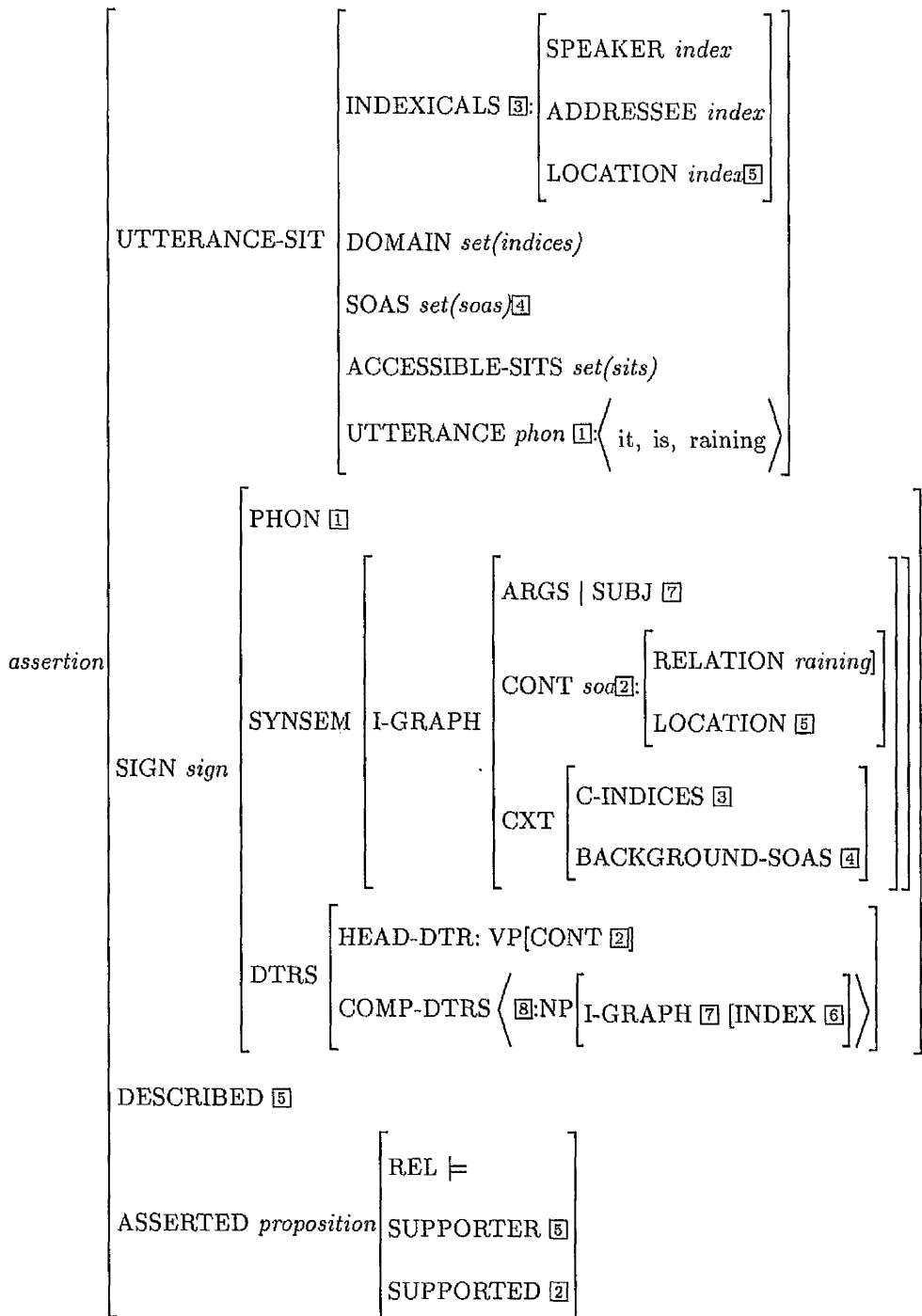


the function of predication targets, and that there are real and interesting parallels between the ways in which they do so. The semantic basis of this claim will be elaborated below (Chapter 3). Here I will simply indicate how the idea can be integrated into the relational structures which are the concern of this chapter.

The denotation of a sentence uttered in a given utterance situation u is a supports relation between a described situation s and a soa σ which is the CONTENT value of the sentence. All argument parameters in σ which have not been absorbed within σ (see below for this notion) must be anchored to entities which are identifiable from the standpoint of u . (This may involve the use of resource situations, which are also considered accessible from u). Importantly, s itself must also be accessible relative to u .

Schematically, the information involved in the utterance of a sentence type so as to denote a proposition may be represented as follows. Note that the actual linguistic sign is a proper substructure of this complex of situation-theoretic information.

(2.10) An utterance of "it is raining"



The *soa* is given a truth value relative to the described situation which supports it. In this sense it can be said to be predicated of the described situation. In this instance the situation corresponds to the value of a LOCATION parameter in the *soa*, which constrains it. This applies

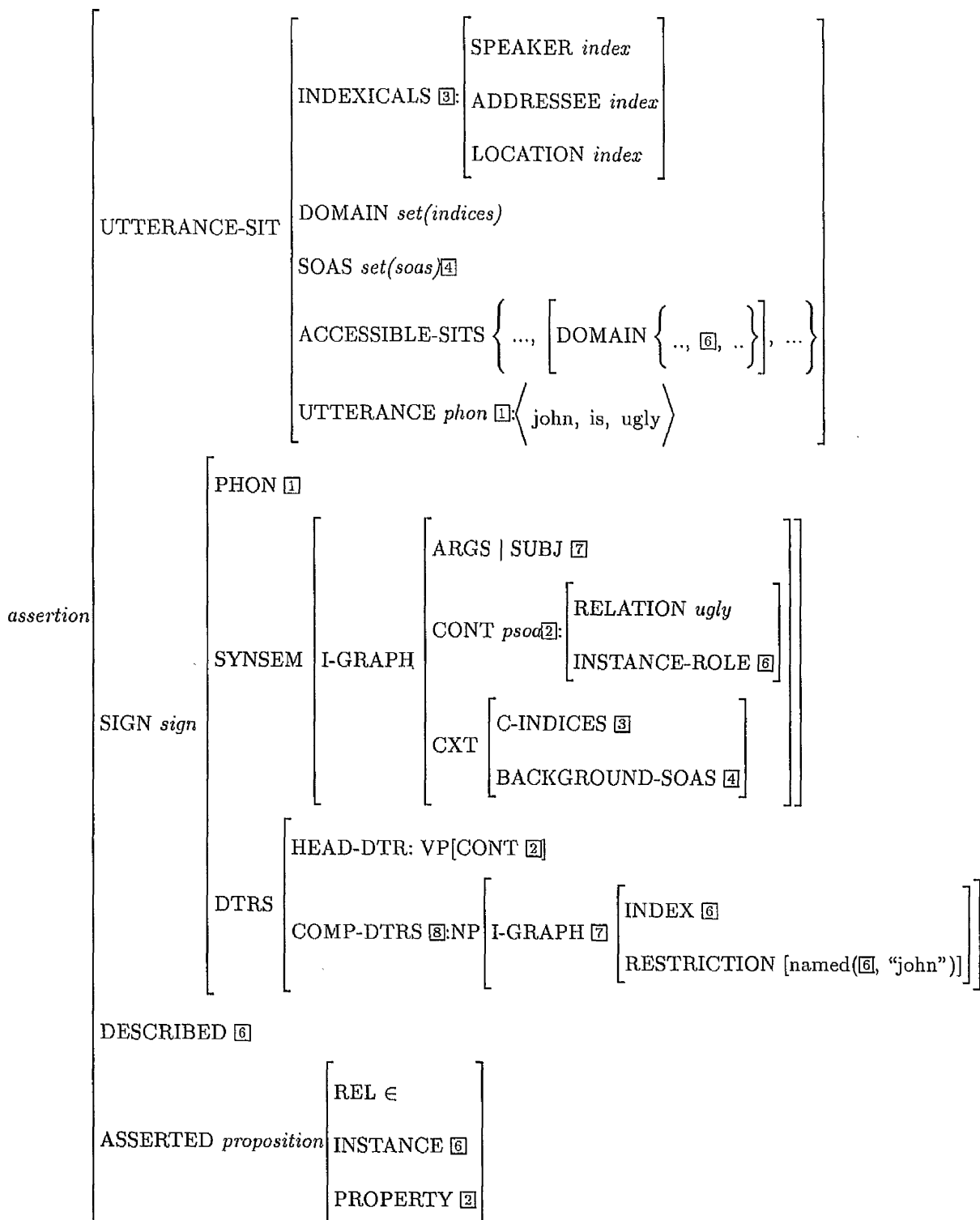
essentially to stage level predicates²³. Effectively the *soa* is predicated of an object (a situation) which is also the value of one of its own parameters.

However a *psoa* may also be predicated in a similar way of an entity which anchors one of its *ROLE* parameters²⁴. Situations are still relevant in the sense that something predicated of an individual is only true (or false) in situations where that entity forms part of the domain. However, it is fair to say that in this case we have a “described entity” rather than a described situation, about which the utterance offers information and relative to which it will be judged true or false.

(2.11) An utterance of the sentence “John is ugly”

²³A number of treatments assume that a stage level predicate has an extra spatio-temporal argument position (Heim [140], Kratzer [200, 199], Diesing [87]). For the idea that this corresponds to the *Topic* of such sentences, cf. Shir [104, p.35f].

²⁴This parallelism between situations and individuals will be one of the main themes of the next chapter.



The intuition here is that the \in relation plays a role formally parallel to the \models relation in the previous case, with the Subject referent (the “described object”) corresponding to the described situation. The index of this referent is identified with one in a (resource) situation accessible to

the utterance situation. It is also this index that is structure-shared with the SUBJ of the clause. When the Topic is not the Subject, then other mechanisms have to be brought into play to bring the Topic's INDEX value up to the top level of the clause so the required structure sharing can take place. I take it that this is what drives the various syntactic constructions involving Topics (section 2.4).

The following generalizations about predication will be utilized in what follows:

- (2.12) 1. Predication is a relation between a *soa* and an object corresponding to one of its parameters.
2. Predication is only possible between informational objects which are present at the top level of a clausal structure.

Finally, consider the case where a stage level predicate is predicated of an individual (2.13).

(2.13) Mary I think is drunk.

The predicate ("drunk") is stage-level, but the sentence is predicated of Mary (as shown in this case by the topicalization). However the situation parameter is still involved, because the property is attributed to the individual only relative to a proper subset of the situations in whose domain the individual occurs. Cases like these, where a described situation and a described individual appear to interact, will be discussed further in Chapter 4.

2.3.4 Predicates and lexicalism

The distinction between relational structure and semantic structure means that the semantic decomposition of predicates is not necessarily reflected by biclausality in the syntax. The relational structure of clauses with more than two arguments is treated here in a way which is analogous to the RG idea of *clause union*, in which a structure which is bi-clausal at the interface with predicate-argument semantics is monoclausal at the level at which it projects into the surface syntax (cf. Aissen and Perlmutter [6], Gibson and Raposo [116], Davies and Rosen [83]). A classic example concerns causativization, which is relevant here because the idea will later be defended that "double

object" constructions have a relational structure close to a cross-linguistically common type of causative, in which the Subject of an embedded transitive predicate is demoted to a 3 (Comrie [73]). The clause union operation collapses two predicates with their arguments into a single clausal structure with arguments taking GRs appropriate to arguments of a single clause (notably observing stratal uniqueness).

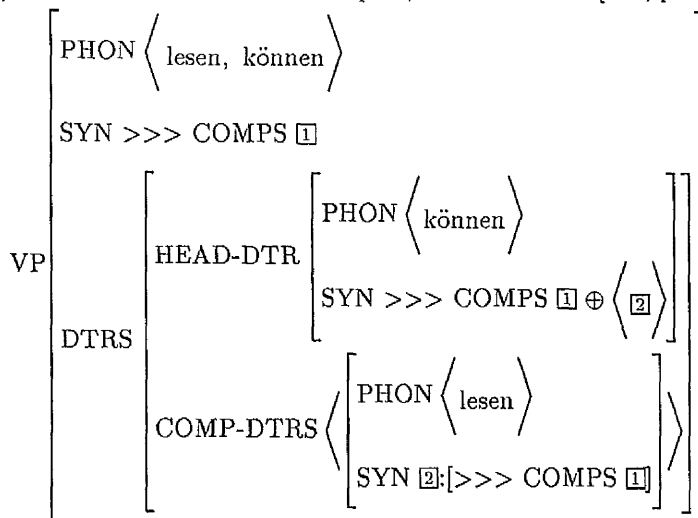
The idea of clause union has been emulated in HPSG by an influential and elegant proposal by Hinrichs and Nakazawa (H&N), normally termed **argument attraction**²⁵. According to H&N (whose theory was designed for the particular case of German auxiliaries and main verbs), the auxiliary selects as its complements both the main verb and the complements of the latter. In this way the clause is headed by a lexical element whose argument structure is underspecified in the lexicon and contributed partly by its complement in the syntax. Thus the lexical categorial head of the construction does not fully determine the argument structure.

Taking the relational head of the sentence as the predicate (the **irreducible predicate** as defined above), then this presents a dilemma regarding the idea of argument structure as the projection of lexical information into the syntax - an idea which is central to most frameworks but raises particularly acute problems for a lexicalist framework like HPSG. If the (irreducible) predicate is formed in the syntax, then this violates the principle of direct syntactic encoding ((2.6), page 40), which envisages that the lexical head project its final relational stratum directly into the syntax. If, on the other hand, the relational structure of such clauses is formed in the lexicon, then it is necessary to define lexical rules over entries composed of more than one syntactic word²⁶. In H&N's approach evidence is given for regarding the Aux-V complex as a constituent, from whose root node the argument structure is projected into the sentence; however the percolation of that information up to that node involves the operation of a syntactic rule (the subcategorization principle). The complement contributes its argument structure while being itself cancelled from the argument structure of the auxiliary.

²⁵[150, 149, 148]; there is a convenient summary in [147].

²⁶cf. A&W [3] for discussion.

(2.14) Structure for the Aux-V complex, based on H&N [147, p.545]



One way of looking at the structure-sharing in the above example is that it in effect makes the complement the “valence head” of the clause by the application of syntactic rules, while the syntactic head contributes morphosyntactic information such as person and tense (cf. the distinction in several LFG studies cited above between categorial and “functional” heads, the latter corresponding to this notion of valence head (Mohanam [236], Nordlinger [246], Bresnan and Sadler [53]).

In this thesis I prefer not to adopt this approach, although it has a claim to be more literally “head-driven” in the sense that the required properties are projected into the syntax through information in the categorial head together with combinatorial rules. Instead, as already indicated, I interpret “head-driven”, for the issues which are important to this thesis, as “predicate-driven”, thus following A&W [3] in invoking a theoretical construct (the irreducible predicate) which may involve some degree of mismatch with the surface syntax, into which its information may be projected via more than one preterminal node. The mother node of the Aux-Verb complex in H&N’s theory occupies the curious position of being a “funnel” through which information is projected. Up to that node the relational structure of the clause is built up; it is then projected into the clause as if from a lexical head, and above that node its valency requirements are discharged syntactically in the normal way. Although the full architectural implications of my preferred approach cannot be properly discussed here, I propose instead to treat the level at which the

predicate projects its information into the syntax as being the essential dividing line between lexical and syntactic processes. Put schematically, the formation of a Predicate is lexical, the cancellation of its valence requirements is syntactic.

2.3.5 Core Relations

In the feature structures discussed in the previous section, the only GRs used were SUBJ and DO. Moreover these feature structures were purely monostratal; the value of the SUBJ feature was assumed to be an initial as well as a final Subject. In this section the theory will be extended to core relations in general, with an initial formalization of the ideas introduced above for the IO and OBL relations (section 1.3.2) and for initial GRs (section 2.3.2).

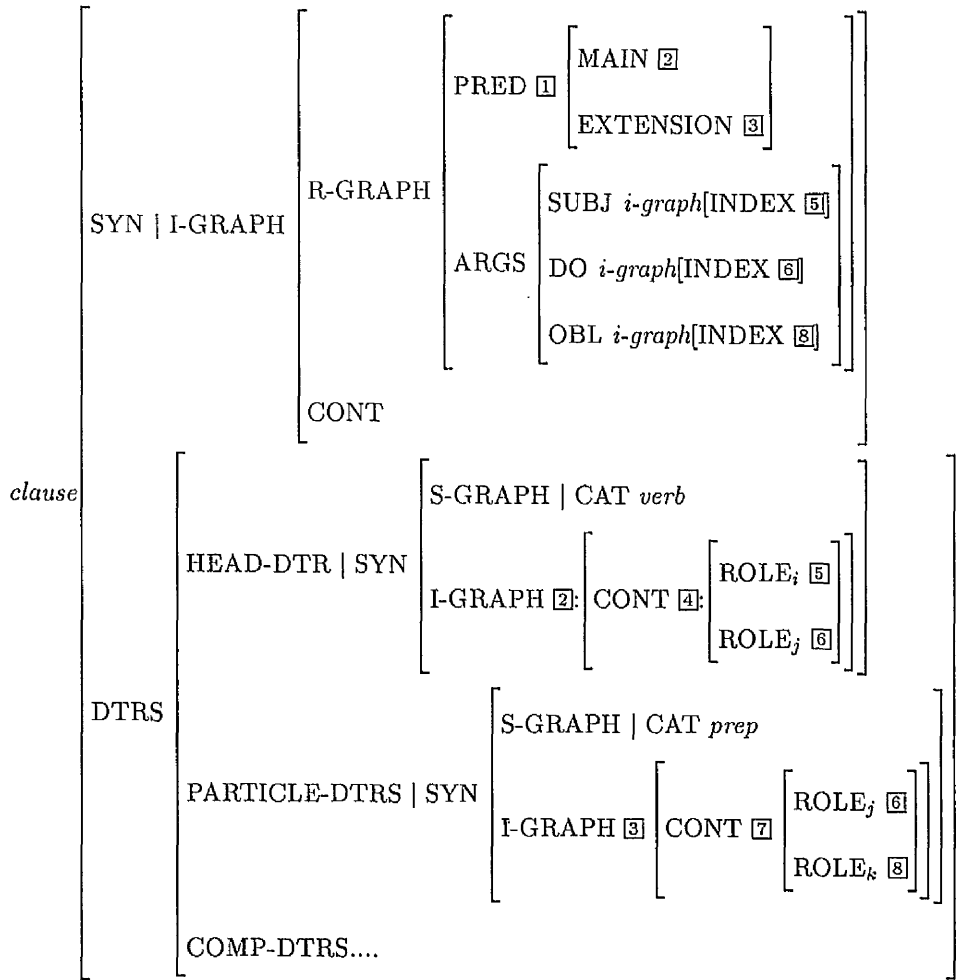
The class of **core relations** in general will be defined to be those GR features which are appropriate for ARGS. Recall that the latter has its tail at the same node as the PRED feature, and its value is structure shared with the R-GRAPH of the predicate (2.15).

Secondary predicates

(2.15) A basic (dyadic) predicate

$$\text{clause} \left[\begin{array}{l} \text{SYN | I-GRAPH | R-GRAPH} \left[\begin{array}{l} \text{PRED } \boxed{1} \\ \text{ARGS } \boxed{2}: \left[\begin{array}{l} \text{SUBJ } i_graph \\ \text{DO } i_graph \end{array} \right] \end{array} \right] \\ \text{DTRS | HEAD-DTR | SYN | I-GRAPH } \boxed{1}: \left[\begin{array}{l} \text{ARGS } \boxed{2} \\ \text{CONT } psoa \end{array} \right] \end{array} \right]$$

(2.16) An extended predicate (with OBL)



Example (2.16) shows the simple relational scheme of (2.15) extended to accommodate a secondary predication as envisaged in section 1.3. In this particular example the extra argument is an Oblique. The secondary predication is represented by the *psoa* tagged [7], which is assumed in this case to be marked by an overt preposition. The latter combines with the verb at the R-GRAPH level to form a composite Predicate, tagged [1], which incorporates both *psoa*s and gives a combined triadic argument structure (the ARGs value). There is thus no assumption of a double predicate, and hence biclausality, in the syntax²⁷ (though it could accommodate such a structure quite naturally if required for particular languages).

²⁷This in particular distinguishes the present approach from Generative Semantics, with which it otherwise shows some similarities.

Passive and initial GRs

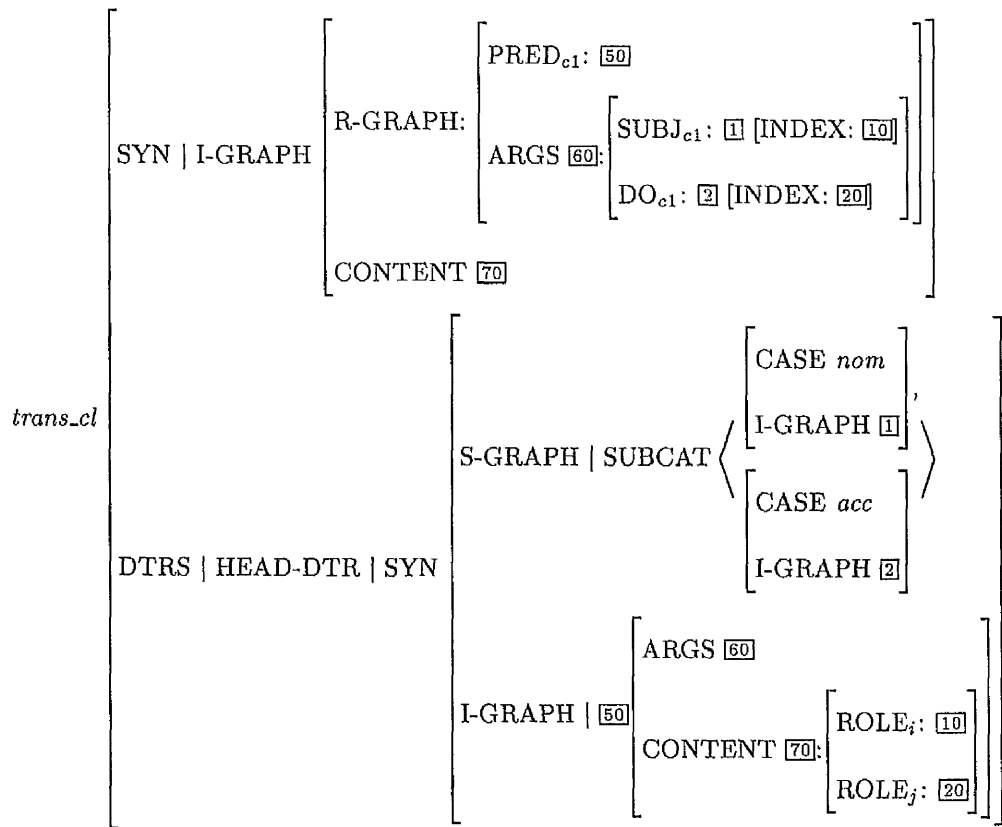
The other aspect of core relations which had to be captured was the idea of revaluation, in which GRs are “changed” (that is to say, there is a systematic mismatch between the information they feed into the surface syntax and the assignments that would be expected from the predicate-argument semantics). The treatment here will be based on a lexicalized version of the relations Sponsor and Erase which constrain relational networks in APG (J&L [174]) (the present treatment is, however, only a sketch of such an analysis). To present the basic idea I will focus on Passive, a well-studied example of a relation-changing operation involving only core relations.

Basic Passive constructions are characterized relationally by the advancement of an initial DO to SUBJ, forcing the chomage of the initial SUBJ [258]. A Passive is projected into the syntax on the basis of its final GRs, the *chômeur* having the status of an optional constituent which, if realized, has its INDEX identified with the value of the appropriate θ -role. In P&S this identification is captured by making it an optional “most oblique element” on the SUBCAT list²⁸

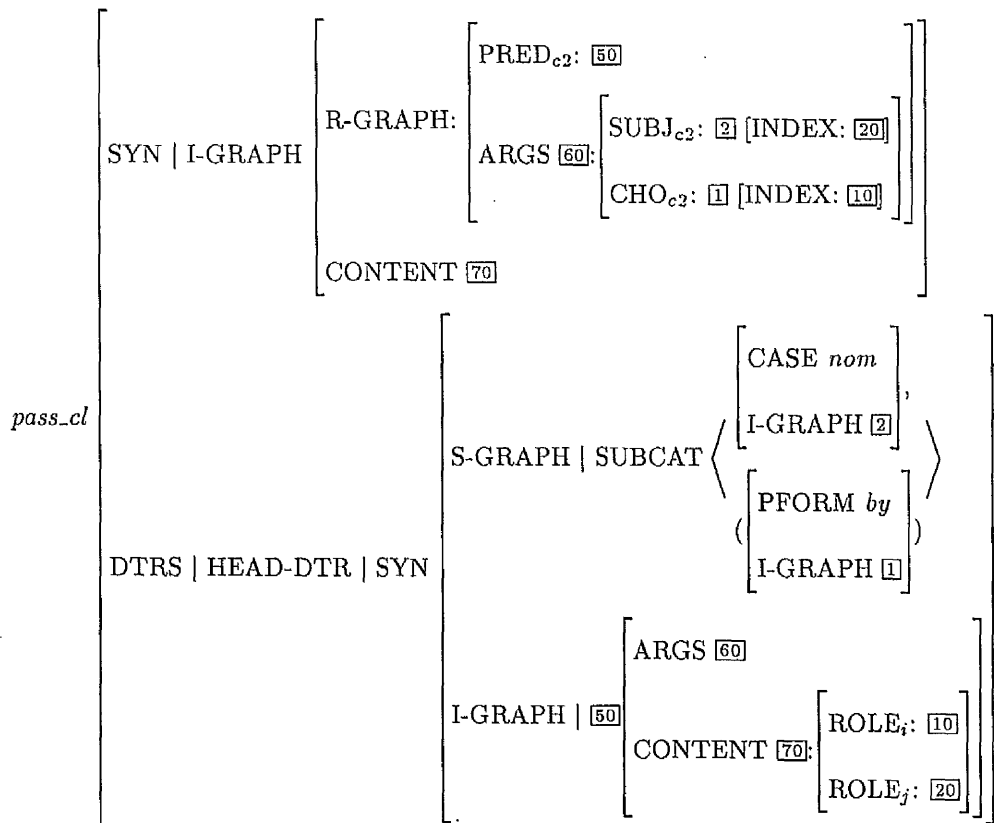
I assume that Passive will be represented by a relation between two lexical entries partially represented as follows:

(2.17) 1.

²⁸In English, which typically maps GRs into positions on the SUBCAT list. Cross-linguistically other realizations of the CHÔ relation are possible, including incorporation (Chung [67]) or obligatory deletion.



2.



In (2.17) the GR features have been labelled with co-ordinates as if part of a stratified feature structure of the kind proposed by Johnson and Moss (op.cit.). This is, however, only for expository purposes²⁹. It will be noticed that the passive feature structure only contains explicit representation of one stratum - c_2 , the final one. The important operation is the formation of the passive predicate from the active one. Information about the pre-final stratum c_1 is thus not represented in the passive feature structure, but is available through the accessibility of the active predicate in the lexicon.

The idea, then is that relational networks are defined over, and act as constraints on, the productive process of forming new predicates within the lexicon. In a sense the relational strata will be recorded but only on the "derivation-history" of the predicate in the lexicon.

Relational operations of the kind exemplified by Passive (known as **revaluations** in the RG literature) involve **parallel** arcs whose tails are at the same node (the clause, which was defined,

²⁹They could alternatively be represented as the input and output of a lexical rule, as in P&S [265].

following APG, as that node which is also the tail of a predicate). Initial GRs in such a configuration are licensed directly by the argument structure of the predicate; as far as the syntax can see they are "self-sponsoring". I interpret this as meaning that they fulfill the condition in (2.18) straightforwardly, as in standard HPSG, by the structure sharing of their *index* with the expected ROLE value.

- (2.18) Arcs are sponsored iff they have a substructure whose value is structure-shared with the value of a ROLE feature of a predicate.

In the case of revaluations, the arc label is licensed to change provided that the old arc sponsors the new one, which in turn erases the old one. Thus on the one hand the new arc is related to an argument-structure position (it will have a substructure which is structure-shared with a ROLE value), and on the other the old arc is eliminated from the syntax.

- (2.19) GR Arcs are erased iff their values do *not* appear in the corresponding position in the SUBCAT list.

The list-valued SUBCAT feature of standard HPSG provides, in fact, a useful way of encoding the erasure condition, because if an arc X is succeeded by an arc Y in the course of a revaluation, the object which is its value obviously cannot appear twice in the SUBCAT list because the same object cannot appear twice in a list.

The stratal uniqueness law (forbidding the occurrence of two identical GR labels) is an obvious consequence of a feature structure format in which features are functions. So in the second AVM in (2.17) above, the feature structure [2] can only be the value of SUBJ on the following conditions: SUBJ must have a sub-structure which is a role-filler (the sponsor condition - fulfilled by the presence of [20]); the DO feature with value [2] must be eliminated (the erase condition); and the SUBJ feature with value [1] must be eliminated (stratal uniqueness). This however leaves a feature structure [1] which structure-shares some of its nodes with the main feature structure (notably its INDEX), but is not reachable by a path from its root. The introduction of a CHÔ feature has the effect of re-connecting the graph and restoring well-formedness.

The above considerations apply to what in RG terminology are called **core relations**, which correspond to argument positions and (in the initial stratum) interface with predicate argument structure.

Following RG, two other main non-argument categories of nominal arc need to be considered: retirement relations (represented here solely by the **chômeur** relation, which has been discussed), and **overlay relations** which correspond to information-structural notions and interface with discourse. The last of these will be the subject of the next section.

2.4 Overlay Relations and Non-local Dependencies

Overlay relations have in common, first, that they introduce discourse information into the grammar, and second, that at least in the surface syntax constituents bearing such relations can be found in positions an “unbounded”³⁰ number of clauses above the predicate with whose argument structure they are associated. These aspects are treated in HPSG using a group of features for distinct (but interacting) non-local dependencies (P&S [265, Ch.4,5])³¹.

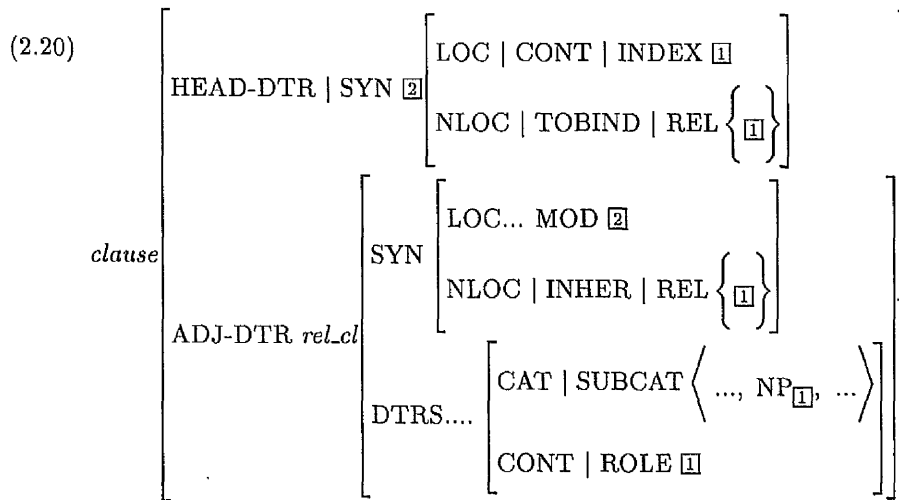
The second of these phenomena (the “dislocation” in constituent structure) is treated in HPSG using the non-local feature SLASH (discussed later in this section).

The main focus of interest here, however, will be in the other side of overlay relations: the introduction of non-local *interpretive* information. Note that these dependencies, and constraints on them, may still exist in the absence of actual dislocation. In Relative Clauses, the nonlocal dependency whose theory is most explicitly developed in HPSG (P&S [265], Sag [280]), this involves the structure-sharing, by means of these nonlocal dependencies, of an *index*. This single token object is constrained to be the value simultaneously of the CONTENT|INDEX path from (i) the SYNSEM of the head noun, (ii) the MOD feature of the relative clause (and of the null relativizer which is its head), (iii) the SLASH feature on the head where the “gap” occurs, (iv)

³⁰I prefer to avoid the term “unbounded dependencies” as it begs the question of long movement versus successive cyclic movement, or its correlates in non-movement theories.

³¹In this section I discuss these issues in terms of the “standard” framework, deferring consideration of the current “clause-typing” approach to HPSG to section 2.5.

the relevant valence feature of the same head - besides also being the value of the nonlocal REL feature, introduced either on the dislocated Wh phrase or the relativizer head³², and bound off by the TOBIND feature on the modified head noun (2.20). I will not go into details of how these constraints interact, as these are to a large extent language-specific and construction-specific and do not concern us here; in any case, I will be adopting some of the important modifications to this scheme made in Sag [280]. The main point is that this multiple re-entrancy enforces the non-local index sharing between the head noun and an appropriate sub-constituent of the relative clause.



The case of Relative Clauses involves the sharing of information between two clauses - although the dependency falls completely within a particular syntactic unit (the combination of main clause and relative clause), which means that it can be constrained entirely within the syntax. This will not be the case with Topicalization, but I take it that apart from this consideration, it is essentially a similar process of inter-clausal index sharing that has to be modelled. The basic idea here will be that information from previously processed sentences as well as non-linguistic information from the utterance situation will be available under the CONTEXT attribute, and *index* objects within this feature structure can be structure-shared with *index* objects in the CONTENT of the current clause (very schematically as in (2.21)).

³²For *that* relatives I assume the account given in Gregory [122], Gregory and Lappin [127], but will not be concerned with the syntax of such clauses here.

$$(2.21) \quad \left[\begin{array}{l} \text{CONT} \mid \text{ROLE}; \boxed{\text{I}} \\ \text{CXT} \mid \text{BACKGROUND-PSOAS} \left\{ \dots, \left[\dots \boxed{\text{I}} \right], \dots \right\} \end{array} \right]$$

This index sharing in turn is closely related to the question of predication. A relative clause sets up a predication on a target which is shared with the matrix clause (whether or not it corresponds to a syntactic constituent within both clauses, as is the case in English Wh-relatives). In general it is reasonable to take this predication target as an index - corresponding, as in P&S, with an individual variable. However, it is also common to find a frame adverbial as the shared element (2.22, 2.23). This seems to have the effect of making the relative clause into athetic judgement, to be satisfied by a suitable anchoring of a location parameter.

(2.22) Costas and Stavros went to [the airport lounge]_i, *where*_i two men in dark glasses met them.

(2.23) I often think of [the 80's]_i, *when*_i a pint still cost less than a pound.

Moreover the predication target may be the denotation of a whole proposition, as in (2.24), or a *to*- infinitive (2.25).

(2.24) [June was flirting with the local fishermen]_i, *which*_i Sebastian thought was intended to annoy him.

(2.25) We were invited [to go out in a fishing boat]_i, *which*_i would have been exciting.

Thus the semantic dependency involved has to be understood in broader terms than simply the sharing of NP indices. Once again, one of the other relevant considerations is the Topic-Focus structure of the sentence.

It is generally claimed that the relativized constituent must be Topic of the relative clause (Schachter [287], Kuno [204], K&C [185]). In the relative clauses of a number of languages the shared element does not surface as a constituent, and this has been interpreted as the obligatory "deletion" (i.e, control) of the Topic of the relative clause by a constituent in the matrix clause. This is argued for Japanese by Kuno [204, 205] and for Philippine languages by Schachter [287].

This however needs some qualification, as there appears to be a difference between restrictive and non-restrictive (appositive) relatives in this respect. The examples given up to now are all appositive relatives, and here the generalization seems to hold. In (2.22) and (2.23) the Topic of the relative clause seems to be the location parameter, which is anchored through the relativized constituent. In (2.24) and (2.25) the Topic seems to be the situation described by the antecedent clause or infinitive. However in the restrictive relatives in (2.26) the situation is not so clear.

- (2.26)
1. John liked [the girls]_i; who_i Bill liked.
 2. John liked some_i girls_i; who_i Bill disliked.
 3. Costas and Stavros showed the police [the place]_i; where_i two men in dark glasses had met them. (It was the airport lounge).
 4. You probably don't remember [the time]_i; when_i a pint cost less than a pound. (It was the 80's).

In these cases it does not seem that the relativized constituent is Topic of the Relative Clause. It certainly shares an index (or a location parameter) with the antecedent, but the function of the relative clause seems to be to identify or restrict its antecedent rather than to offer information about it as an independently identifiable object. In this respect its function seems to be one of Focus rather than Topic. This is supported by the following considerations.

First, the examples in (2.24), (2.25) are ungrammatical as restrictive relatives (2.27). There is no way the relative pronoun can take the matrix proposition or the infinitival clause as an antecedent.

- (2.27)
1. * June was flirting with the local fishermen which Sebastian thought was probably intended to annoy him.
 2. * We were invited to go out in a fishing boat which would have been nice.

I assume provisionally that the denotation of a clause or of a VP is the set of worlds (situations) which satisfy the *psoa* which is its CONTENT. In the original examples (2.24), (2.25), the

evaluation of the matrix clause establishes an antecedent for the relative clause which can also serve as its Topic. However in the restrictive examples the antecedent cannot be evaluated without the relative clause, while the latter in turn cannot be construed as a comment on, or property of, an independently known object.

In Greek, a significant syntactic distinction between restrictive and appositive relatives is that in the latter, but not the former, the relativized position is normally clitic-doubled³³. Thus in (2.28), the first sentence implies monogamy, while the second would imply polygamy.

- (2.28) 1. *I yineka mou, pou tin ghnorises ekhtes, ine*
 the,Nom wife,Nom 1sg,Gen Rel CL,3sg,Acc,f met,2sg yesterday Cop,3sg
kathiyitria panepistimiou. Greek
 teacher,Nom,f university,Gen
 My wife, who you met yesterday, is a university professor.
2. *I yineka mou pou (*tin-) ghnorises ekhtes, ine*
 the,Nom wife,Nom 1sg,Gen Rel (*CL,3sg,Acc,f) met,2sg yesterday Cop,3sg
kathiyitria panepistimiou. Greek
 teacher,Nom,f university,Gen
 The wife of mine who you met yesterday is a university professor.

It is generally claimed in the literature that clitic doubling in Greek is associated with Topic (see Chapter 6 for discussion). On this basis it would seem that whereas the relativized constituent is Topic of the relative clause in sentence 1, it cannot be Topic in sentence 2.

Consider also the following sentences. Indefinite NPs which are left dislocated and clitic doubled (CLLD) can only have generic readings (2.29) - compare the reading in (2.30), where there is no CLLD, and the reading is indefinite (and focussed). As there is no Nominative clitic doubling available³⁴, the corresponding contrast is not syntactically marked if the NP is Subject. However, if such an NP is modified by a relative clause, then the generic reading is forced if the relative clause is appositive (with CLLD), while otherwise the indefinite focussed reading is obtained (2.31, 2.32). In the latter case the relativized constituent falls squarely within a focussed constituent, and cannot be construed as a Topic.

³³I take *pou* as a relative pronoun filling the relativized position. Alternatively *pou* may be a complementizer, with the relativized position being empty.

³⁴At least not in these cases - Nominative clitics appear in Greek only in a very restricted class of exclamatory sentences.

- (2.29) *Enan kathiyiti ton ektimai o kosmos.*
 one,Acc,m teacher,Acc,m 3sg,Acc,m respect,3sg the,Nom,m world,Nom,m
 A teacher people respect. (People respect teachers).
- (2.30) *Enan kathiyiti tha dhiorisoume.*
 one,Acc,m teacher,Acc,m Fut appoint,1pl
 We will appoint a teacher.
- (2.31) *Enas kalos kathiyitis, pou ton ektimai o kosmos, ine tikheros.*
 one,Nom,m good,Nom,m teacher,Nom,m Rel 3sg,Acc,m respect,3sg the,Nom,m
 world,Nom,m Cop fortunate,Nom,m
 Good teachers, who people respect, are fortunate.
- (2.32) *Enas kalos kathiyitis pou tha dhiorisoume tha sas mathi ola avta.*
 one,Nom,m good,Nom,m teacher,Nom,m Rel Fut appoint,1pl Fut 2pl,Gen
 teach all,Acc,n these,Acc,n
 A good teacher who we will appoint will teach you all these things.

The other consideration, this time a semantic one, is that the index (or other parameter) which is shared in a restrictive relative construction can be quantified away in a way which is incompatible with topichood:

- (2.33) 1. There were no_i girls_i who_i John liked.
 2. There was no_i airport lounge_i (where)_i; two men with dark glasses could meet them.
 3. There was never any_i time_i when_i a pint was less than a pound.

This is not possible with appositive relatives:

- (2.34) 1. * There were no_i girls_i, who_i John liked.
 2. * There was no_i airport lounge_i, where_i; two men with dark glasses could meet them.
 3. * There was never any_i time_i, when_i; a pint was less than a pound.

I conclude that the relativized constituent is Topic of the relative clause only in the appositive case, and not in the restrictive case. In accordance with the view put forward in Chapter 1, I propose that the crucial factor that has been overlooked so far is predication. The relativized

constituent in the appositive case must denote an entity on which a predication can be made, whereas in the restrictive case it need not (and indeed cannot).³⁵

This excursus into Relative Clauses has been motivated by the fact that their structure has been perhaps the best explored among overlay relations in HPSG, and because their characteristic feature of index sharing is particularly close to what is required for the non-local *interpretive* dependency involved in Topicalization. I now turn to Topicalization, in the sense of the non-local syntactic dependency in English and other languages which is normally known by that name. Extrapolating from the discussion of relativization, I assume (i) that the main interpretive effect of Topicalization involves bringing an index into a syntactically prominent position where it can be shared with extra-clausal material (though with the important difference that the identification is effected more by discourse considerations and less by purely syntactic constraints); and (ii) that once again predication, primarily the predication structure of the clause undergoing topicalization, is the other crucial issue involved.

Extraction is handled by the nonlocal feature SLASH. This idea was originally introduced within GPSG (Gazdar et al. [115])³⁶ but has undergone a succession of modifications in recent work in HPSG (P&S [265, Ch.9], Sag [280], Ginzburg and Sag [117]. Although the SLASH dependency is of course a static, declarative feature structure, it is common to speak of it as being "introduced" where the gap is, inherited upwards by an inheritance principle, and bound off at the top level with or without a filler category.

In P&S [265, Ch.9] the conception of the gap as a trace is replaced by the idea that it is a feature on the subcategorizing head, which is structure-shared with the value of a valence feature (say SUBCAT). In Borsley's neat formulation, the idea of an empty category is replaced by that of a *missing* category [46]. The relevant dependency is stated directly between the dislocated category and the head whose subcategorization properties give the impression of a "gap".

³⁵ Another reason for avoiding the simple identification of relativization targets with Topics is that in some languages the two contrast in their mode of linkage to the relative clause or Comment. In Bresnan and Mchombo's analysis of Chichewa, for example, relativized constituents may involve functional control, whereas Topics involve only anaphoric control. Following P&S [265, Ch3], I interpret this distinction in HPSG terms as *synsem* sharing as opposed to mere *index* sharing. B&M suggest that this distinction applies to Japanese also [52, p.23,f25]. These issues will be discussed further in chapters 5.2 and 6.

³⁶ See Borsley [46], Sag and Wasow [283] for an introduction.

In Sag [280] and Ginzburg and Sag [117] the introduction, inheritance and binding off mechanism for SLASH features are all radically modified. The SLASH is introduced by a non-null SLASH value which is structure shared with a subcategorized argument of the head, and at the same time the *synsem* object that appears in the SUBCAT³⁷ list is constrained to be of a non-canonical subtype of *synsem*, specifically *gap_synsem*, which is licensed not to be realized by an overt category³⁸.³⁹ In the present framework the need for uncanonical synsems (of both types) disappears, because of the separation of subcategorization from relational information (2.35). The only argument locally realized as a category is the one whose *synsem* is the sole member of the SUBCAT list, namely the Subject. The SLASH argument's *synsem* is not shared with other *synsem* objects in an underlying arguments list, but only shares its I-GRAPH value with the SUBJ feature, the latter being completely indifferent to how its value is realized categorially. In other respects the lexical rule given here is close to the CELR of standard HPSG.⁴⁰⁴¹

(2.35) Complement Extraction Lexical Rule (relational version)

Input:

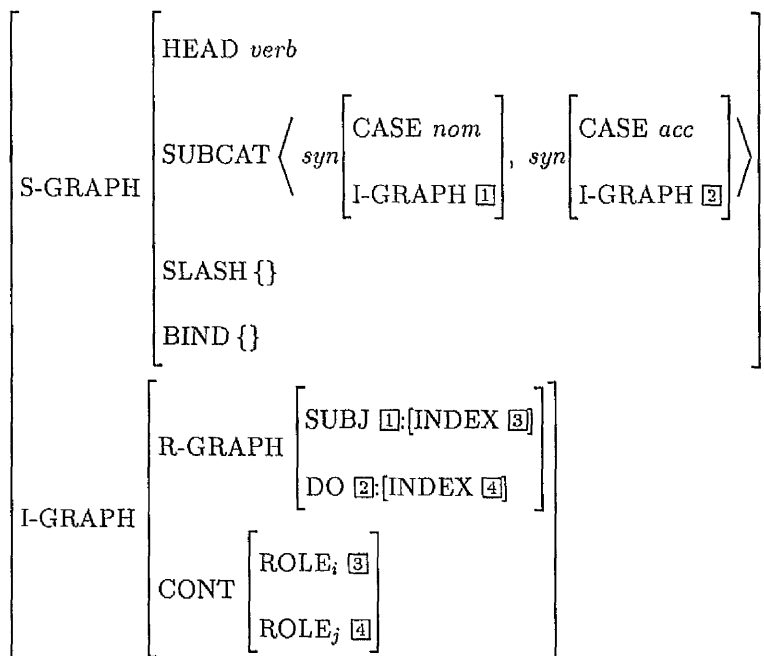
³⁷ Ginzburg and Sag actually use an ARG-STR feature together with a valence principle,

³⁸ The Argument Realization Principle (ARP)

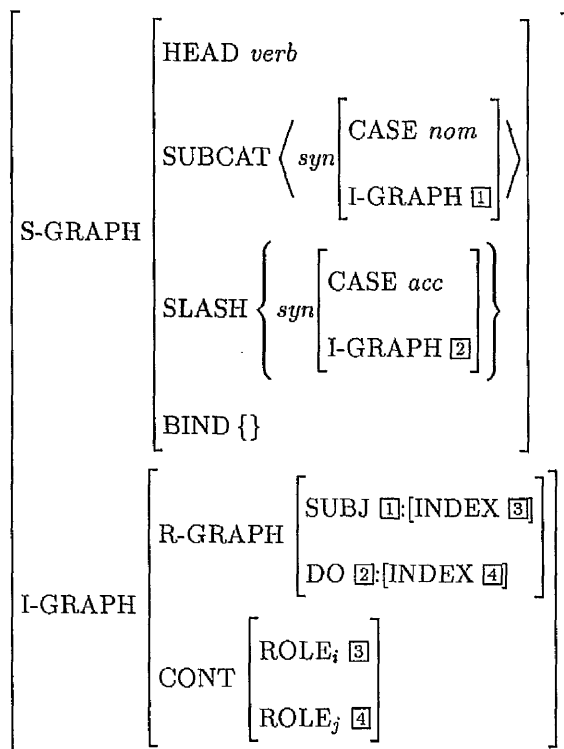
³⁹ Similar non-canonical synsem objects have been proposed in recent HPSG work to deal with pronominal clitics and the related phenomenon of "pro-drop" (Miller [232], Miller and Sag [233], Monachesi [238], Avgustinova [19], Ionescu [159, 160]); these will be discussed in a later chapter.

⁴⁰ Again I have kept as close to the feature structures of P&S and G&S [265, 117] as is compatible with the proposed innovations. I simplify a little by making the SLASH value a set of *synsem* rather than *local* objects. This is technically incompatible with the HPSG treatment of parasitic gaps, but I do not discuss parasitic gaps here.

⁴¹ One question not fully resolved here is how structural Case is assigned, given that GRs do not select for category features like CASE. In some languages of course Case does not correspond straightforwardly to GRs. However for languages like English it is not difficult to fix the correspondence between Case and position on the SUBCAT list as part of the template for verbs in general.



Output



Unlike in GPSG and P&S [265], in Sag [280] and G&S the SLASH is inherited upwards via the head, which contains the SLASH values of its arguments⁴². Thus SLASH is effectively made

⁴²The Slash Inheritance Principle (SLIP)

into a head feature.

At the top of the dependency the SLASH is bound off. In P&S the mechanism is different for topicalization than for other unbounded dependency constructions, being licensed by a configurational schema in the former (the Head-Filler Schema) and by a lexical BIND feature on a null complementizer in the latter. Here I attempt a more unified treatment, using the clause-typing approach in the spirit of Sag [280]. It will be used here to combine proposals about both the constituent structure and the interpretive contribution of topicalization constructions.

2.5 Clause Typing

Over the past few years the theory of P&S has been replaced in the work of many theorists by a new approach pioneered within HPSG by Sag and others [280, 117, 281], which exploits the multiple inheritance networks available within the typed feature-structure framework to systematically cross-classify *constructions*. Among other advantages, this enables the work previously done by null heads to be done instead by the direct application of typing information at the phrasal or clausal level⁴³.

The policy adopted in this thesis is generally to modify the framework of standard HPSG only conservatively, partly from preference but partly also in order to bring out more clearly the innovations I do propose against a background of assumptions which are widely understood and appreciated. However one advantage of the clause-typing approach, like the Construction Grammar framework by which it has been largely inspired, is that it allows a certain directness in the encoding of generalizations which other approaches attempt to derive, often with great ingenuity, from the interaction of other principles. For this reason I make use of clause-typing in this section, which attempts to bring together the considerations discussed into a general account of Topic constructions.

Since the aim is to characterize Topic as a GR and not only as a semantic entity, I propose first

⁴³cf. [280], also the approach to Wh-questions in Johnson and Lappin [170], in which the null complementizer approach of their earlier work [169] (cf. also Gregory and Lappin [127]) is replaced by a constructional type-hierarchy account for this reason.

of all a type of construction which I will call *topic_comment_constr*, of which the purely semantic correlate will be (following Kuroda) the type *categorical_judgement*. The first of these is a subtype of *sign* - though importantly not of *clause*. Recall that clause was defined above as the tail of a Predicate arc, and GR arcs in this framework link objects of type *i_graph*, not signs⁴⁴. Moreover as an overlay relation Topic must have its tail in a node outside the clause. Thus the I-GRAPH value of a topic-comment structure represents, within the relational domain, a super-clausal node, or what might be called the extended projection of a clause⁴⁵, just as in the domain of signs the topic-comment structure itself represents a proper superstructure of the phrasal sign corresponding to the clause. The idea here is close to the GB conception of discourse-related functional heads as being higher than, and properly including, the IP, though the relational structures used here are not assumed to be *necessarily* configurationally encoded in the same way.

The I-GRAPH value of a topic-comment structure (and the corresponding node for other overlay relations - the node designated X_{GR} in the discussion in section 2.3.2) will be a type designated *overlay*, this and the *clause* having a more general type called *clausal*. The CONTENT value of a topic-comment structure, *categorical_judgement*, is, along with *thetic_judgement*, a subtype of *message* (cf. G&S [117]). The type hierarchy is given (partially) in (2.36), and some of the relevant constraints in (2.37).

(2.36) Type declarations⁴⁶

- $\text{top} > \{\text{sign, syn, i_graph, r_graph, content, \dots}\}$
- $\text{sign} > \{\text{word, phrase}\}$
- $\text{phrase} > \{\text{headed, n_headed}\} * \{\text{basic, overlay_constr, \dots}\}$
- $\text{overlay_constr} > \{\text{topic-comment-constr, rel-wh-constr, \dots}\}$

⁴⁴In the tradition stemming from Sag [280], it is usual to make clausality one dimension of inheritance for phrasal signs (along with e.g. headedness). In the present approach the information is factored differently, clausality being separated from phrasality as a relational rather than a phrase-structural notion.

⁴⁵Cf. Grimshaw [129]

⁴⁶The symbol $>$ is used here for partitions. Each set represents a dimension of inheritance, different dimensions being joined by the operator $*$. The notation comes from ProFIT [102, 103], in which a grammar reflecting this approach has been partially implemented in order to check its consistency (see the appendix to this chapter for a fuller version).

- headed > {head_subj, head_comp, head_adj, head_filler....}
- i_graph > {clausal, nominal, predicate}
- clausal > {clause, overlay}
- content > {message, abstract, soa, index}
- message > {judgement,}
- judgement > {categorical_judgement, thetic_judgement}

(2.37) Feature declarations

$$1. \quad \text{clause} \Rightarrow \left[\begin{array}{l} \text{R-GRAPH} \left[\begin{array}{l} \text{PRED } \textit{predicate}: [\text{CONT:} \boxed{1}] \\ \text{ARGS} \left[\begin{array}{l} \text{SUBJ } \textit{nominal} \\ \dots \end{array} \right] \end{array} \right] \\ \text{CONTENT } \boxed{1}: \textit{soa} \end{array} \right]$$

$$2. \quad \text{judgement} \Rightarrow \left[\begin{array}{l} \text{SUPPORTER } \textit{index} \\ \text{SUPPORTED } \textit{abstract} \end{array} \right]$$

$$3. \quad \text{abstract} \Rightarrow \left[\begin{array}{l} \text{PSOA } \textit{soa} \left[\begin{array}{l} \text{ROLE } \boxed{1} \\ \dots \end{array} \right]^{47} \\ \text{VARIABLE } \boxed{1}: \textit{index} \end{array} \right]$$

$$4. \quad \text{overlay} \Rightarrow \left[\begin{array}{l} \text{R-GRAPH} \mid \text{COMMENT } \textit{clause} \\ \text{CONT } \textit{message} \end{array} \right]$$

$$5. \quad \text{overlay_constr} \Rightarrow \left[\begin{array}{l} \text{SYN} \left[\begin{array}{l} \text{SUBCAT } \langle \rangle \\ \text{SLASH } \{ \} \end{array} \right] \\ \text{I-GRAPH } \textit{overlay} \end{array} \right]$$

⁴⁷These features can be thought of in terms of the parts of a λ -expression, as will be elaborated below.

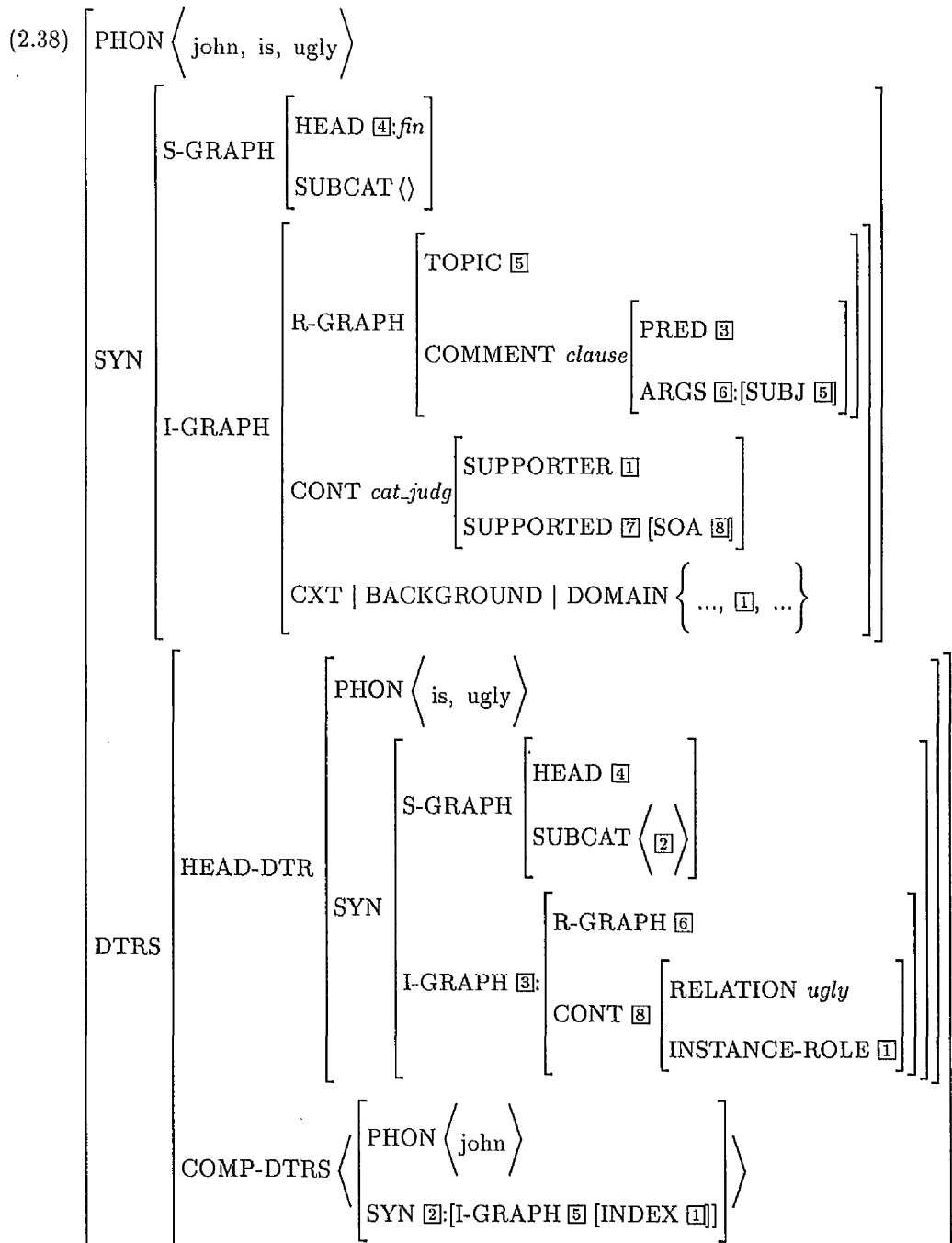
$$6. \quad \text{topic_comment_str} \Rightarrow \left[\begin{array}{l} \text{SYN | I-GRAPH | R-GRAPH} \left[\begin{array}{l} \text{TOPIC } \textit{nominal} \\ \text{COMMENT } \textit{clausal} \end{array} \right] \\ \text{CONTENT } \textit{categorical_judgement} \end{array} \right]$$

The semantic significance of a *judgement* is that it involves a predication, in the sense discussed above. I assume that this is effected by λ -abstraction on one argument of the *psoa* to give the CONTENT value of the clause (the Comment). In the case of athetic judgement abstraction is on the LOCATION parameter, while in categorical judgements it is on a ROLE parameter. The function of the CONTENT value of the Topic is then to provide an individual which can combine with the abstract to give a truth value by β -reduction. What is left in the *psoa*, whether or not it is saturated with respect to its ROLE arguments, is thus made into a predicate, a function into the set of truth values⁴⁸. The semantics of Topics will be explored in more detail in the next few chapters.

Thus the effect of a topicalization construction is to take the *soa* content of a clause and separate it into a λ -abstract and an individual term. This can be done in a number of configurations. The simplest is that it can simply be superimposed (literally an "overlay") on a Subject-VP construction, specifying the Subject as Topic and the VP content as the λ -abstract⁴⁹. The following structure shows how the index of the Subject NP may be passed to the top level of a Topic-Comment structure without the need to posit any extraction (2.38). This may be compared with Subject Wh-relatives (cf. Sag [280, p.22]), where the relevant index is passed up as a REL feature to the top level of the construction, where it is identified with the INDEX of the modified head noun (2.39).

⁴⁸This is a departure from the normal treatment in situation semantics, as will be discussed in the next chapter.

⁴⁹In this connection it is worth noting that many of the languages where the Subject is constrained to be Topic (Chinese, Malagasy) are also well known for being highly configurational.

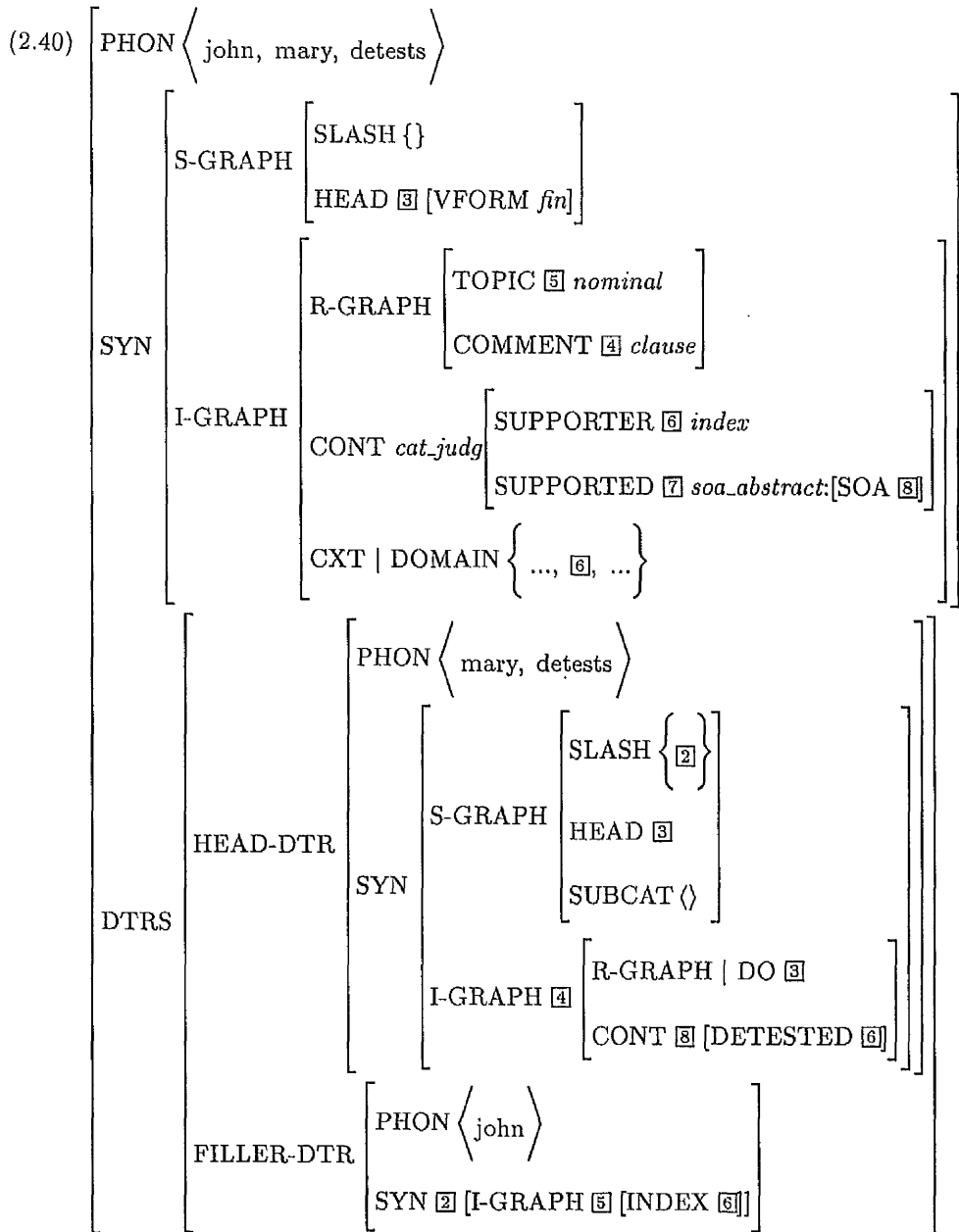


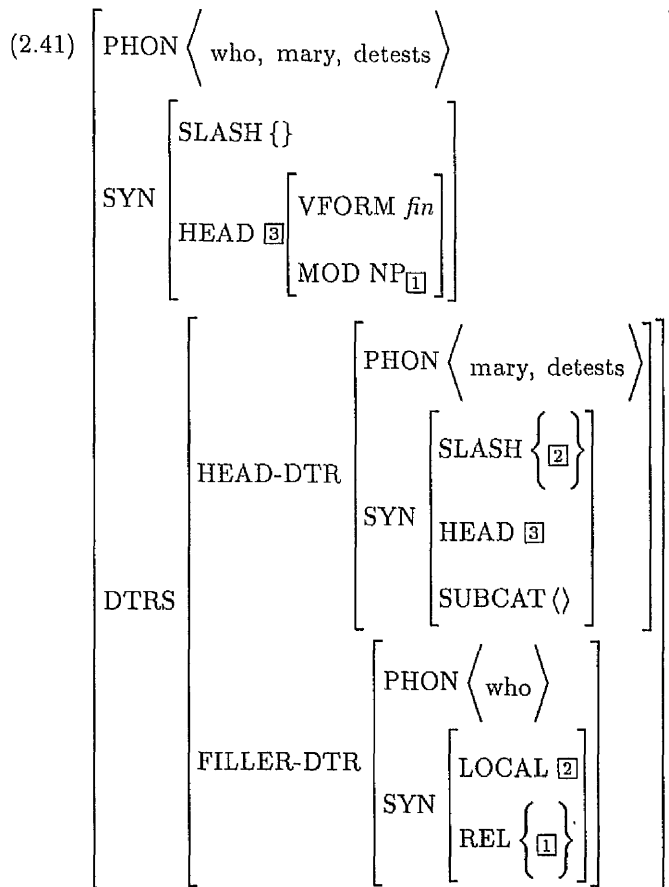
$$(2.39) \left[\begin{array}{l} \text{PHON} \langle \text{who, is, ugly} \rangle \\ \text{SYN} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \text{VFORM } \textit{fin} \\ \text{MOD NP}_{\boxed{1}} \end{array} \right] \\ \text{REL } \{ \} \end{array} \right] \\ \text{DTRS} \left[\begin{array}{l} \text{HEAD-DTR} \left[\begin{array}{l} \text{REL } \{ \boxed{1} \} \\ \text{SUBCAT} \langle \boxed{2} \rangle \end{array} \right] \\ \text{COMP-DTRS} \langle \left[\text{SYN } \boxed{2} \mid \text{REL } \{ \boxed{1} \} \right] \rangle \end{array} \right] \end{array} \right]$$

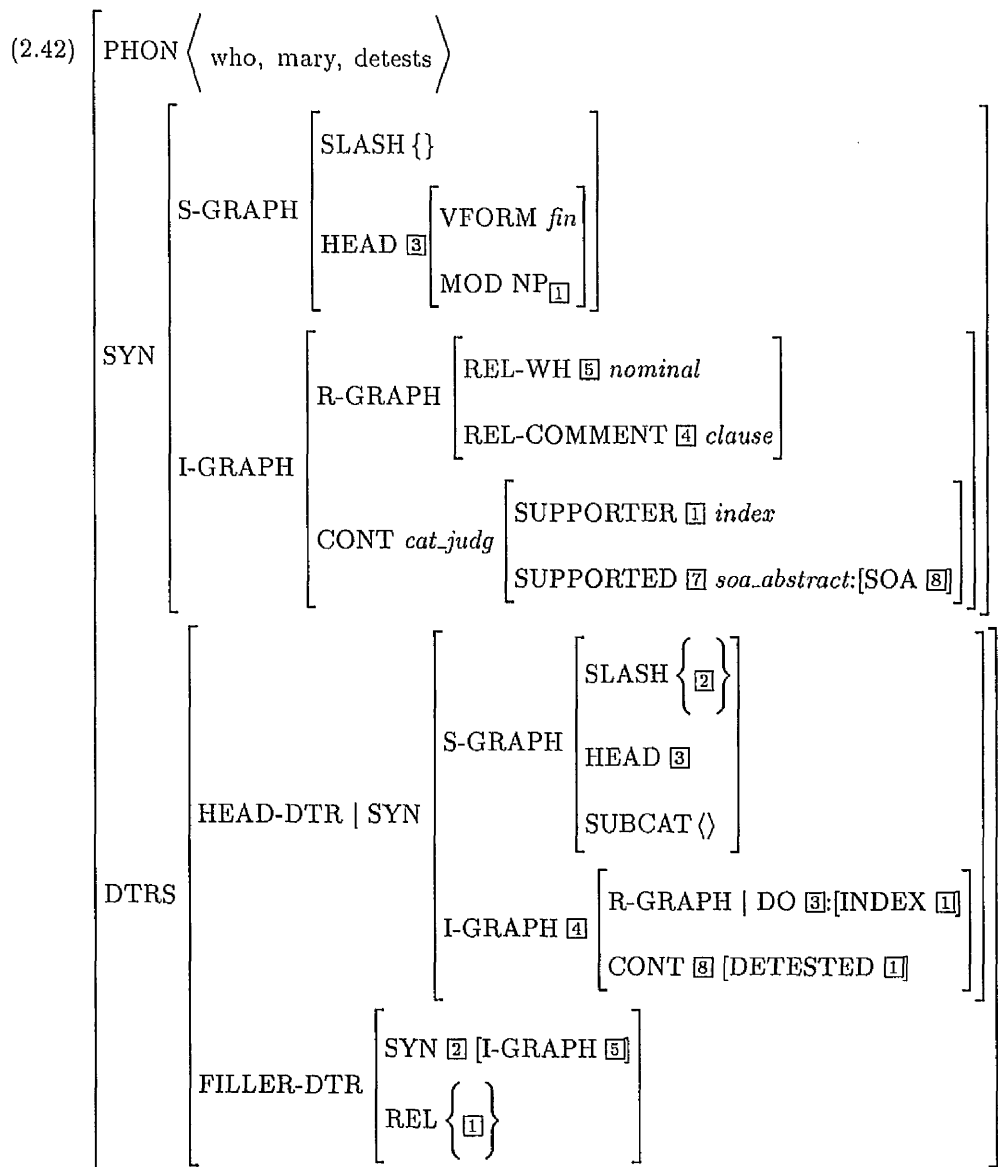
In (2.38) the constituent structure is isomorphic, *mutatis mutandis*, with that proposed by Sag for relative clauses (2.39); I assume, with Sag, that there is no need to posit extraction, though this would be easy enough to effect if desired (an example might be a sentence where the Subject has clear Topic intonation). The idea is that extended categorial projections of V^0 are only introduced into the syntax when they are needed (cf. Grimshaw [129]). The predication effect is obtained purely by the relational structure in the R-graph of the matrix clause, which identifies the Subject as Topic and makes a λ -abstract out of the *soa*.

A number of mechanisms seem to exist for performing λ -abstraction instead on the DO of a sentence. Topicalization, leftward extraction though a filler-gap dependency, is a particularly common and important one. The suggested structure for this is given in (2.40). Again, a corresponding structure for filler-gap relative clauses based on Sag [280] is given for comparison (2.41); and in (2.42), to facilitate the comparison, I suggest a way of filling out Sag's structure with relational information following the present proposals. I assume a supraclausal relational node corresponding to a Topic-Comment structure but defined, in place of TOPIC and COMMENT, for the two features REL-WH, whose content value will be an *index* structure-shared with the REL value, and REL-COMMENT, having a *psoa* abstract as its content value like the Comment of a Topic-Comment construction. Otherwise essentially the only differences are that the SUP-

PORTER index is structure-shared with the head noun instead of a CXT feature, and that this is not identified with the INDEX of the filler phrase (because of the possibility of pied piping).







This is a fairly literal interpretation of several APG ideas, first the separation of the R-graph from the S-graph, and second the representation of overlay relations as immigrant arcs, with their tails at a node other than the clause. From this it follows as a theorem in APG that overlay arcs must have two sponsors; one is the last core relation held by the nominal before it bears the overlay relation, and the other is the relation GR_x which for the relevant cases I have termed Comment. Recall that Sponsor is interpreted in the present system as licensing by structure sharing of the CONTENT substructure. In the case of a Topic, the nominal bearing the relation shares its content with a ROLE feature in the *soa* (the first sponsor), but also with the VARIABLE in the

soa abstract which is the CONTENT value of the COMMENT, which can be seen as giving it a second sponsor. The system is thus faithful to these APG insights.

To conclude this section I sketch analyses for two other cross-linguistically important Topic constructions, which will be discussed in more detail in Chapter 6. They each involve one main difference from the structures examined so far. Examples were given in Chapter 1, repeated here as (2.43).

(2.43) 1. Clitic Left Dislocation:

tin kopela tin-kseroume. (Greek)
 the,Acc girl,Acc her,Acc-know,1pl
The girl, we know.

2. Hanging Topic:

Yama wa ki ga kirei desu. (Japanese)
 mountain Top tree Nom beautiful Cop
The mountains - the trees are beautiful.
 (In the mountains the trees are beautiful / the mountains have beautiful trees).

The first is clitic left dislocation, which is like topicalization but the dislocated element is doubled by a clitic pronoun. However, Greek also shows a variant of this construction in which the NP is not dislocated, and is normally treated as *in situ*. In this case it is the presence of the clitic that forces a Topic reading. An account of this based on the theoretical considerations just discussed will be given in chapter 6.

The second structure is the "Hanging Topic" characteristic of a number of East Asian languages. It differs from the structures given above for cases where the Subject is Topic, in that the Comment is a complete clause, and that the Topic does not (directly) satisfy a ROLE requirement of the Predicate. In chapter 5 I give an account of what is involved in the process of making a clause into a property to be predicated of a term which is not directly one of its arguments.

2.6 Conclusion

This chapter has introduced a version of the typed feature framework HPSG. Like standard HPSG it adopts a semantics based on Situation Semantics, and a phrase structure component based on licensing schemata and argument cancellation from a SUBCAT list. It further makes use of the clause-typing approach developed in Sag's work on nonlocal dependencies.

Its main innovation is to incorporate an independent relational structure based on ideas from RG, APG and LFG. The Predicate, whose value may be a categorially and/or semantically complex object, forms the relational core of the clause, with which it shares the *soa* which is its CONTENT value. Argument relations (core GRs) are licensed by structure-sharing their CONTENT|INDEX value, and are in turn mapped onto surface categorial structure. Cases of non-isomorphism between predicate-argument structure and surface realization are governed by sponsor and erase relations, stated not as part of the grammar but as metalinguistic constraints on the formation of predicates in the lexicon.

A proposition is obtained not from a clause but from a sentence utterance, which introduces contextual information. This contextual information is mediated by overlay relations (hence a proposition, or any other type of *message*, requires an overlay relation). The semantic effect of an overlay structure is to abstract over the *soa* content of the clause to obtain a predication, and to provide or constrain objects which can serve as its target. In the last section some cross-linguistically important syntactic constructions involving Topics, the main overlay relation to be considered here, were discussed, and proposals made for the integration of the relational structure of Topics into the grammar. Extraction, where it occurs, like the Subject-VP dichotomy, are natural ways of encoding the relational and semantic structure by delaying the absorption of an argument into the predicate.

The semantics of Topics will be the theme of chapter 4. First, however, the next chapter will look in more detail at the semantic framework used.

2.7 Appendix: a partial implementation

The general architecture of the grammar outlined in the first part of this chapter has been partially implemented using ProFIT (Erbach [103]). In this appendix I give, more explicitly than in the text, the type partitions and feature declarations used in that grammar.

The platform for the implementation was the grammar used in the SOAS HPSG ellipsis project (Gregory [121], Gregory and Lappin [127]); acknowledgements are also due to the work of Hsueh Shih.

2.7.1 Type and feature declarations

In ProFIT, type and feature declarations are normally effected in the same statement, using the following syntax:

(2.44) `supertype1 > [subtype1,subtype2,...]*[subtypeA,subtypeB,...] intro
[feature2:type2,feature3:type3].`

1. `>` - is partitioned into
2. `*` - joins two dimensions of inheritance
3. `intro` - declares the features for which supertype 1 is the most general type
4. `feature:type` - the value of *feature* is an object of the specified *type* (or of *top* if unspecified).

`top > [bool,sign,synsem,i_node,r_node,s_node,category,content,index,head,case,vform,dtrs].`

`bool > [+,-].`

`sign > [lex,phr] intro [phon,syn:synsem].`

`phr > [headed,n_headed]*[sentential,overlay_constr] intro [dtrs:dtrs].`

`overlay_constr > [topic_comment_constr,rel_wh_constr].`

`synsem intro [s_graph:s_node,i_graph,i_node].`

`i_node > [clausal,argument,predicate] intro [r_graph:r_node,cont:content].`

clausal > [clause,overlay_node].

r_node > [clause_rels,overlay_rels,nom_rels,args].

clause_rels intro [pred:predicate].

args > [subjective,n_subjective]*[transitive,n_transitive].

subjective intro [subj:argument].

transitive intro [dir_obj:argument].

overlay_rels > [top_comm,rel_comm] intro [comment:clause].

top_comm intro [topic:argument].

s_node intro [cat:category,subcat,slash].

category > [subst,funct].

subst > [noun,verb,adj].

noun intro [case:case].

case > [nom,acc].

verb intro [vform:vform].

vform > [fin,inf].

content > [message,abstract,psoa,obj].

message > [judgement,question].

judgement > [categorical_jdg,thetic_jdg] intro [supported:abstract,supporter:index].

psoa > [monadic,dyadic,attitude] intro [role_1:index,soa_index:index].

abstract intro [psoa:psoa].

dyadic intro [role_2:index].

obj intro [index:index,rest].

dtrs > [head_comps,head_adj,head_filler] intro [head_dtr:sign].

head_comps intro [comps].

head_filler intro [filler].


```

dtrs!filler!syn!i_graph!cont!index!I &
syn!i_graph!r_graph!topic!T &
syn!i_graph!r_graph!comment!S &
syn!i_graph!r_graph!comment!cont!P &
syn!i_graph!cont!supporter!I &
syn!i_graph!cont!supported!psoa!P.

top_p(T,S,P) := @schema5 &
                 @topic_comment_constr &
                 phon!P &
                 dtrs!head_dtr!S &
                 dtrs!filler!T &
                 syn!s_graph!slash![].
```

Chapter 3

The Semantic Framework

In the previous chapter great importance was attached to the Grammatical Relation **Predicate** and to the idea of predication. In this chapter the semantics of the predicate-argument and Topic-Comment relations will be explored further, and the logical framework used to analyze them made more explicit.

The ideas put forward here have various origins, and I will start by acknowledging the more important of these. The underlying impetus for the theory comes largely from Situation Semantics (B&P [28], Cooper et al. [79], Barwise et al. [27], Cooper [77]). However the semantics proposed here incorporates ideas from a number of sources, most of them derived directly or indirectly from Montague semantics (Montague [241], Partee [248], Dowty [94], Partee et al. [249, 250]). Two such lines of research on which I particularly rely are Generalized Quantifier Theory (Barwise and Cooper [25], Westerstahl [320, 321], Keenan [184], which will play an important part in the next chapter, and the intensional Boolean semantics of Keenan and Faltz [186], which will be discussed shortly.

However one of the crucial features of situation semantics, and one which is important in this thesis, is its partiality - the replacement of total worlds by partial worlds or situations. The formalization of situation semantics I rely on here is that of Barwise and Etchemendy [26]. In that paper the domain of *soa* contents, in relation to the situations which support them, is modelled

as an “infolgebra”, whose operations are designed to capture the idea of entailment, or more generally **information containment**¹. In the context of a classical possible-worlds semantics such as that of Montague or Keenan and Faltz (op.cit.), such an algebra is Boolean, Boolean algebras being standard models for classical logic (Boole [44], Landman [211]). When situations are understood as partial, however, some of the rules of classical logic no longer apply (notably, every situation is not required to assign every issue true or false). The resulting logic is **intuitionistic** (Kripke [201], Dummett [97]), and the corresponding infolgebra has the structure of a Heyting algebra instead of a Boolean algebra. The classic mathematical example of a model for this logic is a topology, a fact which will be invoked to give a formal semantic interpretation for the intuitive account of topichood put forward in chapter 1. This account will rely on the idea of a topological system as elaborated by Vickers [318, 75f]. As Barwise and Etchemendy note in an appendix, these structures are very close to their own infolgebras; the equivalences (or near equivalences) are reproduced at the end of the chapter (3.35).

The task of reconciling situation semantics with the classical Montagovian tradition is a delicate one, and partiality is not the only issue. In general the semantic framework elaborated in this chapter could be more aptly described as a partialized Montague semantics than strictly speaking a form of situation semantics. In this I follow the approach of Muskens [243] and Landman [209]. This approach has been criticised, not least by Barwise and Perry [29, 23] as mathematically intractable. Such issues are beyond the scope of this dissertation, except to note that Muskens arrives at the opposite conclusion, that such a system is “essentially *simple*”².

Thus the system presented here will have elements which are more familiar to a Montague semanticist and potentially confusing for a reader who is expecting straight situation theory. In particular I treat “propositions” (or rather their partial correlates **soas** or **infons**) as, from one point of view, functions from situations to truth values, and 1-place predicates (almost saturated **psoas**) correspondingly as functions from individuals to truth values; accordingly, they can be thought of as having extensions which are sets of situations or individuals respectively. The

¹Entailment is only well-defined over objects which have a truth value, which **soas** in themselves do not.

²ibid., p.3 (italics original)

difference from classical semantics is that these are *partial* sets, in a sense which will be given formal definition below.

This approach is intended to give formal expression to the view of predication introduced in the previous chapter; more specifically, it enables the device of λ -abstraction to be used, in very much the same way as it is in Montague semantics. This will play a role in characterizing the Content of a categorical judgement, however complex its internal structure, as an individual property combining with an individual term by β -reduction to make a proposition. It has been noted³ that this resource is not in principle available in situation semantics, which replaces variables (which are objects in a logical language) by parameters, which are conceived of as the real-semantic correlatives of variables but over which the theoretical status of abstraction is less well understood (cf. Seligman and Moss [291] for a discussion of this notion).

This approach however also has a cost, which lies in the loss of the highly intensional situation-semantic conception of **relations** - the semantic objects corresponding to what in the previous chapter were termed basic or irreducible predicates. It is well known that a possible worlds semantics (Carnap [60], Montague [241]) does not fully succeed in capturing the idea of intensions by modelling them as functions from worlds to extensions; apart from possible objections that it reduces intensions to a particular kind of extensions conceptually⁴, it fails to distinguish predicates which have different senses but identical extensions in all admissible models, which may arise either by logical or mathematical necessity or because of lexical constraints or meaning postulates⁵.

In a recent paper published when this thesis was near completion, Lappin and Pollard [218] address this problem and propose a hyperintensional semantics based on Topos theory (cf. Goldblatt [119]). In this theory, which is branch of Category theory, the important properties of sets and functions are captured without direct access to the elements of sets, and hence without having to satisfy the axiom of extension. It is hoped that recasting the present approach within Category-

³cf. for example Lappin and Pollard [218]

⁴especially when worlds themselves form a type on a par with extensional types, as in the influential TY₂ formalization of Montague semantics (Gallin [112]).

⁵An example of the first kind is the property of being an equilateral triangle and the property of being an equiangular triangle (P&S [264]), and of the second kind the property of being bought and the property of being sold.

theoretic terms will enable this particular deficiency to be overcome while preserving its advantages (since the features of set theoretic semantics which play an important role in it - characteristic functions, exponentiation, etc. - seem to generalize into category-theoretic notions without requiring extension). However the approach of Lappin and Pollard represents a considerable new departure, and it seemed preferable to leave such explorations for future research.

In the next section an algebra for 0-place and 1-place predicates will be defined, essentially following Keenan and Faltz but using the partialized definitions proposed by Muskens and by Landman.

3.1 Predicate algebras and infon algebras

3.1.1 Predicate algebras

Keenan and Faltz (K&F) [186] provide a theory of semantic types in which different classes of types are distinguished by their formal characteristics as Boolean algebras (3.24). The classes involved are predicates, arguments, modifiers and determiners. Of these, determiners will be deferred to Chapter 4, while modifiers will not be discussed at all. The focus of this section will be on predicate and later argument algebras.

Predicates were defined above as functions into the set of truth values. This is not very controversial, except for the corollary (also motivated above) that what are commonly described as propositions should also be regarded as predicates. In K&F's intensional system they are functions from a set J of world indices to truth values. This will be retained, though the worlds will shortly be partialized into situations. I will also adopt K&F's practice of calling these "0-place predicates" or P_0 , the subscript being taken here as denoting the number of unsaturated ROLE parameters. The semantic type of these objects is thus notated T_{P_0} . Similarly, what were described above as Aristotelian predicates (essentially the semantic content of VPs) are notated P_1 . Their semantic type T_{P_1} is normally taken to comprise functions from entities to truth values, i.e. 2^D .

Aristotelian predicates, freed from the restriction that their target must correspond to the grammatical Subject, were then argued to be the content of the Comment part of a categorical judgement. On this basis the difference between T_{P_1} and T_{P_0} corresponds to the difference between categorial and thetic judgements, and the domain of the former will constitute first and foremost the denotation of Topic NPs. The nature of this domain will be investigated below; it is clearly related to, though not straightforwardly identical to, the domain of discourse D .

The relevant definitions for Boolean Algebras (BA's) and for lattices in general are given in an Appendix to this chapter. BA's are distinguished by the two complement laws, $a \wedge a' = 0$ and $a \vee a' = 1$. As such BA's are models for classical logic, in which both the following axioms hold:

(3.1) The Law of Contradiction (LC)

$$P \wedge \sim P = \textit{false} \text{ for any proposition } P$$

(3.2) The Law of the Excluded Middle (LEM)

$$P \vee \sim P = \textit{true} \text{ for any proposition } P$$

Following Montague, propositions (P_0) can be modelled as functions from a set of world indices J to the 2-element BA $\{\textit{true}, \textit{false}\}$, or $\{0, 1\}$, henceforth simply $\mathbf{2}$. Each proposition p_0 can be thought of as carving up J into the set $\{j \in J: p_0(j) = 1\}$ and its complement. These can be thought of as the worlds which respectively verify and falsify the proposition.

The originally unstructured set J now has the structure of a powerset lattice (which is a BA), $\langle S \subset J, \sim, \cap, \cup, J, \emptyset \rangle$. All powerset lattices are complete and atomic, the atoms being the singleton sets. Each proposition denotes the characteristic function of a subset of J .

Things work similarly with 1-place predicates P_1 . These denote functions from D to $\mathbf{2}$ which are the characteristic functions of subsets of D . D now has the structure of a BA (powerset lattice), whose atoms are the singleton sets corresponding to the elements of D . Each 1-place predicate is the characteristic function of a subset of D , and the elements of D can be thought of as verifying or falsifying instances of the predicate. In chapter 4 it will be argued that this idea of verifying and falsifying instances of a predicate is precisely what is required to characterize the notion of

Topic.

This simple scheme of things has to be complicated first of all by two ideas which are central in situation semantics: the “situated” (or “Austinian”) notion of a proposition, which is modelled using Infon algebras, and partiality.

Infon algebras

In situation semantics the idea of a proposition is factored into an information-bearing element or **infon** and a situation about which it conveys information. The set I of **infons** is itself ordered by the relation \Rightarrow of information containment. This relation is in general only a pre-order, but it can be made into a partial order by taking equivalence classes $([\sigma]_{\Leftrightarrow} = \{\sigma' : \sigma' \Leftrightarrow \sigma\})^6$.

The binary relation \models (read as **supports**) is defined over Sit (the set of situations) $\times I$ (the set of infons). A situation-theoretic proposition (an **Austinian proposition**) is of the form $s \models \sigma$ for some $s \in \text{Sit}$ and some $\sigma \in I$. The structure $\langle \text{Sit}, I, \models, \Leftrightarrow \rangle$ forms an **infon algebra** [26], which will be described in more detail below.

Clearly, the Boolean setup described at the beginning of this section can also be expressed in terms of a **supports** relation between worlds and 0-place predicates, so that $\langle J, P_0, \models, \rightarrow \rangle$ is a (Boolean) infon algebra - a particular limiting case of an infon algebra. However the more general notion of an infon algebra will be needed. To avoid introducing several sets of notation, I will continue to use J for situations (“worlds”) and P_0 for saturated infons (“0-place predicates”). Presently I will attempt to argue that $\langle D, P_1, \models', \rightarrow' \rangle$ constitutes a similar algebra (with suitable definitions of \models', \rightarrow').

Partiality

The linguistic motivation for partiality for the case of saturated predicates (P_0 's) is discussed extensively in B&P [28], Muskens [243] and elsewhere. It is arguably also motivated for P_1 , first of all by selection restrictions. P_1 's do not simply carve up the domain D into entities of which they

⁶A pre-order is a relation which is reflexive and transitive but unspecified as to symmetry. If \leq is a preorder on a set S , it can be factored into (i) an equivalence relation $\equiv (x \equiv y \text{ iff } x \leq y \text{ and } y \leq x)$, and (ii) a partial order (\leq defined on the resulting equivalence classes is anti-symmetric).

are true and entities of which they are not; there are also entities of which neither they nor their complement can be predicated without anomaly. There are many types of such anomaly, and the nature of semantic anomaly in general will not be discussed here (cf. for example Lappin [212]). A particular case however which is of some importance for this thesis is the well-known example (3.3):

- (3.3) 1. The King of France is bald.
 2. The King of France is not bald.

The analysis of these sentences, in which the Subject fails to refer, is controversial (and will be further discussed in chapter 4). As propositions, it is not clear whether they should both be undefined in truth value (as argued by Strawson [302]) or whether the first sentence should be false and its negation true (as originally maintained by Russell). Leaving aside the analysis of definite descriptions, this hinges also on the interpretation of the negation (cf. [153]). On one interpretation the negation will assign *true* if the entities which verify the predicate "bald" do not include the King of France. On the other, it will assign *true* only if the King of France is in the set of entities which falsify the predicate. On the latter (Strawsonian) interpretation a partial logic is required. The former reading is compatible with classical logic. However the classical interpretation can be recovered quite simply even when using a partial logic, as will be described shortly.

For the rest of this section I confine attention to P_0 's.

The required partialization is effected by dropping one or both of the complementation laws.

If the axiom $a \vee \sim a = 1$ is dropped, then the resulting algebra (a Heyting Algebra) is a model for partial logics which do not assume the Law of the Excluded Middle (LEM). This includes intuitionistic logic⁷ [97, 81]. This is the normal approach within situation semantics; the infon algebras of B&E [26] are Heyting infon algebras.

⁷The law of double negation is not an axiom of the logic, and consequently the LEM is not a theorem [211, p.149].

Some studies of partiality have explored the possibility of discarding both complement laws⁸, thus admitting the idea of “impossible situations” which support contradictions. This has been argued for on both linguistic and information-theoretic grounds (Landman [209], Muskens [243], Barwise [24]), and although it will not be the focus of much interest here, I wish to keep this possibility open for later work. Linguistically its motivation is similar to that which underlies partial logics without LEM; namely that identifying all contradictions is as unsatisfactory as identifying all tautologies, and for similar reasons. Thus if John believes that it is raining and it is not raining and Mary believes that it is cold and it is not cold, one would probably not want to say that they believe the same thing.⁹

In the absence of both complement laws the idea of a complement rests on the axioms of double negation (3.30) and the De Morgan laws (3.29), and the appropriate algebraic structure has been argued to be a De Morgan lattice (a distributive lattice with precisely these two extra axioms) (Anderson and Belnap [10], Landman [209], Muskens [243])¹⁰. The idea behind these lattices is that the top and bottom elements, which normally represent *true* and *false*, are replaced by a set of tautologies and a set of contradictions¹¹, these being a filter and an ideal respectively.¹² This avoids identifying all contradictions, just as the situation-semantic / intuitionistic approach refrains from identifying all tautologies, giving them potentially different verifying or falsifying instances. In the case of contradictions, verifying instances will be the “impossible” situations. The idea of a proper filter (one not containing 0) is replaced by that of a **pure** filter, namely any filter in the lattice which does not contain any element of the ideal of contradictions, and a

⁸The remaining possibility, of discarding LC and keeping LEM, does not seem to have attracted much interest. As Muskens comments, mathematically it would seem to be just a mirror image of the more usual partial approaches.

⁹I envisage later versions of this research making much use of the framework of Barwise and Seligman [30, 24], in which “impossible” situations are treated as tokens in a classification which are not sound with respect to a local logic defined on its types. Alternatively, the hyperintensional approach being developed by L&P [218], cited at the beginning of this chapter, avoids identifying logically true or false propositions but without invoking the idea of impossible situations, because they are not required to have extensions in the sense that is required in set-theoretic semantics.

¹⁰The structures used by Muskens obey additionally the zero and unit laws (3.31), and are termed Kleene lattices [243, p.44].

¹¹To define membership of the set of contradictions, Landman [209, p.34] gives the condition $p \wedge q \in \perp$ iff $\exists r: p \wedge q \leq r \wedge \sim r$.

¹²The set of contradictions has a lub $\bigvee \perp$, and the set of tautologies has a glb $\bigwedge \top$. Technically this is an “extended De Morgan lattice”, obtained by adding further conditions to avoid “fixed points of negation” - see Landman [209, p.36ff] for discussion.

coherent situation will be one which supports only pure filters of infons.

3.1.2 The Keenan-Faltz treatment of predicative algebras

In Keenan-Faltz semantics the algebras used are **complete atomic BAs**.¹³

The denotations of 0- or 1-place predicates can be seen as subsets of J or D , or as characteristic functions from J or D into 2 . On either interpretation, their domains have the structure of powerset lattices, which are **complete atomic BA's**. Because of this isomorphism, the set of properties or the set of propositions can be considered in isolation from the original carrier sets D or J and assumed to form a complete atomic Boolean algebra, its order relation corresponding to the relation of set inclusion in the powerset algebras of J and D . The important property for present purposes is their atomicity, the atoms corresponding to the singleton sets in the powerset algebra, which are in turn in 1:1 correspondence with the original elements of J or D .

Because of this, it is possible to take properties as primitive (propositions will be considered later) and to arrive at a new definition of individual, which corresponds to the original elements of J or D but does not make reference to them. Following Montague (op.cit.) the denotation of an NP is a set of properties (a Generalized Quantifier or **GQ**). An individual can be defined as a particular kind of GQ; thus corresponding to each $x \in D$ in the original domain there is an **individual** I_x in the set of GQs which satisfies the conditions in (3.4). As is well known, this representation of individuals has the advantage that it enables the denotations of NPs to form a unified type.

(3.4) For any $x \in D$, the **individual** I_x generated by x is the set of sets X such that $x \in X$. I_x is closed under unions and intersections, and any set S is in I_x iff its complement S' is not in I_x . (cf. K&F [186, p.62, 75]).

¹³The following definitions may be helpful:

1. A lattice is **complete** iff any arbitrary subset has a glb and lub. (For lattices in general this is only required for *finite* subsets).
2. An **atom** is a non-zero element of a lattice which is not preceded by any other non-zero element (intuitively atoms are the "minimal" non-zero elements of the lattice). A lattice is **atomic** iff every element is preceded by an atom.

These definitions hold for algebras, which are also lattices.

To avoid possible terminological confusion, I will from this point follow K&F's practice of referring to the original elements of D as **entities**, reserving the term **individual** for a set of properties which satisfies the above conditions¹⁴. The set I of individuals is a subset of the set of GQs (sets of properties) with certain distinguishing characteristics, whose significance will be discussed presently:

- (3.5) 1. All GQs can be obtained from members of I by the operations of intersection, union and complement. In other words I is the set of "free generators" for the set of GQs.
2. Predicates (P_1) are not just functions from an unstructured domain to 2 , but homomorphisms from one BA to another¹⁵, i.e. from the set of GQs which is a powerset BA to 2 . Individuals play a particular part in defining these homomorphisms.
3. The type T_{P_1} forms a function algebra, enabling the formation of complex predicates. However these complex predicates only behave as homomorphisms when their arguments are individuals.

The main reason for insisting that these algebras are atomic is that the atoms are systematically related to the elements of J and D , which were argued to serve as verifying or falsifying instances. In a Boolean system this is rather trivial in one respect, because the verifying and falsifying sets are simply complements of each other, but it becomes non-trivial with partialization [209]. J and D can be seen as providing the carrier sets for algebras on which GQs can be defined and a distinguished subset of individuals picked out.

Predicate types as function algebras

It was claimed above that both T_{P_0} and T_{P_1} are function spaces with an Boolean algebraic structure in their own right, derived ultimately from the set of truth values.

¹⁴For the present these are assumed to be sets of properties of entities, though there are other properties which can sustain a similar structure, and these too will be referred to as **individuals**. In K&F these include the denotations of CPs and subcategorized VPs.

¹⁵A homomorphism from A to B takes elements of A to elements of B in such a way as to preserve relevant structure (thus a Boolean homomorphism will preserve Boolean operations, etc.). For lattices this means that $h:A \rightarrow B$ is a homomorphism iff for all $x, y \in A$, $h(x \wedge y) = h(x) \wedge h(y)$, and similarly for other operations.

As examples, take the soa contents of “it rains” and “it is cold” as expressions of category P_0 and the psoa contents of “is ugly” and “snores” as expressions of category P_1 . I follow the usual situation-theoretic convention of using σ for soas, and I will use ψ for psoas - more precisely “almost saturated psoas” which have exactly one ROLE parameter unanchored (i.e. the contents of P_1 expressions).

It is probably more intuitive to start with P_1 's. The functions in T_{P_1} are homomorphisms from the set of GQs to $\mathbf{2}$. This is so because by a theorem of K & F's (3.6), if the value of a function is known for the individuals on a domain, then that function is in 1:1 correspondence with a homomorphism on the whole domain (on condition that the domain and range are complete atomic algebras, a condition which is satisfied here because the domains in question are powerset lattices and the range is the set of truth values).

(3.6) The Justification Theorem [186, p.92]

For P and B any complete atomic algebras and f any function from I_P , the set of individuals on P , into B there is exactly one complete homomorphism h_f from P^{*16} into B which agrees with f on all the individuals, i.e. $h_f(I) = f(I)$ for all individuals I .

Consequently the predicate denotations, the points of the function spaces T_{P_0} and T_{P_1} , are homomorphisms (rather than arbitrary functions) from their arguments, whether individuals or not. The following example illustrates this view of predicates as homomorphisms.

(3.7) h is a homomorphism from GQs to truth values iff

1. $h(GQ_i \cap GQ_j) = h(GQ_i) \wedge h(GQ_j)$
2. $h(GQ_i \cup GQ_j) = h(GQ_i) \vee h(GQ_j)$
3. $h(\sim GQ_i) = \neg(h(GQ_i))$

(3.8) Let ψ be the content of the P_1 expression “are ugly”, GQ_i that of “all semanticists” and GQ_j that of “some syntacticians”. Then:

¹⁶The powerset of P in K&F's notation.

1. $GQ_i \cap GQ_j =$ the set of properties $S = \{p: p \in GQ_i \text{ and } p \in GQ_j\}$
2. $\psi(GQ_i \cap GQ_j) = 1$ iff $\|ugly\| \in S$, i.e. iff $\|ugly\| \in GQ_i$ and $\|ugly\| \in GQ_j$
3. $\psi(GQ_i) = 1$ iff $\|ugly\| \in GQ_i$ and $\psi(GQ_j) = 1$ iff $\|ugly\| \in GQ_j$
4. (Intuitively:) “all semanticists and some syntacticians are ugly” is *true* iff “all semanticists are ugly” is *true* and “some syntacticians are ugly” is *true*

Moreover these homomorphisms themselves form an algebra. To obtain this, their values on individuals are compared pointwise, and the operations \vee and \wedge and \sim defined accordingly to give new functions. If ψ_1 is the content of “is ugly” and ψ_2 the content of “snores”, then given an individual i_x :

- (3.9)
1. $(\psi_1 \wedge \psi_2)(i_x) = 1$ iff $\psi_1(i_x) \wedge \psi_2(i_x) = 1$
 i_x (is ugly and snores) iff (i_x is ugly) and (i_x snores)
 2. $(\psi_1 \vee \psi_2)(i_x) = 1$ iff $\psi_1(i_x) \vee \psi_2(i_x) = 1$
 i_x (is ugly or snores) iff (i_x is ugly) or (i_x snores)
 3. $(\sim\psi_1)(i_x) = 1$ iff $\sim(\psi_1(i_x)) = 1$
 i_x (is not ugly) iff it is not the case that (i_x is ugly)
 4. The 1 element is the $\psi \in T_{P_1}$ which is *true* of all i_x - i.e. the 1-place predicate *exist*
 5. The 0 element is the $\psi \in T_{P_1}$ which is *false* of all i_x - i.e. the negation of *exist*

Note that these definitions of algebraic operations on predicates hold only when the operations are defined pointwise using individuals as arguments. They do not hold, in general, when the arguments are quantified expressions. This point will be taken up in the next chapter, where it will be argued that the denotations of Topic NPs are confined to those GQs which correspond to individuals.

By analogy, I assume that 0-place predicates are functions from a complete atomic Boolean algebra W to 2 . This algebra W will have propositions as its members, and will be isomorphic to the powerset algebra that would be formed if propositions are considered as subsets of J . Moreover

there will be **individuals** in W , which will comprise sets of propositions closed under conjunction and disjunction and excluding their complements, just as in the definition of individuals given above. These individuals on W are in 1:1 correspondence with elements of J . Besides individuals, W will also allow quantified expressions which are not individuals. For the following examples I take W not as worlds but as times, for which it is perhaps easier to treat these notions intuitively.

First, the P_0 's denote homomorphisms from W to $\mathbf{2}$ (their domain includes quantified temporal expressions):

(3.10) Let σ be the content of the P_0 expression "it rains", w_i that of "some afternoons" and w_j that of "every Friday evening". Then:

1. $w_i \cup w_j =$ the set of propositions $S = \{p: p \in w_i \text{ and } p \in w_j\}$
2. $\sigma(w_i \cap w_j) = 1$ iff $\|\text{it rains}\| \in S$, i.e. iff $\|\text{it rains}\| \in w_i$ and $\|\text{it rains}\| \in w_j$
3. $\sigma(w_i) = 1$ iff $\|\text{it rains}\| \in w_i$ and $\sigma(w_j) = 1$ iff $\|\text{it rains}\| \in w_j$
4. (Intuitively:) "it rains some afternoons and every Friday evening" is *true* iff "it rains some afternoons" is *true* and "it rains every Friday evening" is *true*

Second, the functions in T_{P_0} also form an algebra. To obtain this, their values on individuals in their domain W are compared pointwise, and the operations \vee and \wedge and \sim defined accordingly to give new functions. If σ_1 is the content of "it rains" and σ_2 the content of "it is cold", then given an individual $w_j \in W$ (recall that this will correspond to a single world-index j):

- (3.11)
1. $(\sigma_1 \wedge \sigma_2)(w_j) = 1$ iff $\sigma_1(w_j) \wedge \sigma_2(w_j) = 1$
(It rains and it is cold) at w_j iff (it rains at w_j) and (it is cold at w_j)
 2. $(\sigma_1 \vee \sigma_2)(w_j) = 1$ iff $\sigma_1(w_j) \vee \sigma_2(w_j) = 1$
(It rains or it is cold) at w_j iff (it rains at w_j) or (it is cold at w_j)
 3. $(\sim\sigma_1)(w_j) = 1$ iff $\sim(\sigma_1(w_j)) = 1$
(It does not rain) at $w_j =$ it is not the case that (it rains at w_j)
 4. The 1 element is the $\sigma \in T_{P_0}$ whose value is *true* at all w_j

5. The 0 element is the $\sigma \in T_{P_0}$ whose value is *false* at all w_j

By going one step further and considering not sets of propositions but sets of properties of propositions (\mathcal{PW} or the powpowerset¹⁷ of propositions), it is possible to obtain a domain of denotation for CPs¹⁸, which interacts with predicates taking sentential complements. As it is isomorphic to a powpowerset, this domain is a free BA and thus admits a structure of individuals just as the type of NP denotations does. This apparent isomorphism between the two domains of worlds and entities will be explored below from a slightly different perspective, with a view to substantiating the claim assumed in Chapter 1, that in the context of Topics it makes sense to treat the denotations of Topic NPs as analogous to worlds.¹⁹

3.1.3 The formal specifications of Infon algebras

As was briefly described above, in situation semantics the information-bearing elements corresponding to propositions are **infons**, and the corresponding algebra is an **infon algebra** [26]. Infons are standardly treated as the same thing as **soas**, but in this dissertation I define them as equivalence classes of soas under the equivalence relation of mutual information containment, so that the relation of infons to soas is analogous to that between propositions and propositional formulas. This more abstract definition of **infon** also means that the antisymmetry of the \Rightarrow relation in infon algebras follows automatically rather than having to be stipulated separately as in B&E [26].

¹⁷The powpowerset of a set is the powerset of its powerset.

¹⁸i.e. the CP argument denotes a set of properties of propositions, just as an NP argument denotes a set of properties of entities.

¹⁹K & F tentatively suggest a similar treatment of VP complements as well. According to this idea, VP complements denote sets of properties of properties. Thus all argument categories denote sets of properties, differing only on whether these are properties of entities, of propositions or of properties, a difference which is less important than their structural isomorphism (they are all freely generated BAs, the generators being a distinguished set of individuals as defined above).

Carrier set:	D (entities)	J (world indices)
Powerset:	properties of entities	propositions
Powpowerset:	NP denotations (GQs)	sets of sets of indices
Powpowpowerset:	subcategorized VP denotations	CP denotations

In this table the argument types are those in the bottom two rows, except that powpow J does not seem to correspond to any obvious argument category. I suggest that it in fact corresponds to those objects which can be the value of a LOCATION parameter. These objects will be discussed further below.

In this dissertation I have had to confine my attention to NP denotations, and argue that while all NPs may be arguments, only those which correspond to individuals may be Topics. I conjecture that this will prove to be the case for these other categories as well, but have to defer investigation of this for future research.

An **infon algebra** comprises a distributive lattice $\langle I, \Rightarrow \rangle$ together with a set of situations Sit and a supports relation \models on $S \times I$ satisfying the axioms in (3.12) [26, p.39].

- (3.12)
1. If $s \models \sigma$ and $\sigma \Rightarrow \tau$, then $s \models \tau$.
 2. $s \not\models 0$ and $s \models 1$
 3. if Σ is any finite set of infons, then $s \models \bigwedge \Sigma$ iff $s \models \sigma$ for each $s \in \Sigma$
 4. if Σ is any finite set of infons, then $s \models \bigvee \Sigma$ iff $s \models \sigma$ for some $s \in \Sigma$

Thus if a situation supports an infon then it supports all the information contained in (implied by) that infon, and it supports the conjunctions and disjunctions of any infons it supports. By the second condition, no situation supports an infon which is logically false, and every situation supports an infon which is logically true. By the last two conditions the infons form a function space $(F_{2/Sit}$ or 2^{Sit}) corresponding to T_{P_0} as discussed above, except that negation (complementation) has yet to be discussed.

This factoring out of situations from the lattice of information-bearing elements effectively performs the same role as the use of world-indices or entities in the Boolean structures used above: they provide a notion of verifying (falsifying) instances. This time the notion is non-trivial because of the absence of LEM.

This domain of verifying instances can sustain a structure on which the notion of individual can be defined. An infon can be treated as the set of the situations which support it, given an important proviso which will be returned to later, namely that the further condition (3.13) is satisfied.

- (3.13) For all infons σ, τ such that $\sigma \not\Rightarrow \tau$ there is a situation $s \in Sit$ such that $s \models \sigma$ but $s \not\models \tau$.

[26, p.40]

In this case the supports relation reduces to set membership. A situation s can then be reconstructed as a set of sets (i.e. set of infons) satisfying certain closure conditions. The precise conditions involved will not be the Boolean conditions specified in (3.4) above, but other conditions to be discussed below.

It is important to note that although the infon algebra defined in (3.12) is not Boolean, a Boolean algebra can be recovered from it simply by taking elements of the **supports** relation (i.e. propositions in the non-situated sense, henceforth **Russellian propositions**); the algebra will comprise sets of support relations, ordered by set inclusion (B&E [26, p.44-5]). Because of the conditions just stipulated for the **supports** relation, each situation supports a **prime filter of infons**.^{20 21} These prime filters of infons correspond to models for the infon algebra. In the next chapter I will argue that in the same way, Topic NPs correspond to prime filters of properties, for which they can analogously be considered models.

It is possible either to see infons as functions from worlds (situations) to truth values or to shift perspective and treat situations as functions from infons to truth values.

The former viewpoint is basically that taken in the previous section, except that the use of a partialized semantics affects the definitions of predicate and argument algebras. In particular the notions of function spaces and of the set-theoretic structures induced on their domains has to be modified. The approach followed here is based on [209, p.44f] and [243, p.57ff]. A predicate is reconstructed as a pair with the same content but contrasting polarity (cf. the situation-theoretic idea of an **issue**), and a set becomes a **partial set**²², again a pair, comprising the verifying and falsifying instances of a predicate.

It is convenient to start by defining the partial sets which will denote the verifying / falsifying instances of the predicates, and to start with properties rather than propositions. From the perspective of properties as subsets of the carrier set D , these partial subsets will now be defined as in (3.14). The domain of properties is now the powerset of $D \times D$, ordered by partial set inclusion, which is defined along with the other set operations in (3.15).

²⁰A filter in a lattice is an upward-closed set which is closed under meets (cf. its dual, an ideal, which is a downward closed set which is closed under joins). A prime filter has, additionally, the property that if it contains $a \vee b$, then it already contains either a or b (the "disjunction property"). Definitions of these and other lattice-theoretic concepts are given on page 116.

²¹These sets of infons are prime filters because of (one half of) condition 4 in (3.12), which requires that $s \models \bigvee \Sigma$ only if $s \models \sigma$ for some $\sigma \in \Sigma$ - the "disjunction property".

²²The use of partial sets here should be distinguished from the use of the same term in [235]. In the latter work it refers to sets whose actual membership is not determined at a particular information state, and on which the idea of possible membership imposes a concept of "murky sets" whose membership is not fully determined. The term is also used for a (different) notion of sets with underspecified membership in [212]. In the present usage there is no connotation of underspecification intended.

(3.14) Partial sets (cf. Muskens [243, p.58-9])

1. A **partial set** S is a tuple $\langle S^+, S^- \rangle$ (the **denotation** and **antidenotation** respectively). A predicate will take S^+ to *true* and S^- to *false*.
2. The complement of $S^+ \cup S^-$ (in the relevant domain) is termed the **gap** of S and the intersection $S^+ \cap S^-$ is its **glut**.
3. A set is **coherent** iff its glut is null, and **total** iff its gap is null.

These definitions are easily extended to partial n-place *relations*.²³

(3.15) Partial operations on sets

$$\sim S \quad := \langle S^-, S^+ \rangle$$

$$S_1 \cap S_2 \quad := \langle S_1^+ \cap S_2^+, S_1^- \cup S_2^- \rangle$$

$$S_1 \cup S_2 \quad := \langle S_1^+ \cup S_2^+, S_1^- \cap S_2^- \rangle$$

$$S_1 \subseteq S_2 \quad \text{iff } S_1^+ \subseteq S_2^+ \text{ and } S_2^- \subseteq S_1^-$$

According to these definitions:

1. $\neg p$ is true for situations where p is false and vice versa
2. $p \wedge q$ is true in situations where both p is true and q is true and false in situations where either is false
3. $p \vee q$ is true in situations where either p is true or q is true and false in situations where both are false

(3.16) Partial predicates

1. $\|P_0\| = f_\sigma: J \times J \rightarrow 2: f_\sigma(j) = 1$ iff $j \in S^+$ and $f_\sigma(j) = 0$ iff $j \in S^-$

²³In fact in Muskens (loc cit) they are given as definitions of partial n-ary relations. The conversion of relations into curry functions and the consequent focus on sets, eschewed by Muskens in favour of relations and Cartesian products, is restored here because of the view of predication argued for in the previous chapter - that is, a (modified) Aristotelian rather than a Fregean view.

$$2. \|\mathbb{P}_1\| = f_\psi: D \times D \rightarrow \mathbf{2}: f_\psi(x) = 1 \text{ iff } x \in S^+ \text{ and } f_\psi(x) = 0 \text{ iff } x \in S^-$$

These definitions of partial sets and operations on them correspond to De Morgan lattices, and are compatible with the use of Kripke frames for intuitionistic logic (Landman [209, p.44-6]).²⁴

The structure so defined is a De Morgan lattice [209]. It is possible to dispense with the carrier set and define the set of (partial) properties primitively as a De Morgan lattice, in the same way that K&F define the set of (total) properties as a Boolean algebra. Nonetheless it is still helpful to think of them as sets when checking their behaviour. GQs will be normal GQs except that the relevant intersections have to be calculated using the denotation and antidenotation separately. However the space of GQs will still allow the notion of individual to be defined as in the Keenan-Faltz system, using the partial definitions of conjunction, disjunction and complement.

The notion of partial individuals will not be further explored here because, as already described for **infun algebras**, it is possible to recover a Boolean algebra of individuals. To make the parallel with infun algebras explicit, I assume an identical algebra defined over individuals and almost saturated psos, for which I introduce the term ψ -algebra²⁵. Let $\langle \mathcal{L}_\psi, \models_\psi, \Psi, \Rightarrow_\psi \rangle$ be a

²⁴One way of treating these partial operations is to use a many valued logic (Anderson and Belnap [10, 33], Blamey [43], Muskens [243], in which the BA of truth values $\mathbf{2}$ is replaced by the 4-element BA of truth combinations $\mathbf{4}$, this being the powerset of $\mathbf{2}$, i.e. $\{\emptyset, \{t\}, \{f\}, \{t, f\}\}$. Besides the normal set-theoretic algebra, which will be discussed below (in connection with the idea of approximation), this set carries an algebra of logical relations LK4 - the logical Kleene algebra on $\mathbf{4}$ [243, p.44] - having the following characteristics:

1. Truth functional connectives (originally from [98])

- (a) $\phi \wedge \psi$ is true iff both conjuncts are true.
- (b) $\phi \wedge \psi$ is false iff either conjunct is false.
- (c) $\phi \vee \psi$ is true iff either conjunct is true.
- (d) $\phi \vee \psi$ is false iff both conjuncts are false.
- (e) $\neg\phi$ is true iff ϕ is false and vice versa.

Note that the resulting values may include \emptyset or $\{t, f\}$. The truth tables obtained are the Extended Strong Kleene tables [243, p.43] (they are given for reference on page 115).

2. The partial order \leq on the algebra ($\phi \leq \psi := \phi \wedge \psi = \phi$) corresponds to the entailment relation:

- (a) For sets of formulae Γ, Δ : $\Gamma \Rightarrow \Delta$ iff $\bigcap \phi \in \Gamma \subseteq \bigcup \psi \in \Delta$.

It is unclear to me at the moment what is gained by explicitly using this multi-valued logic rather than the approach in the main text. The semantics proposed here is intended to be intuitionistic, as envisaged by [26] on which it is based. Van Dalen [81, p.269,280] notes that multi-valued approaches were tried "during the early childhood of intuitionism and its logic", but that a result of Gödel's shows that intuitionistic logic cannot be captured by any finite set of truth values. Landman's [209] treatment of partiality appears to capture the notions required here (those in the definitions just given) without resorting to a multi-valued logic, and I have thus opted, at this stage of the research, for his apparently simpler system.

²⁵Unfortunately there is no established term corresponding to infons to use for almost saturated psos. Infon algebras in the strict sense, which are defined for soas with no unsaturated roles, will be distinguished when necessary as σ -algebras. The distinction refers to the elements of the algebra; the actual algebraic structure is intended to be the same.

ψ -algebra, comprising the set \mathcal{I}_x of (partial) individuals, the lattice $\langle \Psi, \Rightarrow_\psi \rangle$ the set of almost saturated **psoas** ordered by information containment²⁶, and the **p-supports** relation \models_ψ defined in (3.17).

(3.17) An individual I_x **p-supports** a **psoa** ψ iff $\psi^+ \in I_x$ ²⁷

The \models_ψ relation can then be used to construct a Boolean algebra $\langle S, \subseteq \rangle$, the elements of S being sets of \models_ψ relations and the ordering simply set inclusion.

As already mentioned, a standard mathematical example of an infon algebra is a topology. This is discussed by B&E [26, p.41], who suggest that points in a topological space (the example given being the real numbers) can be used to model situations in the same way that I wish to use them to model Topics. In the next section I discuss informally how ideas from topology capture the intuitions about Topics set out in Chapter 1, and then in more detail how a **topological system** corresponds to an infon algebra.

3.2 Topology

A topology is a way of capturing the notion that our information about particular objects may not enable us to completely pin down those objects. An information state (treated as a set of propositions) does not exhaustively characterize the state of the world in which it is supposed to hold; it generally only approximates it, i.e. provides a coarser- or finer-grained frame of reference against which the actual state of the world can be understood less or more precisely. The standard mathematical example of a topology is the process of calculating the value of real numbers by using rational numbers, or rational intervals (intervals with rational endpoints). Recall that there are infinitely many more real numbers than rational numbers²⁸. To use a metaphor which is quite suggestive for the application to which topology will be put here, “the rational numbers are spotted along the real line like stars against a black sky, and the dense blackness of the background is the

²⁶Details of this will be given in the next chapter. Note that as with infons, I assume that these ψ objects are in fact equivalence classes of **psoas**, so that \Rightarrow_ψ is antisymmetric.

²⁷ ψ^+ being the denotation of ψ in the sense of the partial definitions given above.

²⁸The set of rational numbers is countably infinite, while the reals are uncountably infinite.

firmament of the irrationals" (Simmons [295, p.37]). In the theory proposed here, the constellations of linguistic information (carried by utterance types) are used as a framework for pinning down the chunks of blackness corresponding to situations and entities individuated in the context of utterance tokens. It expresses what Barwise and Perry describe as the "efficiency" of language - the recycling of relatively limited means to describe an unlimited continuum of situations and entities.

In the algebras discussed above, the *infon* side of the algebra provided a fixed framework of information-bearing elements, with a fixed relation of information containment (and other logical relations) between them²⁹. An *information state* may be defined as a set of infons which are supported simultaneously by a given situation. However they do not provide exhaustive information about the situation, they only approximate it. It is similar with individual entities and properties. An entity may be characterized by the set of properties which hold of it (as it is in GQT). These may constitute all the knowable information about that entity, but they still only approximate it, and the addition of other properties will characterize the entity more precisely.

In topology these ideas are given more precise expression. The underlying idea is a geometric space of points, but with ideas of direction and even distance abstracted away³⁰, the space being reconstructed instead from the notion of open sets. An open set can be visualized as a set without its boundary points. In other words any point inside the set is well and truly inside it; however closely it approaches the boundary, it may not touch it. This captures the notion of a verifying instance of whatever is represented by the set (a point outside the set is a falsifying instance, while a boundary point neither verifies nor falsifies). A topology on a space X is a class \mathcal{T} of subsets of X (designated the *open sets*) satisfying (3.18).

(3.18) Definition of a topology (Simmons [295, p.92])

1. The union of every class of sets in \mathcal{T} is a set in \mathcal{T} .

²⁹ At a later stage the possibility will be discussed that even these may not be absolutely fixed, but that there may be mechanisms in discourse for changing or adding relations between infons.

³⁰ Some topological spaces retain the idea of distance (a "metric"), but the spaces which will be used here are non-metric spaces.

2. The intersection of every *finite* class of sets in \mathcal{T} is a set in \mathcal{T} .

3. The full set X and the null set are sets in \mathcal{T} .

The cases considered above in a Boolean context, where J and D are sets of world indices and entities respectively, supporting an appropriate algebra of P_n 's, is a limiting case of a topology, where all sets (the denotations of the P_n 's) are regarded as open³¹. By definition the complements of all sets are also open (since they too are sets). Thus every P_n simply partitions its domain into verifying and falsifying instances. In a partial system, such as that used here, the verifying and falsifying sets are potentially independent of each other, leading to a non-trivial topology.

The "frame of reference" used for a topology is called a **basis**. As mentioned in Chapter 1, a convenient example is a co-ordinate grid formed by the x and y axes of a graph representing a Cartesian plane. The rational intervals on the axes divide the plane into squares (or rectangles); this grid constitutes the **basis**, comprising of course the (possibly infinite) union of these rectangles (the **basics**). However each rectangle is itself formed by the simultaneous readings from intervals on the x and y axis, each reading itself marking out a "strip" of space. Each rectangle is the conjunction (intersection) of two strips, one based on the x axis and one on the y axis (or more generally a finite number of readings corresponding to a finite number of axes). These readings individually are known as **subbasics** (a whole axis being a **subbasis**). Thus a **basis** is formed by a *union of intersections of subbasics*. This forms a convenient way of constructing a topology.

In Vickers [318], following Abramsky [2] and Smyth [296], a topological system is constructed in this way from a particular logic - **geometric logic**, or the "logic of finite observations". The idea behind this is that a space of propositions can be seen as corresponding to observations that are finitely verifiable, if it is assumed to be closed under disjunction and *finite* conjunction. The point of this last requirement is that an infinite conjunction cannot be finitely verified because it would involve checking an infinite number of cases, whereas an infinite disjunction is verified once you hit the disjunct which is true. These conditions on disjunction and conjunction, however, are algebraically the same as the conditions on a topological space as given above. Consequently the

³¹The discrete topology

propositions of a geometric logic can be thought of as the open sets of a topological space, while the verifying instances correspond to its points.

Topological systems seem an appropriate interpretation for infon algebras. The correspondence between the two is noted, for the case of σ -algebras, by Barwise and Etchemendy [26, p.75f]. Situations correspond to points in a topological space, while the infons correspond to the open sets. This is one viewpoint (the **spatial** viewpoint), in which the underlying idea is of infons as sets of situations, or functions from situations to truth values. This viewpoint can be reversed, with infons and the logical relations defined over them taken as basic and the situations which support them regarded as sets of infons or functions from infons to truth values. In this treatment (the **localic** viewpoint), situations are obtained as prime filters as has already been described. The point of using topological systems, apart from developing the metaphor which underlies the present research, is that they are concerned with the conditions under which the two viewpoints are interchangeable so that there is complete duality between the two.

The correspondence between infon algebras and topological systems is given more fully in the appendix (page 117). In the next chapter the same approach will be applied to ψ -algebras.

The topological system to be used can be constructed in the following steps. First of all let $\langle P, \leq \rangle$ be a lattice, in which P comprises the propositions (equivalence classes of propositional formulas), and the partial ordering is the entailment relation ($p \leq p'$ in P iff $p \Rightarrow p'$ in the logic³²). As it is a model for geometric logic, P is closed under joins and *finite* meets, corresponding to arbitrary disjunctions and finite conjunctions, and finite meets distribute over joins (3.19). A lattice satisfying this conditions is called by Vickers a **frame**, and this term will be retained here (glossed as a **topological frame** when necessary to avoid confusion - however unlikely - with Kripke frames and frames for modal logic). A frame also has a top element *true* or $\bigwedge \emptyset$ and a bottom element *false* or $\bigvee \emptyset$ ³³.

(3.19) A **frame** is a poset satisfying the following conditions [318, p.21]

³²The entailment may either be logical or in more interesting cases imposed by constraints (B&E [26]).

³³So that $\text{true} \wedge p = p = \text{false} \vee p$. (Vickers [318, p.9])

1. Every subset has a join
2. Every finite subset has a meet
3. binary meets distribute over joins ($x \wedge \bigvee Y = \bigvee \{x \wedge y : y \in Y\}$)

If the elements of a frame are taken as infons, the underlying idea is as follows. There are a potentially infinite number of infons (because the infinite generative power of language produces an infinite number of possible meanings), and the union of them all is the conceptual space in which sentence denotations will be located. At the same time it seems reasonable to assume that any information state in a discourse will comprise a finite conjunction of infons³⁴. This is the basis of the proposal that topology is a suitable instrument for modelling the denotations of Topics in a discourse.

A **topological space** is a frame defined over a class of subsets. Thus, given a set X , a topological space can be seen as the structure imposed on X by a frame. For example the frame of infons structures the set of situations as a topological space (under certain conditions to be introduced shortly), and it will be argued below that the frame of properties (provisionally speaking, infons with one unsaturated ROLE parameter) similarly structures the domain of entities as a topological space.

A **frame homomorphism** is a function between frames which preserves joins and finite meets. Note that the Boolean algebra $\mathbf{2}$ also counts as a **frame** (the “Sierpinsky frame”), so that suitable functions into $\mathbf{2}$ are frame homomorphisms. Infons can thus be treated as a space of functions from topological spaces to $\mathbf{2}$, in which, as in the Boolean framework considered above, the elements of the function space are homomorphisms.

(3.20) The frame of infons as a function space

1. $(\bigvee \Sigma)(j) = \bigvee (\Sigma(j))$ for arbitrary sets Σ

If you take any disjunction of infons, you get a true description of j iff some infon in the disjunction is a true description of j .

³⁴I find it difficult to conceive of infinite discourses, or discourses with infinite sets of presuppositions.

2. $(\bigwedge \Sigma)(j) = \bigwedge (\Sigma(j))$ for finite sets Σ

If you take any finite conjunction of infons (say a discourse fragment), you get a true description of j iff all infons in the conjunction are true descriptions of j .

3. Frame homomorphisms are not required to preserve negation.

(3.21) Infons as frame homomorphisms

For I any set of individuals on D :

1. $\sigma(\bigvee I) = \bigvee (\sigma(I))$

What an infon assigns to any disjunction of individuals is the **lub** of what it assigns to each individual. Thus *beautiful* is true of the disjunction of {mary, elaine,...} iff the disjunction of {beautiful(mary), beautiful(elaine),... } is *true*. This disjunction can be assigned *true* for any set of individuals I (though it could be assigned *false* only for a finite I).³⁵

2. $\sigma(\bigwedge I) = \bigwedge (\sigma(I))$ for any finite I

What an infon assigns to any conjunction of individuals is the **glb** of what it assigns to each individual. Thus *beautiful* is true of the conjunction of {mary, elaine,...} iff the conjunction of {beautiful(mary), beautiful(elaine),... } is *true*. However this conjunction can only be assigned *true* for a finite set I (though it could be assigned *false* for an infinite I).

Now let \mathcal{E} be a family of truth-assignment functions e from P to $\mathbf{2}$, each e being a frame homomorphism. This means that they observe the conditions set out in (3.12) for the supports relation between situations and infons (modulo the contrast between finite meets and arbitrary joins). The conditions are repeated here (slightly adapted) as (3.22). \mathcal{E} here corresponds to the set of situations, which are (from one point of view) functions from infons to truth values.

- (3.22) 1. If $e \models \sigma$ and $\sigma \Rightarrow \tau$, then $e \models \tau$.

³⁵ Falsification is the mirror image of verification, in that arbitrary conjunctions but only finite disjunctions can be finitely falsified.

2. $e \not\models 0$ and $e \models 1$
3. if Σ is any finite set of infons, then $e \models \bigwedge \Sigma$ iff $e \models \sigma$ for each $e \in \Sigma$
4. if Σ is any (arbitrary) set of infons, then $e \models \bigvee \Sigma$ iff $e \models \sigma$ for some $e \in \Sigma$

Under these conditions the subset of P $\{p: e(p) = \text{true}\}$ is a completely prime filter in P ³⁶.

Considering \mathcal{E} as a set E , a ordering \sqsubseteq may now be defined on it, so that $e \sqsubseteq e'$ iff $\forall p \in P$, if $e(p)=1$ then $e'(p)=1$. This ordering corresponds to the ordering by set inclusion of the completely prime filters in P . This ordering is in general a pre-order, but under certain conditions to be stated shortly it forms a partial order, so that a poset $\langle E, \sqsubseteq \rangle$ is obtained, on which more structure will be defined in due course. $\langle E, \sqsubseteq \rangle$ corresponds to a parametrized model for P , and will henceforth be referred to as "the model", with $e \models p$ iff $e(p) = 1$. E and P together comprise what Vickers calls a **topological system**; if $\langle E, P \rangle$ is a topological system D , then E is written as $\mathbf{pt} D$ and P as ΩD [318, p.53]. A topological system, including the relations \Rightarrow and \models , is equivalent to an infon algebra, with the same proviso noted above, that the former requires infinite joins. (Details of this correspondence are given in the Appendix to this chapter).

If X is a set of points over which ΩX has been defined as a topology, the points side $\mathbf{pt} X$ is simply the original set X . This is called a **spatial topological system**, and amounts to treating opens as purely extensional objects, distinguished only by the points in X which satisfy them. In other words opens are treated as characteristic functions from X to $\mathbf{2}$. By contrast, if the points are treated as frame homomorphisms from the opens to $\mathbf{2}$, as in the previous paragraph, then what is obtained is a **locale** [318, p.61]. In this, points are treated as abstract objects, effectively models for the the opens of a frame (sets of completely prime filters of opens, as described above). If a topological system is both spatial and localic (a **spatial locale** or "sober space"), then the abstract points \widehat{X} obtained from the **locale** are in 1:1 correspondence with the underlying set of points over which ΩX is a topological space.

This duality is unsurprising when the points represent worlds (or situations) and the opens represent propositions (or infons) - e.g. definitions of propositions as denoting sets of worlds, and

³⁶Definitions for ideals and filters are given for convenience in the Appendix to this chapter (3.34), page 116.

of worlds as models for (filters of) propositions, are common enough in the literature. What is perhaps not so immediately obvious is that when opens are taken as properties denoting sets of individuals, there is a corresponding dual definition of an individual in terms of filters of properties and hence models. This approach to individuals will be elaborated in Chapter 4.

In general I adopt the practice of referring to situations and individuals collectively as **points**, as already anticipated from time to time in earlier chapters. (In Chapter 1 I also referred to them collectively as worlds). The justification is that they are both modelled as the $\mathbf{Pt} \ \mathbf{X}$ side for some topological system X (a different one in each case).

Finally, I assume that E has a bottom element \perp . This is the point that supports only *true*, i.e. combinations of affirmations which are either logically true or stipulated to be true by constraints on the infon algebra (cf. B&E [26]). In situation-theoretic terms it supports the “logical” domain of propositions and properties as opposed to the “informational” domain of situated information³⁷.

3.3 Situations and Individuals

So far the paradigmatic cases of predications on individuals have been individual level predicates, while stage-level predicates have been assumed to be predicated of worlds (situations). However, stage level predicates can also be predicated of individuals, and the interaction of individuals and situations in these cases is potentially illuminating for the relationship between their two domains. Individual-level predicates, by contrast, cannot felicitously be predicated of situations.

- (3.23)
1. Anili is cooking a curry. (That is why there is such a beautiful smell).
 2. Anili is a native speaker of Malayalam.
 3. Anili is cooking a curry. (That is why she can't check your semantics paper for you right now).
 4. ?? Anili is a native speaker of Malayalam at the moment.

³⁷ cf. Cooper [74] for a clear discussion of the latter notions within situation semantics.

In the first sentence we have a saturated *soa* with a stage-level predicate, supported by a situation. The continuation forces a reading in which the situation, and not Anili, is the Topic.

In the second sentence the predicate is an almost saturated *psoa* (a property), predicated of an individual. The individual however is available as a referent only in those situations in which she is part of the domain. On the other hand, it is claimed to be true as a generalization over such situations (or perhaps all such situations which are accessible). Thus instead of a described situation, we have a described object, which is associated with a set of situations. The proposition will be true or false in that set of situations, and undefined elsewhere.

In sentence 3 the same *soa* as in sentence 1 is predicated of the individual *anili*, but only with respect to a single situation (or in general a subset of the Anili-containing situations), being undefined elsewhere.

The final sentence appears to be anomalous precisely because it requires a single situation to support a *soa* with an individual level predicate, which necessarily generalizes over situations.

The relationship between these different types of predicate will be discussed in more detail in the next chapter.

3.4 Conclusion

This chapter has set out the semantic framework used in the dissertation. It develops a view of predicates which is based on the Keenan-Faltz approach (in which they are function algebras of a particular kind, most importantly atomic ones). In this approach the semantics of propositions (0-place predicates) and 1-place predicates show considerable parallels, differing very largely in the nature of the carrier sets, J and D , which form their domains. This view is then adapted to the context of a partialized semantics, in which the idea of verifying and falsifying instances assumes greater significance. This relationship between information-bearing objects and their instantiations is treated in the context of Barwise and Etchemendy's formalization of *infor* algebras (which, although its motivation arose from situation semantics, should be considered a proper

generalization of that framework in that situation-theoretic objects are explicitly only one of its possible applications). Topological systems (as developed by Vickers) are an appropriate way (though a non-standard one within the linguistics literature) of modelling infon algebras, one whose basic spatial intuitions have been argued to be helpful in understanding the notion of Topics as objects to be located in a conceptual space. Both infon algebras and topological systems were developed for use with propositional logics, that is to say the logic of 0-place predicates. The main contention of the next chapter will be that the parallelism between 0- and 1-place predicates carries over into the more general context of infon algebras, and that consequently the semantics of the Topic-Comment relation can be modelled by a topological system, with the denotations of Topics as the points or models and the denotations of comments as the open sets.

3.5 Appendix

3.5.1 Definitions of the different classes of algebras denoted by types of linguistic expression

- (3.24) 1. **Argument algebras** are complete atomic BA's freely generated by a set of individuals.
2. **Predicative algebras** for n place predicates are the function spaces comprising the homomorphisms³⁸ from an argument algebra to the BA which is the type of an $n - 1$ place predicate. These function spaces are themselves complete atomic BAs.
3. **Modifier algebras** comprise functions from the type of the modified head into itself. These will not play a role in the present study.
4. **Determiner algebras** comprise a subset of the functions from a set (the set of properties) into its powerset.

³⁸There are some predicates, notably collective and properly intensional predicates, which may not denote homomorphisms, at least not without more being said. However I ignore this here.

3.5.2 Truth tables for 4-valued logic

(3.25) For the logical Kleene lattice on 4 (LK4) (Extended Strong Kleene Tables - cf. [243, 314])

\wedge	t	f	*	#	\vee	t	f	*	#	\neg	
t	t	f	*	#	t	t	t	t	t	t	f
f	f	f	f	f	f	t	f	*	#	f	t
*	*	f	*	f	*	t	*	*	t	*	*
#	#	f	f	#	#	t	#	t	#	#	#

(3.26) For the approximation Kleene lattice on 4 (AK4)

\sqcap	t	f	*	#	\sqcup	t	f	*	#	-	
t	t	*	*	t	t	t	#	t	#	t	t
f	*	f	*	f	f	#	f	f	#	f	f
*	*	*	*	*	*	t	f	*	#	*	#
#	t	f	*	#	#	#	#	#	#	#	*

3.5.3 Definitions for lattices

(3.27) Lattice axioms [211, p.235f]

1. A partial order $\langle A, \leq \rangle$ satisfying:

(a) $\forall a \forall b \in A: a \wedge b \in A$ and $a \vee b \in A$

2. A structure $\langle A, \wedge, \vee \rangle$ satisfying:

(a) Idempotency: $(a \wedge a) = a$, $(a \vee a) = a$

(b) Commutativity: $(a \wedge b) = (b \wedge a)$, $(a \vee b) = (b \vee a)$

(c) Associativity: $(a \wedge b) \wedge c = a \wedge (b \wedge c)$, $(a \vee b) \vee c = a \vee (b \vee c)$ (Associativity)

(d) Absorption: $a \wedge (a \vee b) = a$, $a \vee (a \wedge b) = a$

(3.28) Distributivity

1. $a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$, $a \vee (b \wedge c) = (a \vee b) \wedge (a \vee c)$

(3.29) De Morgan Laws

$$1. \sim(a \wedge b) = \sim a \vee \sim b, \sim(a \vee b) = \sim a \wedge \sim b$$

(3.30) Law of Double Negation

$$1. \sim\sim a = a$$

(3.31) Zero and Unit laws

$$1. a \wedge 1 = a, a \vee 0 = a$$

(3.32) Complement laws

$$1. a \wedge \sim a = 0$$

$$2. a \vee \sim a = 1$$

(3.33) Boolean algebras

1. A Boolean Algebra $\langle A, \sim, \wedge, \vee, 0, 1 \rangle$ is a distributive lattice (3.27) obeying the zero and unit laws and both complement laws.

3.5.4 Definitions of Filters and Ideals as used in the text

(3.34) The definitions given here for a **filter** (a subset of a poset which is closed under \leq and \wedge) can generally be applied dually to an **ideal** (closed under \geq and \vee).

1. A **principal** filter is the filter generated by a single element: $[a] = \{b \in P: a \leq b\}$
2. A **proper** filter is a filter which does not contain 0. (It has the "finite intersection property": every finite subset is compatible).
3. A **pure** filter is a filter which does not contain any element of the set of contradictions.
4. A **prime** filter is a filter with the "disjunction property": if $a \vee b \in F$, then either $a \in F$ or $b \in F$.
5. A **completely prime** filter is the complement in P of a principal prime ideal.
6. A maximally proper filter (or **ultrafilter**) is a filter such that every element in the poset is either in it or incompatible with it.

3.5.5 Correspondences between topological systems and situation semantics

(3.35) The following correspondences (and others) are noted by B&E [26, p.75f]

Topological systems (Vickers [318])	Infon algebras (B&E [26])
opens (open sets)	infons
points	situations
frame of opens ΩX	lattice of infons (complete heyting algebra)
(closed under finite meets and arbitrary joins)	(closed under finite meets and joins)
$\models \subseteq \text{pt } X \times \Omega X$	$\models \subseteq \text{Sit} \times I$
topological system	infon algebra
spatial topological systems [318, p.57-67]	strongly balanced infon algebras [26, p.40]

Chapter 4

The semantics of Topic

This chapter proposes a formal semantic characterization of Topics. Section 4.1 sets out some of the intuitions behind the proposed approach. Section 4.2 gives the formal detail, arguing that Topic NPs include within their denotations one or more fixed individuals, which play a role for the *psoa* abstract represented by the Comment formally analogous to that performed by situations for *soas*. Section 4.3 examines the implications of this for the Topic relation within the clause, while Topic relations across discourse are reserved for discussion in the next chapter.

4.1 Topics and finite observations

As discussed in Chapter 1, Kuroda [207] argues for the recognition of two types of underlying semantic structures for declarative sentences; the **thetic judgement**, which comprises a simple observation that a given state of affairs does or does not obtain, and the **categorical judgement**, which requires both recognition of an entity and evaluation of an observation in relation to that entity.¹ This contrast is reflected in Japanese in the marking of the Subject with *ga* or *wa*, (1.1), reproduced as (4.1).

¹The terminology given is from the Prague School, especially Marty. Kuroda also cites the Japanese grammatical tradition, where the two types are known as “single” and “double” judgements respectively.

- (4.1) 1. *Inu ga neko o oikatete iru.*
 dog Nom cat Acc chasing is
 The/a dog is chasing the/a cat. ("Look - the dog's chasing the cat".)
2. *Inu wa neko o oikatete iru.*
 dog Top cat Acc chasing is
 The dog is chasing the/a cat. ("The dog? It's chasing the cat").

Although the English translations of the two sentences are almost identical, the difference in sense is partly captured by the paraphrases in parentheses. The first sentence simply describes a situation, while the second evaluates it in relation to the dog, which is the Topic of the sentence.²

The difference between the two can be understood in terms of the role of a Topic in verifying a statement. The first sentence in (4.1) can be verified by a dog-chasing-cat situation, whereas the second is verified by a currently cat-chasing dog.

In this simple instance, the conditions are obviously mutually entailing, so that it might be thought that there is no truth-conditional difference between them. However this is not always the case. For example the sentence "Nobody is chasing the cat" can be verified as athetic judgement by an appropriate situation, but as a categorical judgement (with "nobody" as topic) it is not clear how it would be verified.³ Similarly with a non-specific indefinite, as in "three girls are chasing the cat"; on athetic reading it can be verified straightforwardly by an appropriate situation, while the categorical reading requires us to produce three cat-chasing girls; this, however, forces a specific reading of the NP.

A common generalization in the literature is that NPs undergoing topicalization in English are restricted to definites, generics and specific indefinites (while in some languages they seem to be restricted to definites and generics, though a lack of standardization in terminology introduces an element of uncertainty here).⁴

²This terminology is avoided by Kuroda because of its vagueness in the literature, preferring the term "notional subject", cf. the discussion in Chapter 1.2 above.

³Perhaps only by a specified set of people of whom it is possible to verify that they are not chasing the cat. (Imagine a context like: "John is reading a book, Mary is watching TV, but nobody is chasing the cat"). It can be disputed whether even this is a Topic - note for example that the corresponding Object topicalization would be ungrammatical ("Nobody the cat saw"). In any case, however, it contrasts with thethetic reading, which requires no such contextual set of people.

⁴The difference between specific and non-specific indefinites is a subtle but crucial one. It is argued by Enç [99] that a specific reading is essentially partitive, and involves the dependence of the index of an indefinite NP on some

Thus the observed semantic constraints on topicalization (in particular non-specific indefinites and negative NPs cannot be topicalized) seem to correlate with the function a Topic NP is expected to perform in a categorical judgement, namely that of being evidence for the statement. Understood in this way it is to be expected that topicalization is relevant to truth conditions, as argued in chapter 1, in that it affects the notion of “what the world must be like for the sentence to be true”.

This function of topic NPs in the verification of statements has been explored in a number of papers, notably Strawson [302], Reinhart [271] and, in connection with Generalized Quantifier Theory, Lappin and Reinhart [219]. In a number of cases, normal semantic processing (truth-conditional evaluation) breaks down when the Topic NP cannot be assigned reference. Two well-known cases involve definite descriptions (4.2) and “improper quantifiers” (4.3).

(4.2) The King of France visited the exhibition.

(4.3) All unicorns like curry.

In both cases the impossibility of assigning a denotation to the Subject NP makes it impossible to straightforwardly assign a truth value to the sentence. Moreover, it has been argued (a point of view which will be adopted here) that this is related to the default function of the Subject NP as Topic. If that function is taken over by another NP whose reference is not problematic, then the sentence can be straightforwardly assigned the value *false* [302].

(4.4) 1. The exhibition was not visited by the King of France.

2. The exhibition the King of France did not visit.

Arguably (4.2) itself can also be assigned *false* if it is taken as athetic judgement, i.e. a statement without a Topic at all.

(4.5) A: What happened next?

definite index. Although the characterization as partitive will be argued to be too restrictive (Chapter 5), this is close to the view which will be presented here.

B: The King of France visited the exhibition.

A: That's impossible.

With improper quantifiers (4.3), when the N' restriction set is empty the sentence is judged unprocessable even though the conditions imposed by the quantifier are (vacuously) satisfied. It is observed by Lappin and Reinhart [219] that this effect occurs when an empirical statement is intended, and it is suggested that it should therefore be regarded as a matter of processing rather than of denotational semantics. The fact that the effect also only occurs when the NP concerned is Topic is taken (contr. Strawson) as further evidence for a processing explanation (assuming the standard view that Topic-Focus structure is purely a matter of processing). From the point of view of the semantics that will be proposed here, this dichotomy between verification and denotation disappears; a categorical judgement which lacks a verification essentially lacks a denotation. A more detailed account of improper quantifiers from this point of view will be offered in Section 4.2 below.

The idea is, then, that a statement requires a verification. If knowledge of its meaning depends on what the world must be like for it to be true, then it depends on knowing what sort of object in the world can in principle verify it. It is claimed that whereas athetic judgement is verified by a situation, a categorical judgement requires an individual (or individuals) to verify it, and this individual is the denotation of the Topic. Thus individuals and situations form in some sense a natural class, performing an analogous role for the two different types of statement. This will be reflected in the proposed ontology, although for the time being attention will be focussed on categorical judgements and individuals.

In section 3.18 of the previous chapter topological systems were defined, comprising two parts: a set of points or models, and a structured set of information-bearing elements termed opens or infons. The intended interpretation of these ideas in the present theory is that in categorical judgements the finite affirmations or opens correspond to the denotations of Comments (i.e. **observations** - cf. page 18), while the points correspond to the denotations of *Topics*. This interpretation of points as "evidence for a piece of information" is the subject of a major current

of research in topology (Sambin and Valentini [284]). They can also be thought of as models supporting the truth of an affirmation (Vickers [318]). In this sense the denotations of Topic NPs will turn out to be analogous to worlds in which propositions are evaluated.

4.2 Topologizing the Universe

The previous chapter discussed the construction of a Topological System from a finite affirmative logic, following [318, 276]. In this section a topology will be defined on the domain of discourse D .⁵ The discussion will try to substantiate the following claims:

- (4.6) 1. GQs corresponding to fixed individuals, in a sense to be defined, constitute the points of a topology on D .
2. The set of expressions with a Topic NP denoting such a GQ corresponds to the set of categorical judgements in natural language. Thus the Comments of categorical judgements correspond to those expressions which denote open sets in ΩD .
3. Only GQs of the specified type can combine with a predicate set to give the required expression.

The results will be used as the basis of the logic of Topics set out in subsequent sections. It is also intended to contribute further non-trivial constraints to the GQT characterization of natural language.

I make the simplifying assumption of a single domain of discourse D .

The information-bearing elements with respect to D are the properties. These generally correspond to almost saturated *psaos*, with just one *ROLE* parameter abstracted over. As discussed in

⁵The title of this section was prompted by that of a section in K & F, "Eliminating the Universe" [186, p.52f]. Having shown how the concept of individuals can be defined in terms of sets of properties, thus giving a set of individuals which is on 1:1 correspondence with elements of D (see the previous chapter), K & F describe the original domain D as "mysterious, a kind of noumenal world of entities which underlies the phenomenological world of individuals" (ibid., p.29). This, together with considerations of formal elegance, lead to the proposal to eliminate it from the ontology. While agreeing with K & F's characterization, I prefer to see the world of entities, while it does not correspond directly with the concepts used to describe it, as a world of objects which is to be *approximated* by these concepts. Hence the universe is not to be eliminated but topologized.

Chapter 2.1, the classic examples of such objects are VP denotations, but abstraction may equally be performed over an argument which does not correspond to the grammatical Subject; it may be embedded arbitrarily deeply in a structure of recursively embedded soas. Moreover, as shown by the hanging topic examples from East Asian languages, a whole clause may be a property of an individual which is not a role-filler in any obvious way.

The semantic characteristic of properties which is relevant here is that they constitute a frame. Thus they are closed under joins and finite meets (because an infinite meet of properties cannot be finitely verified), and finite meets distribute over arbitrary joins.

$$(4.7) \quad 1. (\bigwedge P_i)(x) = \bigwedge (P_i(x))$$

x has the property $\bigwedge P$ iff it has property P_1 and property P_2 and.... (finitely verifiable for finite number of properties)

$$2. (\bigvee P_i)(x) = \bigvee (P_i(x))$$

x has the property $\bigvee P$ iff it has property P_1 or property P_2 or.... (finitely verifiable for arbitrary number of properties)

$$3. P(x) \wedge (\bigvee Q)(x) = \bigvee (P(x) \wedge Q_i(x))$$

x has the property $P(x) \wedge (\bigvee Q)(x)$ iff it has property $(P(x) \wedge Q_1(x))$ or property $(P(x) \wedge Q_2(x))$ or....

At a basic level this already yields a topology on D if all sets denoted by these properties are taken as open; they simply partition D into entities which have a given property and those which do not. Let us therefore provisionally define D as $\text{pt } X$ and the set of properties as ΩX for a topological space X .

The intuitive content and linguistic properties of the opens in such a system may be expected to be heterogeneous⁶, the only *a priori* requirement being that they should be verifiable by producing a suitable individual. In the simplest case they may be properties such as those typically

⁶cf. the contrast between clitic doubling languages and languages with hanging Topics, in both of which the Comment comprises what appears to be a complete clause, with languages such as standard English in which this does not normally occur.

represented by common nouns or predicative adjectives, whose single argument place (following standard HPSG) is an INSTANCE feature filled by an *index*. In this case the correspondence between the set membership relation and the idea of being a verifying instance of a property is intuitively quite clear. It is easily checked that such properties are homomorphic (when they take individuals as arguments) and combine to form a topology under the operations in (4.7).

- (4.8)
1. John is a scholar and a gentleman iff John is a scholar and John is a gentleman.
 2. John is a scholar or a gentleman iff John is a scholar or John is a gentleman.
 3. John is everything that Bill is iff for the (finite set of) properties that Bill has, in each case John has that property.
 4. John is something that Bill is iff for the (arbitrary set of) properties that Bill has, a property can be found such that John has that property.
 5. John is a gentleman and something which Bill is iff for the (arbitrary set of) properties that Bill has, a property can be found such that John has this property and that of being a gentleman.

More complicated cases are generally of two kinds, calling for two extensions to this simple system. The first involves the extension to polyadic predicates (for $n > 1$ arguments), the second to stage level predicates.

In the case of a polyadic predicate the problem is to convert something denoting a relation into something denoting a set⁷. This can be done, of course, by specifying an order in which arguments are combined with the Predicate by β -reduction, as in standard Montague semantics⁸. On this approach each n -adic relation can be converted to a λ -formula with a single λ -operator. Assuming that the λ -operator binds an individual variable, such an expression corresponds to a property of individuals.

⁷This is the "other side of the coin" of the approach advocated by Muskens [243], who generally seeks to convert functions into relations. The latter approach is reasonable assuming the Fregean view of predicates as relations between arguments having equal status as predication targets, but has been abandoned here precisely because it makes it impossible to accommodate the notion of a topic in the denotational semantics of a sentence (Chapter 1).

⁸i.e. using curry functions.

It is worth checking that expressions formed in this way combine as expected with each other and with the class already introduced.

- (4.9)
1. John has the property of Mary liking him and Bill hating him iff John has the property of Mary liking him and John has the property of Bill hating him.
 2. John has the property of Mary liking him or Bill hating him iff John has the property of Mary liking him or John has the property of Bill hating him.
 3. John is everything Bill hates iff for every property P such that Bill hates individuals having P, John has P. (verifiable for finite set of properties)
 4. John is something Bill hates iff for some property P such that Bill hates individuals having P, John has P. (verifiable for arbitrary sets of properties)
 5. John has the property of Mary liking him and being something which Bill hates if for some property P such that Bill hates individuals having P, John has property P and also the property of Mary liking him.
- (4.10)
1. John has the property of being a gentleman and Mary liking him iff John is a gentleman and John has the property of Mary liking him. (etc)

Turning to stage level predicates, the complication is that these are predicated of an individual only at a certain index. Thus a predicate whose semantics normally involves evaluation in a situation has to be construed as a property which can be predicated of an individual. This can be done, as in the cases just discussed, by reversing the order of the λ -operators, assuming that the basic thematic reading of a stage-level predicate derives from λ -abstraction on a location parameter which fixes the situation supporting it⁹. In the first case (4.11) the last λ -expression to be applied

⁹This treatment of the location parameter does not correspond to standard situation semantics. In effect, it is introducing a situation parameter into the infon, so that the situation occurs both on the left of the supports relation and embedded in the expression on the right. Of course this is different from the embedding of situations in infons denoted by attitude or perception reports, where the situation is not that which supports the infon. The effect intended is analogous to the introduction of event variables into infons by Lappin and Pollard [218], though in that theory situations as such are dispensed with. Clearly, the present approach has the drawback, from a formal point of view, of duplicating this information in the infon algebra. It is not, however, an accidental feature of this theory, as it recurs in the treatment of Topics, which also p-support a psOA while being associated with a parameter within it. (This is motivated particularly by clitic doubling - cf. the treatment of Greek by Tsipplakou [311, 312],

is the situation type of Anili cooking a curry, and thus (when evaluated with respect to a situation) a thetic judgement. In the second case the last λ -expression denotes the property (an individual property) of cooking curry at the moment of evaluation, t_0 , which when applied to an individual will give a categorical judgement.

- (4.11) 1. (a) Anili is cooking a curry. (thetic judgement)
- (b) $\lambda x \lambda s [\text{cook}(x, \text{curry}, s)](\text{anili})$
- (c) $\lambda s [\text{cook}(\text{anili}, \text{curry}, s)]$
2. (a) Anili is cooking a curry. (categorical judgement)
- (b) $\lambda s \lambda x [\text{cook}(x, \text{curry}, s)](t_0)$
- (c) $\lambda x [\text{cook}(x, \text{curry}, t_0)]$

Again, it should be checked that the incorporation of this class of properties behaves as expected.

- (4.12) 1. John has the property of cooking a curry at t_i and drinking Cobra at t_j iff he has the property of cooking a curry at t_i and he has the property of drinking Cobra at t_j . (etc.)
2. John has the property of doing everything at t_i that Bill hates iff for every property P such that Bill hates individuals doing P, John does P at t_i . (verifiable for finite set of properties)
3. John has the property of doing something at t_i that Bill hates iff for some property P such that Bill hates individuals doing P, John does P at t_i . (verifiable for arbitrary set of properties)

where the Topic labels a database while the same entity occurs as an object within it). The underlying purpose of the approach taken here is to be able to treat the functions represented by almost saturated psos (and in parallel soas) as corresponding to verifying sets (of entities and situations respectively), i.e. treating them extensionally. As mentioned above, the framework of L & P is likely to have an important influence on future developments of this research, and in particular may provide a more formally satisfactory way of dealing with this question of extensionality.

4. John has the property of cooking a curry at t_i and doing something at t_i which Bill hates iff for some property P such that Bill hates individuals doing P, John does P at t_i and also cooks a curry at t_i .

- (4.13) 1. John has the property of being a gentleman and cooking a curry at t_i iff John is a gentleman and John has the property of cooking a curry at t_i . (etc.)
2. John has the property of cooking a curry at t_i and Mary liking him iff he cooks a curry at t_i and Mary likes him.

It is important to note that when stage level predicates are treated in this way as individual properties, it is not necessary for the situation to be held constant, or even to be an specific situation, for the predicate to behave as a homomorphism (it may be existentially quantified, as in (4.14)). The only requirement is for the individual to be held constant.

- (4.14) 1. (Tell me about Anili). Anili sometimes cooks curry and sometimes goes to the cinema iff Anili sometimes cooks curry and Anili sometimes goes to the cinema.
2. (Tell me about what happens around SOAS). Anili sometimes cooks curry and goes to the cinema \neq sometimes Anili cooks curry and sometimes Anili goes to the cinema.

Two other extensions to this system will be introduced shortly, but I pause here to take stock of what is being claimed so far. The domain of discourse is being treated as a topological space, in which the open sets represent finitely observable properties of individuals. They are finitely observable because as a topology they are isomorphic to a set of formulas obeying the axioms of the logic of finite observations discussed above (3.19), and they are individual properties having the form of λ -expressions where abstraction is on an individual variable. The different types of property discussed simply represent different ways in which the λ -expression is obtained from sentences with different syntactic and aspectual characteristics.

Shifting perspective slightly, the logic of these finitely observable individual properties can now be studied. These objects are not **infons** (which can be seen as situation types¹⁰), but the

¹⁰Modulo the question of the infon algebra being strongly balanced - i.e. obeying condition (3.13).

aim will be to structure them on the analogy of infon algebras (with the added dimension of finite affirmability). In parallel with what has just been said about infons, they will be seen as “individual types”, or sets of individuals.

Let Ψ be the set of finitely observable individual properties (for the rest of this section simply **properties**). Like infons, they can be ordered by a relation of informational containment \Rightarrow_ψ . This can be defined in terms of the informational containment relation on infon algebras.:

(4.15) $\psi \Rightarrow_\psi \psi'$ iff, if $\psi = \lambda x \sigma$, $\psi' = \lambda x \sigma'$, then $\sigma \Rightarrow \sigma'$ for all values of x .

As with infons, I assume that the unit of information we are working with is in fact an *equivalence class* of properties, $[\psi]_{\Leftrightarrow_\psi}$, though for convenience these will simply be notated ψ . Thus $\langle \Psi, \Rightarrow_\psi \rangle$ is a poset. The examples given earlier in the section indicate that it is in fact a distributive lattice, and moreover satisfies the conditions for a frame (cf. (3.19)).

To make this frame into a topological system (or geometric infon algebra), it is now necessary to define a class of homomorphisms from $\langle \Psi, \Rightarrow_\psi \rangle$ to the frame **2**. Linguistically speaking, functions from properties to **2** are GQs, the denotations of NPs, and this is, of course, the intended interpretation here. The question of interest is which GQs count as frame homomorphisms, and once that subclass is identified, how it relates to the original domain of entities which is the carrier set for the algebra of properties.

It should be noted that in general GQs do not yield frame homomorphisms from the set of predicates, and this is true even for the more constrained class of GQs allowed in GQT as NP denotations for natural language. The sets of properties they comprise are not closed under the required operations. This is clear, for example, in (4.16) where the NP is a non-specific indefinite (a cardinal GQ) - a perfectly respectable NP denotation, but not closed under conjunction of predicates.

- (4.16) 1. A million Greeks support Panathinaikos.
2. A million Greeks support Olympiakos.
3. A million Greeks both support Panathinaikos and support Olympiakos.

Even for those unfamiliar with the habits of Greek football supporters, clearly the first two of these statements do not imply the third. Thus the GQ ||a million Greeks|| is not a frame homomorphism. To obtain frame homomorphisms, further constraints are needed on top of the constraints of domain restriction imposed by GQT in general. The problem with (4.16) is clearly related to the fact that the Subject NP can denote sets with non-identical individuals, even keeping the model constant. If such cases were eliminated (if the same Greeks were involved in each of the two premises) then the inference would be valid. Such a condition might be expressed as follows:

(4.17) **Fixed individual condition (FIC)** (provisional form) A Generalized Quantifier Q

satisfies the FIC iff the condition for a set S to be an element of Q depends on the identity of the entities required to be members of S.

Some examples:

1. ||every N|| observes the FIC because all the individuals in N are required to be elements of every S. Therefore N will be contained in the union and intersections of all sets in Q.
2. ||three N|| observes the FIC on its specific reading because the same three elements of N are required to be elements of every $S \in Q$.
3. ||three N|| does not observe the FIC on its non-specific reading because the same three elements of N are not required to be elements of every $S \in Q$. Thus the intersection of $S, S' \in Q$ need not contain three members of N, in which case $S \cap S' \notin Q$. (cf the example in (4.16) above).
4. ||john|| observes the FIC because john is an element of every $S \in Q$ and will be an element of all their intersections and unions.
5. ||no N|| does not observe the FIC because although it is closed under union and intersection it does not require any individual to be in S.

It seems that NPs whose GQs satisfy the FIC can be topicalized, whereas those which do not satisfy it cannot be topicalized (some apparent problems for this claim will be discussed presently).

It will be claimed that the FIC in fact serves as a defining semantic characteristic of a Topicalizable NP.

Note that filter quantifiers satisfying the FIC will be prime filters - they are closed under \cup as well as \cap and \subseteq . This is the basis for the claim that a supports relation parallel to that between situations and infons holds between Topicalizable NPs and individual properties.

The intuitive notion to be captured is that certain GQs, such as $\|\text{a million } X\|$ on the purely cardinal (non-specific) reading represented by (4.16), do not provide models for the frame of properties; consequently, such a NP cannot combine with a predicate to form a categorical judgement. This does not mean that there are no models for sentences with only non-specific NPs (of course), but that such sentences arethetic judgements. A model for a categorical judgement has to pick out a fixed individual (or individuals, but I will use the singular for convenience) such that the \models_{ψ} relation between the model and the lattice of individual properties is prime filter. The intuition to be captured here is that a categorical judgement can be reduced to the assertion that a particular individual has the property stated, or using the spatial metaphor, that a given point falls within an open set.

Although a formal proof of this requires further mathematical research which is beyond the scope of this thesis, I argue informally that it is reasonable to regard entities in D as (isomorphic to) the points side of a topological system of which the lattice of individual properties is the frame. This is equivalent to the following claim (4.18).

(4.18) Individuals are in 1:1 correspondence with the set F of prime filters of the Boolean algebra of sets of \models_{ψ} relations ordered by set inclusion.

Recall that in infon algebras, situations correspond to prime filters of sets of \models relation [26], provided that the condition in (3.13), repeated as (4.19), is satisfied. This condition makes the infon algebra “strongly balanced”, that is to say it ensures that there are enough situations to separate truth-conditionally any two infons neither of which informationally contains the other. I will refer to this simply as the **separation condition**.

(4.19) For all infons σ, τ such that $\sigma \not\approx \tau$ there is a situation $s \in \text{Sit}$ such that $s \models \sigma$ but $s \not\models \tau$.

[26, p.40]

The claim made in (4.18) is that models for the Ψ algebra constructed in the same way by prime filters of sets of \models_ψ relation correspond to individuals, and that this justifies the apparent importance of individuals in the topicalizability of NPs (as stated in the FIC).

The arguments are presented informally; however, they are based on the Stone Representation Theory for atomic Boolean algebras (hence the insistence on atomicity in the previous chapter).

11

First, if properties are considered as sets of entities in D , they form a powerset algebra on D . Given the partial definition of properties discussed in the previous chapter, this will be in the first instance an algebra on **partial subsets** of $D \times D$ (partial sets being ordered pairs of sets). However, as also discussed above, a Boolean powerset algebra can be recovered from this by taking sets of supports relations (the details here follow closely those given for infon algebras in B&E [26, p.44]). In the present context “propositions” are confined to **categorical judgements**.

- (4.20)
1. $\models_\psi(a, \psi)$ iff $a \in \psi^+$, for every entity $a \in D$, every almost saturated psOA $\psi \in \Psi$.
 2. Define a proposition as a pair $(a : \psi)$ so that $(a : \psi)$ is true iff $\models_\psi(a, \psi)$, and its negation $\neg(a : \psi)$ is true iff not $\models_\psi(a, \psi)$. That is to say, the proposition is true iff a is in the **denotation** of ψ and false iff a is in the **antidenotation** or the **gap** of ψ .
 3. Define a B-set as any set of relations $\subseteq D \times \Psi$ satisfying the conditions for **supports** relations in infon algebras (3.12).

¹¹The formal substantiation of this will be attempted in future research, but the idea is as follows.

The essence of a representation is to show that an algebraic structure of a given type can be reduced to a particular standard example of that algebra - in this case, that complete atomic BAs can be reduced to powerset algebras. “Reduced to” (or more technically “represented as”) means here that there is a homomorphism η from any complete atomic BA A to a set theoretic BA B , such that (i) η is an isomorphism (there is an inverse homomorphism $\eta^{-1}: B \rightarrow A$, and (ii) there must be some useful (i.e. specifiable) characterization of the image of A under η , namely B . The most general representation theory for BA's (the Stone Representation Theory) proceeds by building an algebra isomorphic to A out of the prime filters (or ideals) of A . This powerset algebra is isomorphic to a subalgebra of a powerset algebra $\mathcal{P}X$, where X , the set of atoms out of which $\mathcal{P}X$ is built, are the prime filters of A . These prime filters can be characterized as the points of a topological space (X, T) , the ideal space of A , the open sets of T constituting the image of η . Thus there is a homomorphism from the original BA A to the open sets of a topology, the points of which correspond to the prime filters of A .

Details are from Davey and Priestley [82, p.193f]. I am grateful to Carl Pollard for suggesting this approach to me; any inaccuracies are my own.

4. $(a : \psi)$ denotes the B-set B such that $\models_{\psi}(a, \psi)$.
5. The algebra $\langle B, \subseteq \rangle$ (B-sets ordered by inclusion) gives a BA of propositions.

For each $a \in D$, the psoas in Ψ such that $\models_{\psi}(a, \psi)$ form a proper prime filter in Ψ (cf. B&E [26, p.45]).

The processing of improper quantifiers

The above discussion has relied to a great extent on the assumption that sentences in which the Topic NP's reference is problematic are undefined for truth value rather than simply false (henceforth the "truth gap" theory, following in general Strawson [302]). However Strawson's particular theory of reference, notably for definite descriptions, has come under attack from other philosophers (cf. Donnellan [93]), and it is not intended that the present theory should be dependent on it. Moreover it has also been suggested even from within the GQT tradition (Lappin and Reinhart [219]) that processing considerations rather than questions of semantic denotation play a primary role here. In this connection the phenomenon of "improper quantifiers" is relevant. It has often been observed that when strong determiners take as their restriction an empty N' set, their logical interpretation (both in FOL and GQT) is in sharp contrast with their intended meaning. (Propositions whose Subjects denote such quantifiers come out as vacuously true, when on any intuitive reading they should be uninterpretable).

(4.21) Improper quantifiers

All unicorns have exactly one horn.	true
All unicorns have read "A Critique of the Minimalist Program".	anomalous
All unicorns in this room have exactly one horn.	anomalous

In Lappin and Reinhart [219], building on the observation that this effect is strong in empirical sentences and not apparent in definitional ones (4.21), it is attributed to a breakdown in processing, assuming GQT together with certain possible algorithms for verification. This is regarded as a more important factor than Strawson's preferred explanation in terms of topic-focus structure, the

latter being ostensibly closer to the view being advocated here. In fact, however, I suggest that the present view incorporates important elements of both.

The approach taken here has attempted to take account of the processing aspect of the problem by the choice of a geometric logic (logic of finite observations). Without making any commitment as to the actual algorithms involved in verification¹², it builds the importance of verification into the idea of denotation. Essentially this involves ascertaining that a given point (or model) satisfies the informational content of some open set. The role of the topic NP is to pick out the points. If it is unable to do so, then the open set makes no affirmable statement. Note that this is a somewhat different claim from the question of referentiality as focussed on in Strawson's account. Cardinal NPs for example are referential, but I have argued that they cannot pick out a model in the sense required.

In the case of an improper quantifier such as *all unicorns*, the fact that the N' set is empty means that there are no points which can be related to the open set, and normal linguistic processing of the sentence breaks down (though logicians may still subject it to logical analysis). A definitional statement, however, is different in that definitions can be seen as a case of constraints built into the frame. Such statements will be supported precisely by the \perp element of the model, which was defined as supporting *true*. Any empirical statements about unicorns, by contrast, do not have the value *true*, and therefore \perp is not available to support them.

4.3 Sentential Topics

In this section I will characterize the ability of an NP to provide a model for a sentence in terms of the conditions imposed on its GQ. The semantics proposed will also allow a dynamic characterization of the ability of a non-Topic NP to become the topic of a subsequent sentence. This in turn will be used in Chapter 5 to support a more general account of the development of

¹²There is a discussion of this issue in Smyth [296, p.690ff]. For example the claim that infinite disjunctions are finitely affirmable assumes some search procedure in which the disjuncts are enumerated. I defer this whole question to future research.

topics in discourse.

4.3.1 Generalized Quantifiers and Topichood

In Generalized Quantifier Theory, a GQ is a subset of $\mathcal{P}(D)$, but as shown by Barwise and Cooper [25], Westerstahl [321] and Keenan et al. [187, 186], GQ denotations of natural language NPs are confined to a highly restricted class of such subsets, the restrictions themselves reflecting the “logical topicality” of language in a broader sense ¹³. However, even these conditions do not capture the notion of Topic in the grammatical sense (they allow all NPs, including non-specific indefinites, cardinal NPs and negative NPs). It was argued above that topicalizable NPs have a semantics in which the identity of elements in the relevant set intersections, specifically the intersection of the N' set with the predicate set (henceforth the “pivot set”) is important, whereas the crucial characteristic of non-topicalizable NPs is precisely their independence of particular individuals for their interpretation. It is noteworthy here that the class of topicalizable NPs appear to be precisely the complement of those which can appear postverbally in existential constructions. I assume here Lappin’s [213] analysis of the latter as cardinal GQs - i.e. crucially GQs which depend only on the cardinality of what I have called their pivot set and not on the identity of its elements. Topicalizable NPs, by contrast, were characterized above as being precisely those whose GQ denotations do depend on the identity of the elements of their pivot set (4.17).

Given the denotation of an NP as a set of sets whose membership is determined by particular set-theoretic relationships with a restriction set, I first distinguish between those NPs which fix the identity of the individuals in their denotation and those which do not (cf. Keenan [184], Lappin [216, 215]). Prototypical examples of the former class include NPs with definite or possessive Dets, as well as proper names, while prototypical examples of the latter are NPs with cardinal Dets; in this section I will largely confine my attention to these types.

¹³ “The combined effect of CONS(-ervativity) and EXT(-ension), namely Domain Restriction, is a kind of *logical topicality condition*.” (Keenan [184, p.56]).

1. A function D is *conservative* iff if $A \cap B = A \cap C$ then $D(A)(B) = D(A)(C)$
2. D satisfies *Extension* iff with $A, B \subseteq E$ and $A, B \subseteq E'$, $D_E(A)(B) = D_{E'}(A)(B)$.

NPs in the first class, but not those in the second, constitute frame homomorphisms on the lattice of individual properties, by virtue of the fact that they pick out fixed individuals. It is precisely GQs defined by fixed individuals which have the required closure properties. In the discussion of homomorphisms above, the main examples used were proper names. A definite NP such as "the men", or a possessive NP such as "Napoleon's men" will similarly fix an individual or group of individuals in the relevant set of men, either anaphorically or via the reference already fixed for the proper name "Napoleon". The denotation of the NP as a whole will be the set of those sets which stand in the specified relation to the fixed individuals in the pivot set.

A cardinal Det, by contrast, does not fix its reference in the same way.¹⁴ Thus in the sentence "John had four wives", the denotation of "four wives" is not fixed relative to a particular set of individuals but relative to an equivalence class (of sets of the specified cardinality, subsets of the restriction set of wives). Although the NP contributes descriptively to the situation *type*, it cannot be used to anchor it in a situation and thus give it a truth value. Members of the set of sets denoted by the GQ may be completely disjoint, and cannot therefore serve as descriptions of any particular point, hence they do not provide any model.

On the basis of the preceding discussion it might seem that the distinguishing criteria between topicalizable and non-topicalizable NPs is the logicity of the GQs they denote - that is, its dependence on or independence of particular models for their interpretation (van Bentham [34], Westerstahl [321], Sher [292]). A similar distinction has been proposed several times in the literature as a semantic basis for a number of ostensibly syntactic phenomena (Higginbotham [146], May [230], Pesetsky [260], Milsark [234]). In the last of these the corresponding distinction between "strong" and "weak" determiners is argued to be responsible for constraints on post-verbal NPs in existential constructions, which were claimed above to be in complementary distribution to topicalizable NPs. The characterization of this contrast as being precisely one of logicity, how-

¹⁴I refer here to "pure" cardinal Dets, as opposed to the use of cardinal Dets as what Eng calls "covert partitives" [99]; in the latter, whether or not Eng's exact formulation is correct, there is some anaphoric reference to a definite referent already established in the discourse. I assume that pure cardinal GQs are the interpretation of non-specific indefinites, while those which fix the identity of individuals in some way (often termed "intersective GQs") introduce specificity.

ever, runs into problems. As shown by Lappin [215, 216], NPs with exception phrases constitute a class of NPs which cannot be characterized in terms of logicity, because the complement of "except" can be a logical or a non-logical NP; however, the syntactic distribution of NPs with exception phrases is not influenced by the semantic nature of this NP complement. This applies equally to topicalization environments. In the following example the NP complements (in italics) are respectively definite, specific and non-specific, but this does not affect the acceptability of the topicalization¹⁵.

- (4.22)
1. All students except *Hanako* John thinks will be expelled tomorrow.
 2. All students except *five language students* John thinks will be expelled tomorrow. The director is known to like five language students.
 3. All students except *five language students* John thinks will be expelled tomorrow. The director needs five language students to work in the bar.

It is notable, however, that topicalization is strongly sensitive to the semantic characterization of the main determiner of an NP with an exception phrase, and that again the distribution is complementary to that of postverbal NPs in existential constructions. It has been noted (Lappin [215]) that the main determiner for such NPs is in any case severely restricted. It is required to denote a "total" relation, such that the intersection of the N' set N with every set $X \in GQ$ is either N or \emptyset . These two cases are in complementary distribution with regard to existential constructions and topicalization, whether or not an exception phrase is present.

- (4.23)
1. All students the director thinks take drugs.
 2. All students except a few linguistics students the director thinks take drugs.
 3. * No students the director thinks take drugs.
 4. * No students except a few linguistics students the director thinks take drugs.

- (4.24) 1. * There were all students sitting outside the bar.

¹⁵Note that negative NPs are unacceptable as complements of "except", regardless of the question of topicalization.

2. * There were all students except a few linguistics students sitting outside the bar.
3. There were no students sitting outside the bar.
4. There were no students except a few linguistics students sitting outside the bar.

It was claimed that a Topic NP must establish a (possibly composite) individual, in order to have the closure properties necessary for it to denote a completely prime filter of properties and thereby provide a model. Consider therefore each of these cases in turn.

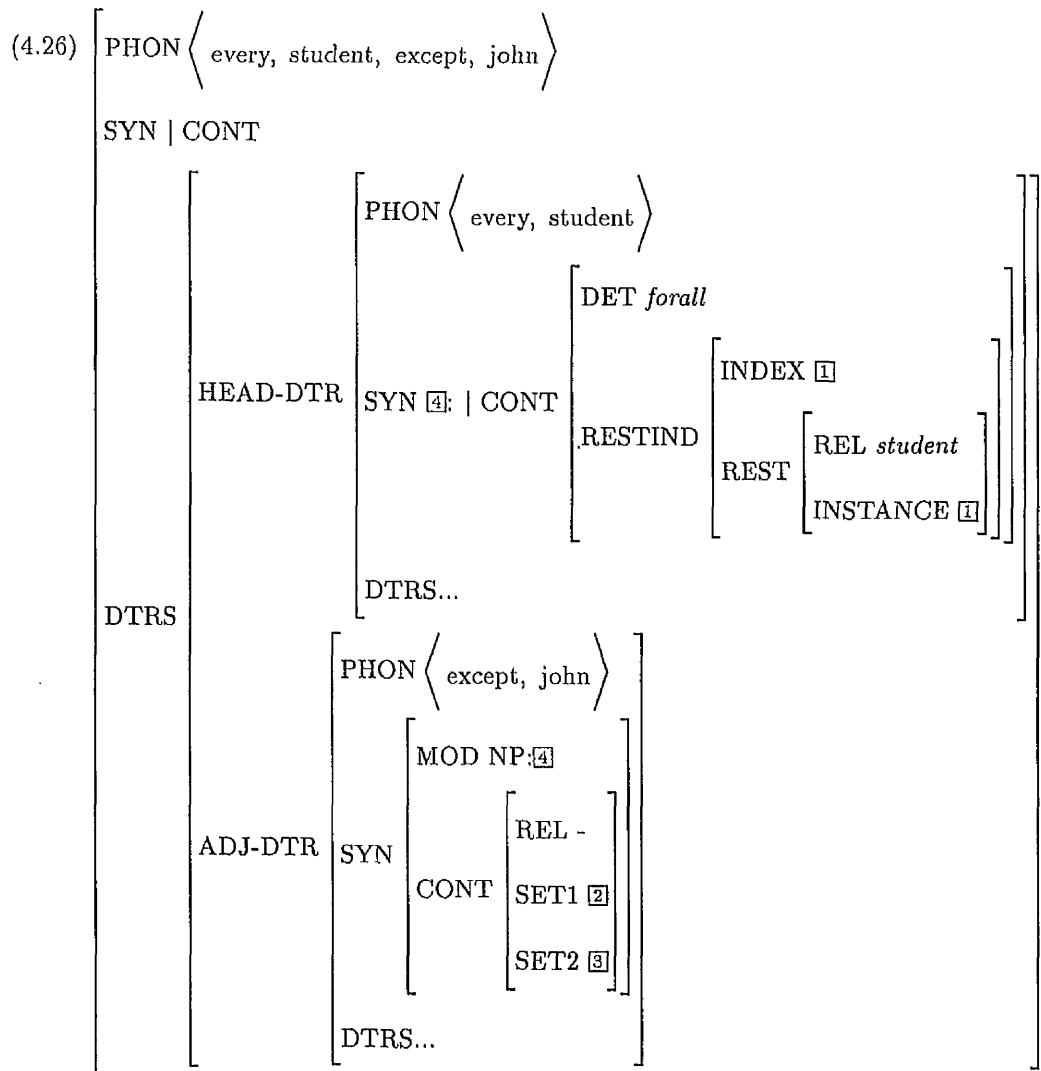
The NP "all students" refers either to the whole of a contextually given set of students (alternatively to students generically, which following Carlson [59] can be taken as denoting an individual). An exception phrase introduces a witness set $R \subseteq N$ for every $X \in GQ$, such that $R \cap X = \emptyset$ ¹⁶. However, $N-R$ can only be a frame homomorphism if R is itself a set of fixed individuals. In the following examples, the required closure properties only obtain on a specific reading of "five philosophy students", the complement of the exception phrase.

- (4.25)
1. All students except five philosophy students the director will expel and the police will investigate iff (i) all students except five philosophy students the director will expel, and (ii) all students except five philosophy students the police will investigate.
 2. All students except five philosophy students the director will expel or the police will investigate iff (i) all students except five philosophy students the director will expel, or (ii) all students except five philosophy students the police will investigate.

In suggesting a solution to this problem, it is worth emphasizing once again that in the framework employed here Topic is not simply a semantic phenomenon but a Grammatical Relation, to which several different types of information make a contribution (though in accordance with the feature geometry set out above this should not include categorial information). From this perspective it is not always sufficient to look at the end result of the interpretation of a complex NP without taking into account its internal structure. The above data strongly indicate that the

¹⁶For exception phrase NPs whose head determiner is $||\text{all}||$, which are those under discussion here. For negative exception phrase NPs this is reversed, so that $R \cap X = R$.

relevant criterion here is not the set-theoretic interpretation of the whole NP but only of the main determiner and the head NP whose index is bound by that determiner. The essential semantic contribution of a Topic NP to the content of a Topic-Comment construction is, according to the proposals in Chapter 2.1, its *index*, and the *index* of a complex NP is inherited from the main determiner which binds it and the head noun whose relation it instantiates. A standard HPSG structure is given in (4.26) (cf, [265, p.318ff]), which is intended to capture the semantics in (4.27)¹⁷.



- (4.27)
1. $\llbracket \text{every student} \rrbracket = \{X \subset D: \llbracket \text{student} \rrbracket \subseteq X\}$
 2. $\llbracket \text{except John} \rrbracket (\llbracket \text{every N} \rrbracket) = \{X \subset D: (N - \llbracket \text{john} \rrbracket) \subset X \ \& \ \llbracket \text{john} \rrbracket \cap X = \emptyset\}$

¹⁷Following Lappin [215] and others, I assume that the exception phrase is a function from NPs to NPs

$$3. \llbracket \text{every student except John} \rrbracket = \{X \subset D: (\llbracket \text{student} \rrbracket - \{\llbracket \text{John} \rrbracket\}) \subseteq X\}$$

The first of these structures (4.26) shows the maximal NP inheriting the index of its head, the latter representing of course the variable introduced by the head noun “students” and bound by the main determiner “every”. It should be noted that in this case a semantic object (the variable) is inherited from the syntactic head of the maximal NP, even though under the Semantics principle of standard HPSG the Exception Phrase, as the modifier, would be expected to be the semantic head (although even in P&S the INDEX of the mother is inherited (via the MOD feature of the adjunct) from the head noun):

(4.28) Semantics Principle (ignoring QSTORE) P&S [265, pp.56,319]

In a headed phrase, the CONTENT value is token-identical to that of the adjunct daughter if the DTRS value is of sort *head-adj-struct*, and with that of the head daughter otherwise.

However it is necessary to make more subtle distinctions both as regards the type of object being modified and the type of modification represented. (The following treatment draws on Pollard [263]). In the first place most verbal and some nominal heads have location parameters¹⁸, and it is reasonable to treat certain modifiers as accessing this rather than a nominal index. It seems that Exception Phrases in general can modify a location parameter, but that when they modify noun phrases it is the nominal index that is modified, even when the head noun appears to also have a temporal argument:

- (4.29)
1. John doesn't eat meat except at Easter.
 2. No habitual offenders except rehabilitated ones will be released.
 3. All heavy drinkers except chronic ones will be helped by this programme.

In the last two examples, even though “habitual” and “chronic” take temporal arguments, the exception phrase as a whole seems to directly restrict only a set of entities. In the first case the set of entities to be restricted is the output of a function involving temporal modification (“habitual”),

¹⁸In [263], event variables. I provisionally treat location parameters as virtually the equivalent of event variables.

while in the second case the restriction involves subtracting a set which is the output of a temporal modifier ("chronic"). However, the restriction imposed by the Exception phrase seems to map nominal entities to nominal entities in a straightforward way. Assuming, then that the exception phrase takes a nominal index as its argument, then that index will be passed up to be the index of the maximal NP. This will hold both for the standard HPSG semantic schema reflected here and for Minimal Recursion Semantics¹⁹.

Evidence that it is the index of the head NP that is crucial for these constructions comes from clitic left dislocation in Greek. Greek gender agreement is highly syntactic in nature²⁰, and in general aggregates of mixed gender follow the rule that masculine takes priority over feminine.

- (4.30) *Oles tis soupes ektos apo (to) ena*
 all,Acc,Pl,f the,Acc,Pl,f soup,Acc,Pl,f except from (the,Acc,Sg,m) one,Acc,Sg,m
patsa tis-efaghan ta pedhya. (Greek)
 patsa,Acc,Sg,m Cl,Acc,Pl,f-ate,3,Pl the,Nom,Pl,n children,Nom,Pl,n
 All the soups except for one patsas the children ate.

This example illustrates two things. First it confirms that the specificity or otherwise of the exception phrase complement has no bearing on the acceptability of the construction with CLLD, that is, to the topicalizability of the maximal NP. In Greek, specific and non-specific readings can be disambiguated by the use of the article as shown, but the clitic is acceptable in both cases. Second, the clitic agrees in gender with the head NP, not with the exception phrase complement nor with the combination of the two, which would be expected to be masculine. Although this gender agreement is a syntactically controlled phenomenon, it has a semantic reflex, namely that the individual variable which fills the relevant ROLE parameter is identified with that of the head noun.

¹⁹In Pollard (op.cit.), which adopts MRS, a nominal index (unlike an event index) is inherited from the syntactic head.

²⁰As discussed by Pollard and Sag [265, Ch.2], agreement cross-linguistically is subject to a great deal of variation in the extent to which it is syntactically or semantically determined. Nonetheless, it is essentially encoded by the structure sharing of the index of an argument with the value of a ROLE feature of the selecting head, this structure sharing being enforced by subcategorization.

4.3.2 The acquisition of Topic status by non-Topic NPs

In 4.2 above a formal distinction was presented between “topicalizable” NPs which are able to provide a model for the sentence and “non-topicalizable” NPs which are not. However, not all topicalizable NPs in a sentence need be actual Topics. In (4.31), in sentence 1 the Object is non-specific and cannot be a topic. In 2 (based on Chafe [62]) the Object is definite and is presumably known information, but nonetheless on the most natural reading of the sentence is not Topic.

- (4.31) 1. John is buying *a Greek island*.
 2. I saw *your wife* at the party. [62]

The characterization of actual Topichood, as opposed to Topicalizability, therefore requires an account of the process by which situations are built up in the discourse.

However in both cases the non-topic NP can naturally become Topic in a subsequent sentence.

- (4.32) 1. It is almost unspoil.
 2. She seemed to be having a good time.

This process is termed “focus chaining” by Erteschik-Shir [104], following the Prague School; this describes the changing informational status of the NP in this kind of discourse, from (presentational) Focus in one sentence to Topic in a subsequent sentence²¹. She characterizes it by the metaphor of first adding a file-card to the top of the stack (focus) and then having it available as the most salient background information (topic). Although I do not make any formal use of the popular image of file-cards here, it is essentially this process that has to be captured. In terms of the account given so far, this would seem to require the following elements:

- (4.33) 1. In the first sentence, the open set representing the predicate should be representable as a relation, whose terms are Generalized Quantifiers. The GQ representing the

²¹As opposed to “topic chaining, in which an existing Topic retains its topic status in a subsequent sentence. I do not adopt this terminology here; in Chapter 5.2 I use the term “topic chaining” for other purposes. This process is also discussed from a computational point of view in centering theory (Grosz et al. [130, 131]), the emphasis there being on predicting likely candidates for these chaining processes rather than modelling the processes themselves.

non-Topic NP will not in general be anchored to the individual which forms the Topic of the sentence, and need not be anchored to any individual at all. (e.g. in the first sentence, there is no reference to any specific island).

2. The situation supporting the second sentence includes the referent of this GQ, now assigned to a specifiable individual, which is now available to serve as Topic. (The island is now a fixed entity).
3. To preserve discourse coherence, the new Topic should also bear a specifiable relationship to the Topic of the first sentence. (It is, specifically, "the island which John is buying").

In what follows I discuss the default situation in which the Subject of a dyadic verb is Topic and its Object is non-Topic.

I assume the standard GQT account of the combination of (extensional) Direct Object NPs with a predicate as given by Cooper [76]²². As usual the NP denotation for the Direct Object, notated GQ_2 , is the set of all sets Y satisfying a given relation with an N' set N_2 or an individual n_2 . The relation R of the transitive verb denotes a set of ordered pairs $\subseteq A \times B$ where A and B are the sets of (descriptively speaking) potential "actor" and "goal" arguments respectively. The denotation V of the transitive verb is then the set of ordered pairs $\langle a, GQ_x \rangle$ such that $B \in GQ_x$:

(4.34) Transitive verbs in GQT [76]

R = denotation of verb relation in $D \times D$

A = potential "agents"

B = potential "patients"

GQ_x = denotation of an NP X

1. $V = \{ \langle a, GQ_x \rangle : \{ b : \langle a, b \rangle \in R \} \in GQ_x \}$
2. $GQ_2 = \{ X : \exp(N, N \cap X) \}$ as above
3. $VP = \{ a : \langle a, GQ_2 \rangle \in V \}$

²²cf. also Lappin [214, p.273-4] for a convenient summary.

The transitive VP thus denotes the set $X (\subseteq A)$ of all x such that $\langle x, \mathbf{GQ}_2 \rangle$ is an element of V , and this then combines with the Subject NP denotation in the normal way.

It is clear from the semantics just given that an Object NP cannot by itself anchor the *psoa*, since its combination with the transitive verb denotation does not fix a unique pivot set in the sense required (its set denotation still contains the unanchored variable x). This is true whether the Object is definite or indefinite. The role of anchoring the *psoa*, i.e. that of Topic, falls to the last NP to be combined; since this is by default the Subject (following the syntactic structure), the Subject will be the default Topic. However I assume that the order of combination may be reversed, either through overt Topicalization of the Object or by some other mechanism with the Object remaining *in situ* (see chapter 6 for an illustration of such a mechanism).

As for the information contained in the Object (non-topic) NP, it is "absorbed" into the predicate, providing an additional constraint on the open set characterizing the final proposition. In the GQT characterization just given, this is seen in the incorporation of its GQ denotation into the description of the predicate set (the VP denotation). However, the crucial point here is that this combination will also have the effect of restricting the denotation of the Object NP to a single set (the intersection of its N' set with the set $\{b: \langle a, b \rangle \in R\}$ specified by the verb) - the latter being *one* of the elements of its GQ set). Unlike the NP denotation itself (for a non-topicalizable NP), this set S partially fixes a particular (possibly composite) individual (call it y) of a given cardinality. This is then available as a model for subsequent sentences.

Finally, the new discourse referent y which is thus made available, and which may itself become a Topic subsequently, depends on the Topic x of the sentence S in which it is introduced. This can be seen in the fact that any model f which fixes y as the denotation of the Topic NP of a sentence, must hold constant all the assignments of the model e which fixed x as the denotation of the topic of the first sentence. In the example, the dependence of the referent of "the island" on that of "John" was described informally by saying that in any future occurrence in the discourse it is definable (at least) as "the island which John is buying". More formally, the model for any sentence in which it occurs must also be a model which preserves the interpretation of "John".

4.4 Conclusion

In this chapter it has been argued that the topological approach outlined is an appropriate formal model of topichood. The semantics of a Topic NP is constrained by the need for it to act as a verifying instance of the the observation represented by the Comment part of the sentence, an idea which has a natural interpretation as the relation between a point and an open set in Topology. Specifically, potential Topic NPs are argued to be those which have a fixed individual or individuals in the pivot set of their GQ denotations. This is equivalent to a closure condition on the sets comprising the GQ which makes them a prime filter. The integration of the idea of verification into that of denotation suggests an alternative approach to well-known puzzles such as the processing of improper quantifiers. Combined with assumptions taken from Generalized Quantifier Theory, the suggested approach interacts with the standard account of NP denotations to predict the difference between topicalizable and non-topicalizable NPs. It further suggests a mechanism by which a non-topic NP in one sentence can serve as a Topic for the next. In the next Chapter I apply the theory to certain well-known issues concerning the accessibility of topical information in more complicated discourse situations.

Chapter 5

Topics and discourse

5.1 Relations between Topics

The previous chapter examined the semantics of Topics from a purely intra-sentential perspective, and it was argued that the semantic restrictions on Topic NPs can be best seen in terms of a requirement that they pick out fixed individuals which can serve as verifying instances, or in effect models, for the Comment part of a categorical judgement. This chapter will extend the discussion to include the semantic relationships between Topics of different sentences in a discourse (henceforth intersentential **topic relations**). In keeping with the approach of the previous discussion, the underlying idea will be of a discourse as an accumulation of information specifying with increasing precision the location of some previously fixed entity in a conceptual space. Using the formal analogy between topics and worlds argued for in the previous two chapters, I propose a modal logic of Topics to capture a number of aspects of the relations between Topics in discourse.

In an early version of this research [123] it was proposed, as a descriptive generalization, that the semantic relation involved in Topichood is a generalization of the three concepts of possession, partition and location (leaving aside for the time being the limiting case where the relation between a Topic and an existing discourse entity is simple identity). In each of the following examples, the italicized NP (the Topic) bears one of these relations to a discourse context set up in the previous

sentence.

(5.1) Hassan is a businessman. *One wife* he employs as a secretary. (**Possessive**)

(5.2) Costas left the monastery. *One monk* he later met again in a massage parlour. (**Partitive**)

(5.3) The knights sat round the table. *One seat* they left empty for the King. (**Locative**)

The effect of this kind of structure is to take a context and focus attention on a part of it, possibly setting up a contrast between that part and its complement (as in the following continuations).

(5.4) 1. The others he doesn't want to worry about his business secrets.

2. The others he never saw again.

3. The others serving wenches kept replenished with plates of wild boar and horns of ale.

These relations also share the property that they satisfy the "about" test for topicality (Reinhart [271]). This test indicates that a question about a discourse entity can be answered not only by a statement about the entity itself but by a statement about an object in a possessive, partitive or locative relation to it.

(5.5) Tell me about Damon Hill.

His car keeps breaking down.

(5.6) Tell me about the monastery.

One of the monks was arrested the other day for drug trafficking.

(5.7) Tell me about Greece.

The beaches are wonderful.

It should be noted that in the case of a possessive relation, the topicality relation only holds if the possessor can be *assumed* to possess the object in question. In the following examples, it holds best in the first sentences which describe inalienable possession, or at least (what seems

to be a more accurate criterion) an expected attribute of the possessor¹. In these cases it is infelicitous to question the relation of possession, at least without invoking special intonation and (usually humorous) effects. In the last two sentences the topicality connection becomes more strained, requiring at least some adjustment on the part of the listener in the form of some bridging assumptions², while the questioning of the possession relation becomes completely felicitous.

(5.8) Tell me about Sheila.

Her tongue never stops wagging.

(?? I didn't know she had a tongue.)

(5.9) Tell me about Howard.

His hair is going grey with stress.

(?? I didn't know he had hair.)

(5.10) Tell me about Captain Bairns.

His ship is in port now.

(?? I didn't know he had a ship.)

(5.11) Tell me about Sylvia.

(?) Her girlfriend was arrested yesterday for streaking.

(I didn't know she had a girlfriend.)

(5.12) Tell me about your daughter.

(?) Her yacht keeps running aground.

(I didn't know she had a yacht).

The same generalization seems to hold also for locative (5.13) and partitive (5.14) examples, as well as others which cannot easily be classified under any of the three relations posited above (5.15, 5.16). Although the facts related may happen to be true, the connection with the question

¹cf. also the example above, where Damon Hill can be assumed to have a car because he is a racing driver. The connection would be less natural in the case of a random human being.

²For this notion cf. Blakemore [42].

is unexpected. The Topic of the reply has to be an expected attribute of the Topic of the question³

(5.13) Tell me about Greece.

(?) The mosques are interesting.

(5.14) Tell me about the monastery

(?) The camel died last night.

(5.15) Tell me about May.

(?) My mother goes to visit her cousin in Romania.

(5.16) Tell me about the fire.

(?) The waitresses behaved heroically.

The last two examples seem acceptable only when there is already an established Topic before the request for information, such as the speaker's family or a restaurant.

This idea of situations having stereotypical attributes has been explored from a variety of points of view. Within the AI tradition it has been proposed to capture such relations by means of the formal notion of a *script* (Schank and Abelson [288]), in which connections between situations are formalized using an attribute-value system. The same idea has also been the focus of much attention in Relevance Theory (Sperber and Wilson [298], Blakemore [42]), which stresses the mediation of such inferences by "bridging assumptions" based on extra-linguistic real-world knowledge.

However situation semantics is not only a theory of language, and HPSG in particular is committed to trying to capture the interaction of all kinds of information which may be involved in language processing, without necessarily claiming that they are part of the grammar. In Section 5.2 it will be argued, on the basis of East Asian languages, that precisely the relations being

³For the last two examples, compare the following, which are much better:

1. Tell me about May
The flowers are beautiful.
2. Tell me about the fire.
The fire brigade took a long time to come.

discussed here do in fact have an influence not only on the interpretation of sentences in context but on the internal well-formedness of certain types of sentences themselves.

So far in this chapter examples have been presented of a particular semantic relation that holds between the Topics of successive sentences. In many cases the labels possessive, partitive and locative come close to a descriptive characterization of this relation, without however exhausting the possibilities. It has been argued rather that the correct generalization is that the Topic of the second sentence should be an attribute of the type of object denoted by the Topic of the first. The relation may therefore be provisionally termed **attributive**, a description which is intended to subsume the three previously mentioned. In the following sections this relation will be discussed and formalized from two distinct points of view. In section 5.1.1 it will be presented as the basis of the accessibility relation for a modal logic.

5.1.1 Individuals and Accessibility: towards a modal logic of topics

In the previous chapter it was argued that the relation between individuals and properties is analogous to that between worlds and propositions. If so, the possibility arises of defining an accessibility relation on the domain of individuals. In this section I will suggest that it is not only possible, but is a convenient and illuminating way of understanding Topics and the semantic relationship they bear to the sentences and discourses in which they occur.

To begin with, I define an abstract accessibility relation R holding between Topics. It should be understood that the intended semantic content of this relation is the **attributive** relation motivated in the previous section.

- (5.17) 1. Let R ("is accessible to") be a binary relation on D such that $\forall x, y \in D, yRx$ iff y is an attribute of x . If yRx then y will also be referred to as a **subtopic** of x .
2. Let R be reflexive, anti-symmetric, and transitive. Intuitively, information about a Topic t is available at t itself (reflexivity), while any information about any sub-topic of t is (modally qualified) information about t , and so is any information about further sub-topics. Thus the progress of a coherent discourse can be modelled as a

progressive build-up of information about an "original" Topic (or supertopic). The antisymmetry requirement will be discussed below.

3. The modal operator τ_i picks out subtopics, so that $\tau_u p$ at t means that p holds at a Topic u accessible to t (uRt).
4. The modal operators \Box and \Diamond are interpreted as quantification over Topics accessible to the current Topic, so that $\Box p$ at t means that p holds at all Topics accessible to t and $\Diamond p$ at t means that p holds at some Topic accessible to t .

The idea here is that at any given (possibly composite) individual x , information about the *more* specific individual y will be accessible (but not vice versa). This choice of directionality may seem counter-intuitive, but the motivation for it is that if a sentence p has topic x , and another sentence p' has topic y such that y is more specific than x , then p' is providing information not only about y but indirectly about x . The effect of p' is to refine x by introducing another $psoa$ which is true at y , and therefore gives information about x iff y is accessible to x (if p' holds at y , then $\Diamond p'$ holds at x). It is not intended to claim that topics are necessarily introduced in discourse following this order, from the more general to the more specific; examples where the opposite takes place will be discussed presently.

The above assumptions for the relation R makes certain predictions about the behaviour of topics under the modal operators \Box and \Diamond , corresponding in this case to universal and existential quantification over subtopics. This accessibility relation should support the axioms **T**, $\Box p \Rightarrow p$ (for reflexivity), and **4**, $\Box p \Rightarrow \Box \Box p$ (for transitivity), but not for example **5**, $\Box \Diamond p \Rightarrow p$, as would be the case for symmetry ⁴.

Given a current topic t , the interpretation of $\Box p$ should be that p holds at any topic t' such that $t'Rt$. Then $\Box p \Rightarrow p$ means that if p is information about all t' then it is also (modally unqualified) information about t . Thus if p is information about every attribute of t , then p is also information about t . This seems straightforward if the relation between t and t' is partitive; if p is true of all subparts of t then it is reasonable to expect that it should be true of t (I leave

⁴cf. Gamut [113, p.25-6], Hughes and Cresswell [158].

aside here the question of collective predicates). With other attributes it is not so straightforward. For example it is necessary to avoid the implication that if "John's hair is long" and "John's nose is long" etc. for all attributes of John, then "John is long". Thus the information content of p cannot be taken simply as " t is long" for whatever entity is denoted by the topic t . The intended reading should rather be that if "long" is true of "John's hair" then it conveys the information that "long-haired" is true of "John", and similarly for other attributes.

This can be captured by positing extra argument places within p so that the anchoring of one (dependent) variable to a subtopic preserves all the assignments of its supertopics. If John's hair is a subtopic of John (whereas hair in general lacks a specific supertopic), then p is true of hair only on condition that there is an extra variable in "hair" which inherits information about John, and p under this assignment of variables will thus give information about John. Thus the semantic form of p will be something like "long(x 's hair)", requiring some assignment for x . This question of the assignment of variables and its inheritance by subtopics will be treated more explicitly below. For the present it is simply noted that this is the intended interpretation of the modal logic.

It may also be noted here that under the interpretation of R as an attribute relation, the relation between topics may be subjected to type constraints similar to those used in the grammar. On this basis subtopics will not in general be defined for the same attributes as their supertopics, except in the case that they are themselves objects of the same type as their supertopic. This means that the disputed reading of $\Box p \Rightarrow p$ will only arise in the case of partitives, which is the one context in which it is desirable. Again, this approach will be further discussed below.

$\Box p \Rightarrow \Box \Box p$ will mean that if p holds at t' then it will also hold at any t'' such that $t''Rt'$. This also seems intuitively useful, allowing for the fact that the topic of the next sentence may not be an "immediate" subtopic but one related by a more complicated chain of reasoning (e.g. one involving bridging assumptions). In fact this axiom gives the equivalences $\Box \Box p \equiv \Box p$ and $\Diamond \Diamond p \equiv \Diamond p$. This means that all quantified modal statements about subtopics will hold no matter how remote the subtopic. On the other hand we do not want $\Diamond \Box p \Rightarrow p$, because this would make it impossible to introduce new information at t' which does not already hold explicitly at

t. *Prima facie*, then, the accessibility relation defined seems to lead to an intuitively reasonable modal logic.⁵

The question of whether natural language includes explicit quantification over topics is similar to that of quantification over resource situations (Cooper [77]). On the assumption that conditional clauses are a kind of Topic (see 5.1.3 below), then “unconditionals” (Zaefferer [323]) may be taken as explicit universal quantification over them [77, p.78]. Likewise the determiner *any* in (5.19) suggests quantification over topics.

(5.18) John is a logician. Whatever he says, nobody understands anything.

$t = \text{john}, p = \text{nobody understands anything}$

$\Box p \text{ at } t (\forall t', t' \models \text{nobody understands anything})$

$\Rightarrow p \text{ at } t (t \models \text{nobody understands anything})$

(5.19) Thassos, in fact any Greek island, Mary is happy to sunbathe on.

$\theta = \text{Thassos}, I = \text{the Greek islands}, p = \text{Mary is happy to sunbathe}$

$\tau_{\theta} p : p \text{ is true at } \theta \in I$

$\Box p : p \text{ is true at every } i \in I$

The relation of topics to conditionals will turn out to be a central claim of this chapter, and will be discussed further in 5.1.3 below. First however the theory will be applied to discourses which do not simply consist of a monotonic adding of psoas, as this should make the functioning of the system a little clearer.

5.1.2 Inheritance of Restrictions

In the previous section one effect of the **attributive** relation was taken to be that the object having the attribute contributes to fixing the reference of the attribute. Thus given yRx and the two statements $\tau_x p$ and $\tau_y q$, then directly or indirectly q is information about x , or to put it

⁵Note that one apparent defect of this approach is that it does not allow the axiom $p \Rightarrow \Box p$, which might seem desirable for guaranteeing the persistence of information through discourse. (If $t \models p$, and uRt , then $u \models p$). Such persistence is at present expressed only in the metalanguage.

another way, x plays a role in establishing the topic of q . Some examples will be helpful here.

(5.20) Bill's family is remarkable. One daughter already has a PhD from Oxford.

$x = \text{Bill's family}; p = \text{remarkable}(x); y = \text{one daughter}; q = \text{has_phd}(y)$

(5.21) Greece is a beautiful country. The sunsets are unforgettable.

$x = \text{Greece}; p = \text{beautiful}(x); y = \text{the sunsets}; q = \text{unforgettable}(y)$

In the first example, the information about the PhD is presented as bearing on Bill's family, and equally the reference of Bill's family restricts the reference of the daughter. In the second case the quality of the sunsets is clearly information about Greece, while equally clearly Greece plays a role in the second sentence in establishing the reference of the sunsets (as opposed to, for example, the sun setting behind Victoria coach station).

The second half of this claim, that of the **supertopic** contributing to the reference of the **subtopic**, can be treated partially by a formal device introduced by Gawron [114] (not explicitly for Topics as such but for contextual restrictions on quantificational domains in general). Although Gawron's immediate purpose is somewhat different from mine, it is convenient in this section to examine this part of his proposal and draw some comparisons.

In Gawron's "Restriction Logic" [114], this updating of contextual restrictions is effected by modelling a context as a pair $\langle \text{Environment}, \text{Information State} \rangle$, the former being a set of restrictions on variables. The point of separating off the Environment is that restrictions on variables may persist across discourse independently of local domains of quantification. The innovation that is relevant here is the operator \leftarrow , which introduces new variables inheriting the restrictions of existing ones in the Environment, so that the left-hand variable's domain of interpretation is a proper subset of the right-hand one's (5.22, 5.23). Gawron comments that this operator acts as a kind of "pragmatic glue" (p.261); it can also be seen as modelling what I have been calling **bridging assumptions**, in this case the assumption of a partitive relation between seals and pups. The second example shows two separate variables being introduced, focussing attention on two different subsets of the original Topic.

(5.22) Few harbor seals in California live long. Most pups die in the first few weeks of life.

x |harbor-seal(x); in(x ,california); few x [live-long(x)]

$y \leftarrow x$

y |pup(y); most y [die...(y)]

(5.23) Few harbor seals in California live long. Most males die in their first year. Most females die before the end of their second.

It would seem that the first of the two examples at the beginning of this section can be captured by Gawron's proposal. Thus the two sentences might be represented as follows:

(5.24) x |bill's_family(x); remarkable(x); $y \leftarrow x$; y |daughter(y); got_oxford_phd(y)

Thus the interpretation of the \leftarrow operator ensures that the reference of y is a member of Bill's family.

This seems quite straightforward for a simple partitive case. In the second example above, however, the relation is a locative one, and it would seem that the \leftarrow operator cannot capture this relation unless its semantics is changed. On the other hand, effects occur with this locative relation which are parallel to those noted by Gawron, so that interpreting \leftarrow by means of a subset relation seems to be missing a generalization.

(5.25) These two countries have Aegean coasts. Most sunsets are unforgettable. Most sunrises go unnoticed because people have usually just gone to bed.

x |country(x); two x [have_aegean_coasts(x)]; $x \leftarrow y$; sunset(y); most(y) [unforgettable(y)]; $x \leftarrow z$; sunrise(z); most(z) [unnoticed....(z)].

In this case of course the interpretation cannot be subjective, as x denotes a location and y and z events. However, the value of x still determines the reference of y and of z (moreover setting up a contrast between them, an aspect which will be discussed in the next section). The effect can be seen by considering what the reference of y or z could be if the first sentence were missing and the second and third sentences occurred in isolation. Bearing in mind that the Topic of a sentence

has been argued to denote an individual, I suggest that the only reference available for these NPs would have to be generic (which, following Carlson [59]) can be treated as individuals). However, although they are interpretable on that basis, the reading changes, and the truth conditions for the sentences certainly change. The relation between the location and the events which take place in that location makes an essential contribution to the reference of the events, by anchoring them to the individuals which are the **supertopic**. In doing so it also ensures that each **subtopic** denotes a specific subset of the (possibly non-specific) set denoted by the subtopic's restriction set.

It is useful to compare the effect of a possessive or locative subconstituent of an NP in guaranteeing that it belongs to the topicalizable class of NPs and not to those which can occur in existential sentences:⁶

- (5.26) 1. There were five books on the table / ??Five books John stole.
 2. ??There were Mary's five books on the table / Mary's five books John stole.
- (5.27) 1. There are five mountains over 20 000 ft / ??Five mountains John has climbed.
 2. ??There are Nepal's five mountains over 20 000 ft / Nepal's five high mountains John has climbed.

The possessive and locative expressions have the effect of making the head NP specific, and hence suitable Topics, by picking out a subset of the set of books or the set of mountains such that the GQ denotation of the head NP is non-logical, whether it otherwise would be or not. Thus the effect is still one of picking out a subset of the variable's restriction, but not by making it a subset of the **supertopic**'s own restriction as in Gawron's proposal.

Thus the attributive relation can be characterized in semantic terms as supplying a function on the NP which is to be the **subtopic**, which restricts the variable of the latter so as to make it specific if it is not already. It will be convenient to represent this as introducing the individual

⁶ A number of writers have suggested that the locative and possessive relations are the same (the possessive relation being merely a more abstract form of the locative). Cf. especially the work of Jackendoff [163, 164, 165]. This will be discussed further in chapter 7, where the semantic interpretation of Indirect Objects as possessors will be invoked in support of their role as Topics.

denoted by the supertopic into the semantic representation of the subtopic (5.29).⁷

(5.28) With every individual i there is associated an anchoring function $f_i: \mathcal{PD} \rightarrow \mathcal{PD}$ such that for every restriction $R \subseteq \mathcal{PD}$ on an individual variable x , $f_i(R)$ is a specific subset of R .

(5.29) The restriction of x to $f_i(x)$ is equivalent to introducing an extra anchoring restriction A relating x to i . If R is the restriction on x , then $f_i(x) = y \leftarrow x \mid R(y) \wedge A(i,y)$.

The partitive case, which is the only one considered by Gawron, is a particular case of this, since a subset of a specific set can be assumed to inherit specificity from the original set.⁸ In this case the variable from which the subtopic inherits and the individuals which anchor it are the same.

(5.30) $f_x(x) = y \leftarrow x \mid R(y) \wedge A(x,y)$.

Another problem, which Gawron points out, is that the \leftarrow operator as he has defined it has difficulty in capturing certain sequences (5.31) in which some restrictions are replaced and no NP explicitly introduces exactly that underlying set of restrictions which remains in force throughout (p.261).

(5.31) Show me night-time flights from Boston to Denver..... Show me daytime flights.

⁷This may be compared with the introduction of a variable representing a resource situation in standard situation semantics [28, 77]. The restriction designated A in (5.29) will then be analogous to a supports relation. This correctly reflects the intended meaning, because the individual i does indeed p-support the psOA representing the restrictions on x . That the locative and possessive relations are both frame homomorphisms on their location or possessor argument is shown by the following examples:

1. (a) Mary has a mobile phone and three laptops iff Mary has a mobile phone and Mary has three laptops. (similarly for disjunction)
- (b) Mary has a mobile phone and something which John has iff for some object x such that John has x , Mary has a mobile phone and x . (frame distributivity)
2. (a) In Greece there are many beaches and some people get sunburnt iff in Greece there are many beaches and in Greece some people get sunburnt (similarly for disjunction)
- (b) In Greece there are many beaches and something happens which happens in Turkey iff there is some event x which happens in Turkey such that in Greece there are many beaches and x happens. (frame distributivity)

At an earlier stage of this research, it was proposed to treat the intersentential relation between Topics as precisely an operation on resource situations. At present it seems important to make a clear distinction between situations and individuals, while bringing out the parallels between the two. One area for future research will be to investigate ways of unifying the two, and the two separate but apparently isomorphic infon algebras in which they appear, into a single domain.

⁸cf. the treatment of specificity as a covert partitive relation in Enç [99].

In applying the approach proposed above to (5.31), I use the minimally different example (5.32), in order to make the sentences into propositions rather than commands. Note that the NPs are topics (as in Gawron's example, where they are the entities about which information is being sought).

(5.32) 1. Night-time flights from Boston to Denver are booked. Daytime flights are booked too.

2. $(x: \text{flights}(x) \wedge \text{night-time}(x) \wedge \text{b-to-d}(x)) \models S1$

$(y: \text{flights}(y) \wedge \text{daytime}(y) \wedge \text{b-to-d}(y)) \models S2$

3. $S1$ at x , $S2$ at y , but $y \not R x$

At z , $\diamond S1 \wedge \diamond S2$

The Topic of the first proposition incorporates the restrictions on y ($\text{flights}(y)$, $\text{night-time}(y)$, $\text{from-Boston-to-Denver}(y)$). The second similarly incorporates restrictions on z . However this time the topic of the second sentence is not a subtopic of that of the first (nor vice-versa). I propose that in this case, which is also of frequent occurrence in discourse, coherence requires the construction of a common supertopic, to which they will both be accessible. Thus the occurrence of two successive Topics which are not related to each other forces the current Topic to be moved in the opposite direction along the accessibility relation from the cases considered previously, namely from two incomparable topics to a supertopic.

In this case the construction of such a Topic is simple, because the restrictions overlap. The variable x associated with the supertopic will be restricted by the restrictions common to both subtopics, giving $\text{flights}(x) \wedge \text{b-to-d}(x)$. The domain of interpretation of x is thus the union of those of y and z . Note that two other possibilities, $\text{flights}(x)$ and $\text{b-to-d}(x)$ (separately) would also be available as possible restrictions for a common supertopic, but it is clear that that is not how the topic of this discourse fragment is interpreted. Rather, the most specific common supertopic is selected. Clearly we have here a meet operation on the accessibility relation between Topics⁹.

⁹The partial order to be read as going upwards in the direction of greater specificity

This apparent algebraic structure on the accessibility relation provides what was lacking in the \leftarrow operator and enables a straightforward account of this discourse fragment to be given.

This particular example, once again, involved a simple partitive relation. It is necessary to check the situation with regard to the more general attributive relation. The following two examples are intended to parallel (5.31), but with the relations involved being possessive and locative respectively.

(5.33) The cat's got fleas again. The dog seems to be OK.

$y | \text{cat}(y); \text{got-fleas}(y); z | \text{dog}(z); \text{seem-ok}(z)$

(5.34) The food is excellent. The wine is a little expensive.

$y | \text{food}(y); \text{excellent}(y); z | \text{wine}(z); \text{expensive}(z)$

To interpret these sentences as categorical judgements, the various Topic NPs must be specific (the generic reading I take to be excluded by the definite articles in these cases). Furthermore to achieve discourse coherence, it should be possible to construct a common supertopic for each fragment. In the first sentence two possibilities present themselves. The first that because of the lexico-semantic relation between dog and cat, the supertopic could be a set of animals (or rather domestic animals, since the glb will be the maximally specific set recoverable). However this will not by itself give a Topic, because the set of domestic animals is not specific. A specific reading can be provided by an attributive relation linking both animals to a possessor, which is an individual, and its associated function f_i will assign a specific subset of the set of cats, and likewise of the set of dogs. Similarly in the second case specific subsets of food and wine are assigned by a function associated with an individual place of which food and wine can be construed as attributes, perhaps a restaurant or a country.

Finally it should be noted that in these examples, where two distinct topics depend on a single supertopic, there is an effect of contrast. This issue will be taken up in the next section. Finally in section 5.2 this approach will be applied to some data from East Asian languages, specifically

Japanese.¹⁰

5.1.3 Topics as Conditionals

The view of Topics presented so far gives them a semantics which is very similar to that which has been suggested for conditional sentences (Zaefferer [323]). In conditionals the antecedent can be seen as providing a modal parameter for the truth of the proposition expressed by the consequent. Thus for the sentence "if P, Q", P picks out a set of worlds and Q is affirmed to be true in those worlds. The semantics proposed here for Topics gives them a similar role, given that under this system individuals can denote points in the model which are partial worlds. I will argue that this correspondence is correct - in particular that it is useful in characterizing contrastive topics - and that semantically Topics and conditionals are essentially identical. (A typological connection between the two has of course often been noted, but as far as I know this precise semantic claim has not been formulated in the literature).¹¹

Although in general I defer cross-linguistic syntactic work to further research, it is worth noting here that in several languages a Topic may be expressed by a conditional, especially when a change of Topic is involved. The following examples are from Turkish and Japanese:

- (5.35) 1. *Rıza kitap oku-yor.* (Turkish)
 Rıza book read-Pres
 Rıza is reading a book.
2. *Rıza-ysa kitap oku-yor.*
 Rıza Cop+Cond book read
 If it's Rıza we're talking about, he's reading a book

¹⁰ Ultimately the intended interpretation of the attributive relation, and the accessibility relation between topics which its correlate in the modal logic, is once again topological. Intuitively, the idea is as follows. The locating of one point (the supertopic) can be done indirectly by fixing the location of other points (subtopics) which are in its *neighbourhood*. Thus information about the points corresponding to subtopics is information about the supertopic, helping to locate it. The accessibility relation thus corresponds to a neighbourhood relation between points, while the attribute relation (which can involve treating a complete proposition, including its Topic, as a property) reflects the contribution that the location of a subtopic can make to a description of the open set which will be used to locate the supertopic. Formal definition of this characterization is deferred to further research.

¹¹ In Lappin and Francez [217] a similar analysis is proposed for modal adverbs quantifying over conditional sentences. According to this analysis the antecedent of a conditional provides the restriction set for the GQ denoted by the quantificational adverb, while the consequent provides its scope; thus the antecedent is again performing a role analogous to that of a Topic.

- (5.36) 1. *Yama wa ki ga kirei desu.* (Japanese)
 Mountain TOP tree NOM beautiful are
 This mountain, the trees are beautiful.
2. *Yama nara ki ga kirei desu.*
 Mountain COP+COND tree NOM beautiful are
 If it's the mountain we're talking about (as opposed to anywhere else), the trees are beautiful.
3. *Mihoko wa hon o yonde imasu.*
 Mihoko TOP book ACC reading is
 Mihoko is reading a book.
4. *Mihoko nara hon o yonde imasu.*
 Mihoko COP+COND book ACC reading is
 Miho? She's reading a book.

In (5.36), the even-numbered sentences replace the Topic marker by a word combining a copula and a conditional marker. The interpretation is the same as with *wa*, but with a more emphatic or contrastive effect¹².

On the modal approach to conditionals introduced above, the antecedent P picks out a set of worlds and the consequent Q is affirmed to be true in those worlds. Two important points however should be noted. First, although P is a clause (that is how it is able to pick out a set of possible worlds), it is not evaluated for its own sake, but only to set the stage for the evaluation of Q. Thus it does not actually move the discourse forward; the state of the discourse remains where it was at least until Q is evaluated.

Second, although attention is focussed on the subset of worlds where P is *true*, there is a contrast implied with its complement, a contrast which may be more or less salient depending on emphasis. This seems to be parallel to the variable degree of contrast associated with Topics:

(5.37) Conditionals

1. If you finish your cabbage we'll go to the park and feed the ducks. (Nothing asserted about alternative worlds).

¹²I am grateful to Naomi Adachi for the Japanese data.

2. *If you finish your cabbage we'll go to the park and feed the ducks.* (Implication that in any alternative worlds we will not go and feed the ducks).

(5.38) Topics

1. His clothes Mary thinks are very tasteful. (Nothing asserted about other aspects).
2. His *clothes*, Mary thinks are very tasteful. (Implication that there are other aspects she is less impressed by).

These observations, and the connection between them, may be given formal expression as follows. Before a conditional is processed, a set W of worlds is accessible to the current world w . The antecedent picks out a set of worlds $A \subseteq W$ and the conditional as a whole states a relation (in the simplest case, the subset relation) between A and the set of worlds $B \subseteq W$ picked out by the consequent. However the whole sentence is evaluated at w . Although subsequent sentences may move the world of evaluation to a world from which only $B \subseteq W$ is accessible, at present both A and $\sim A \subseteq W$ are accessible. The effect of the conditional is thus to partition the currently accessible worlds into A , which is asserted to be a subset of B , and $\sim A$, about which no such assertion is made. I take this partitioning of accessible worlds as essentially introducing the semantics of contrast; worlds at which one proposition is said to hold and other worlds at which it is not said to hold being accessible simultaneously. The degree of contrast will then be a matter of how strongly the hearer is encouraged to assume that the opposite holds for the complement set $\sim A$.

As was illustrated above, it is also possible to explicitly quantify over this partition by means of what Zaefferer calls an "unconditional" (introduced by *whether or not* for an unparametrized proposition or *whatever* or similar for a parametrized one). In this case Q is affirmed to hold over all classes of the partition, and no complement to this class is accessible. To take Zaefferer's neat examples (5.39), in (1) Mary wears something in every accessible world, while in (2) a world where Mary wears nothing is accessible.

- (5.39) 1. Mary looks beautiful whatever she wears.

2. Mary looks beautiful if she wears anything.

The claim here is that Topics function in exactly analogous fashion, with Topic and Comment corresponding to antecedent and consequent respectively. Given a current Topic t , a Topic NP will partition the set T of accessible subtopics, picking out a subtopic u at which the Comment p is evaluated. However the current Topic remains t , so that the complement of u in T (if any) is still visible, giving a contrastive semantics if appropriate. Moreover quantification over the partition, parallel to unconditionals, is possible, as in (5.40.3), the NP effecting this still being a Topic.

(5.40) Topics as Conditionals

1. *This Greek island Mary is happy to sunbathe on.*

2. Topic, Comment \cong If P, Q

at an accessible Topic u , Comment σ holds (but not otherwise)

$\tau_u \sigma$ at t , $\diamond \sigma$ at t

current topic remains t (so that the complement of u is still accessible and τ_u

partitions the set of accessible topics)

3. *Any Greek island Mary is happy to sunbathe on.*

4. Any (Topic), Comment \cong Whatever P, Q

comment holds throughout the partition of accessible topics introduced by τ_u

current topic remains t

The idea that Topics have a semantics which is in some sense equivalent to a clause perhaps helps to explain why syntactically they occur outside the clause with which they are associated (they are either generated or “moved” or somehow “interpreted” outside CP). From the present point of view it is useful in treating those topics, especially contrastive topics, which serve to actually change the topic from one sentence to another. Topics are effectively partitioning a set, non-trivially in the case of contrastive Topics, in order to focus on one sub-possibility (Gregory [123]). Under the present system, that means that a contrastive topic introduces a *proper* refinement of the previous topic. However, the only way to refine a point is to introduce an additional

open set to distinguish it from the original point. Hence the operation performed by a contrastive topic is equivalent to covertly introducing an open set or *psoa*, and since a *psoa* is normally the semantic content of a clause, this means that the Topic effectively has the semantics of a clause. The parallel with conditional sentences is here very close; the antecedent of a conditional is a clause, but it is introduced solely for the purpose of delimiting a set of worlds which will be used for evaluating the consequent. Moreover unless the conditional is to be completely vacuous, the set of worlds so delimited will be a proper subset of those which would otherwise be available for the evaluation of the consequent. Topics, on the analysis proposed, perform essentially the same function.

5.2 Topic marking in Japanese

Japanese provides useful evidence for the GR Topic and its relationship to other GRs, partly by virtue of its well-known morphological Topic marking, but equally importantly because of the close relationship in Japanese between Topic and Subject. It is particularly relevant here because, as is the case with other East Asian languages, it appears to provide an intrasentential syntactic encoding of the relation between Topics which so far in this chapter has been discussed in intersentential and therefore purely semantic terms.

In terms of the typology proposed by Li and Thompson [225], Japanese is both subject-prominent and topic-prominent. Topic-prominent languages, in their terminology, include many of the major languages of East and South East Asia, including not only Japanese and Korean but Chinese as well as a number of languages in the Tibeto-Burmese family. Their main characteristics are (i) that Topic-Comment constructions are "basic" (not derived by a process of topicalization, as is claimed to be the case for Topic-Comment constructions in Subject-prominent languages); (ii) that they have constructions in which the Topic appears to fall outside the selectional restrictions of the verb, as exemplified particularly by the "double subject" constructions (the first "subject" normally being construed as a Topic). (In fact these constructions occur in other languages of the

area which are classified by Li and Thompson as neither subject nor topic prominent - notably in Philippine languages (Bell [31])). At the same time, in the case of Japanese it is common in discourse-neutral contexts for a Subject to take the Topic marker *wa*, provided it fulfills the semantic constraints necessary to be construed as a Topic, while still enjoying the grammatical privileges of a Subject (such as binding of reflexives)¹³. Thus in Japanese "topic-prominence" does not preclude a considerable degree of subject-prominence, and the two interact in a number of ways.

The main focus of this section will be on the "double subject" construction. This was also described above as the "hanging topic" construction, and it will be contended that this is indeed a correct description of the function of the first of the chain of NPs. Nonetheless both Japanese and Korean exhibit a variation in which both NPs are marked with Nominative rather than with the Topic marker.

- (5.41) 1. *Sakana wa tai ga oishii.* Japanese
 fish Top red.snapper Nom delicious
 As for fish, red snapper is delicious.
2. *Sakana ga tai ga oishii.* Japanese
 fish Nom red.snapper Nom delicious
 As for fish, red snapper is delicious.

In these examples, the Topic NP does not fill a role in the *soa* of the verb. Nonetheless, its semantic relationship to the predicate and its arguments is not unconstrained. Pretheoretically, it can be seen that although it is not itself an argument, it provides a frame of reference for one of the arguments. This connection with the predicate-argument semantics will be described, following the discussion by Kitagawa [194], as **topic binding**¹⁴. On the one hand the **topic binding** relation connects the Topic with the *soa*; in the other direction it can be seen as connecting the

¹³In this respect it contrasts with Korean, where in discourse-neutral contexts a Subject is normally marked with the Nominative marker *ka* rather than the Topic marker *nin* (Andrew Simpson, personal communication). This is one of many respects in which Japanese and Korean topic marking, though similar, are not identical. I confine attention here to Japanese.

¹⁴As mentioned above, this should not be confused with "topic chaining", the term used by the Prague School to describe an intersentential relation in which the Topic of one sentence becomes the topic of a later sentence (cf. "focus chaining" where the focus of one sentence becomes the Topic of a subsequent one) - cf. Shir [104]. The term **topic binding** as used here refers to an intrasentential relation, that of a Topic with the argument structure of the Comment.

soa with a context in which it is to be interpreted.

In more complicated examples, a sentence may begin with a number of "subjects", any initial substring of which may be marked with *wa*. In (5.42) there is an initial string of three NPs. In each example successively more elements are topicalized in what Kitagawa [194, p.189] calls a "transitive chain application of topic binding". The examples are originally from Kuno [204, p.71]¹⁵

- (5.42) 1. *Bunmeikoku ga dansei ga heikin zyumyoo ga nagai.*
 advanced-countries NOM male NOM average lifespan NOM long
 (Japanese)

The lifespan of males in advanced countries is long.

2. *Bunmeikoku wa dansei ga heikin zyumyoo ga nagai.*
 advanced-countries TOP male NOM average lifespan NOM long
 The lifespan of males in advanced countries is long.

3. *Bunmeikoku wa dansei wa heikin zyumyoo ga nagai.*
 advanced-countries TOP male TOP average lifespan NOM long
 The lifespan of males in advanced countries is long.

4. *Bunmeikoku wa dansei wa heikin zyumyoo wa nagai.*
 advanced-countries TOP male TOP average lifespan TOP long
 The lifespan of males in advanced countries is long.

In these sentences the soa content of the predicate (*nagai*) assigns a single role, namely to (the index of) *heikin zyumyoo*. Consider how the whole sentence is built up from that simple thematic "shell", and compare it with the claim in section 5.1.2 above, that certain sentences cannot be interpreted properly unless their Topic (i.e. by default their Subject) is "anchored" by a supertopic so that its denotation is specific.

- (5.43) *Heikin zyumyoo wa (/ga) nagai.* (Japanese)
 average lifespan Top (/Nom) long
 (?) The average lifespan is long.

- (5.44) *Dansei wa (/ga) [heikin zyumyoo wa (/ga) nagai].*
 male Top (/Nom) average lifespan Top (/Nom) long
 The average lifespan of males is long.

¹⁵Kuno's original examples use *mizikai*, short. I have changed this to conform with examples elsewhere in the literature, in which males have better prospects.

- (5.45) *Bunmeikoku wa (/ga) [dansei wa (/ga) [heikin zyumyoo wa advanced-countries Top (/Nom) male Top (/Nom) average lifespan Top (/ga) nagai]].*
 (/Nom) long
 The lifespan of males in advanced countries is long.

The simple predication of *nagai* of its thematic subject (5.43) is rather awkward to interpret out of context; it is difficult to predicate anything of *average lifespan* unless we know what it is the average lifespan of. In (5.44) the whole clause in square brackets is predicated of *dansei*, of which it is construed as a property. At the same time *dansei* anchors *heikin zyumyoo* to a restricted subset of the set of average lifespans. The resulting sentence is now interpretable as a generic statement (which is a categorical judgement, because generics can be Topics). Finally in (5.45) this assertion is in turn construed as a property of *bunmeikoku*, which anchors *dansei* to a restricted subset of males. In this particular case the result is still generic, though one could equally well replace *bunmeikoku* by a name (such as *Nihon*, Japan), and the Topic would then be a specific individual. Although I follow Carlson ([59]) in regarding generic NPs as denoting individuals, the semantics of generics is still sufficiently mysterious to prefer specific individuals as examples, so consider the variables and their restrictions in the following revised example:

- (5.46) 1. *Nihon wa (/ga) [dansei wa (/ga) [heikin zyumyoo wa (/ga) Japan Top (/Nom) male Top (/Nom) average lifespan Top (/Nom) nagai]].*
 long
 The lifespan of males in Japan is long.

2. $x | x = ||\text{japan}||; y' | \text{male}(y'); y \leftarrow y'; \text{male}(y) \wedge A(x,y); z' | \text{average-lifespan}(z'); z \leftarrow z'; \text{average-lifespan}(z) \wedge A(y,z); \text{long}(z)$

It is worth noting at this point that the function of a *wa*-marked constituent in restricting a variable in the clause is not confined to variables introduced by ROLE-fillers. They can also bear the same relation to adverbials, especially frame adverbials. An example is given by McCawley (5.47), who describes the phenomenon as a "range topic" [231, p.305].

- (5.47) *Asa wa itsumo usugurai uti ni okita.*
 morning TOP always semi-dark home DAT get-up-PAST
 In the mornings I always used to get up early at home.

In this example, although *itsumo* does not quantify over an argument, the predicate is a stage level predicate, and consistently with the theoretical approach of chapter 4, should be regarded as having a parameter (perhaps the LOCATION parameter) for restrictions on the situation¹⁶. The Topic here appears to be anchoring the assertion made by the *soa* to situations, in a way which is directly analogous to the way in which Topics in the previous examples discussed anchor it to individuals. I take this as confirming the parallelism between Topics and situations being claimed here.

The effect of these constructions thus appears to be to establish a relation (or chain of relations) between a *soa* and a context in which it can be interpreted. At one end of the chain, roles are assigned by the predicate to an *index*. At the other end, an index is anchored to a discourse referent, about which the remainder of the sentence is construed as information¹⁷. The indices involved at the two ends of the chain do not have to be identical, as is normally the case in a single sentence in “non-Topic-prominent” languages, but there is a systematic relationship between the two, possibly via intermediate indices. Thus the **topic binding** relation (henceforth notated \preceq) may provisionally be defined as a relation between indices, as follows:

(5.48) For any I_1, I_2 of type *index*, $I_1 \preceq I_2$ iff:

1. I_1 is an individual term in a situation (accessible to the utterance situation)
2. I_2 is the value of a ROLE feature in a *soa* (supported by the described situation)
3. The restrictions on I_1 determine the restrictions on I_2 , in a sense to be explicated shortly

It may be noted that \preceq is:

1. *reflexive* - the default case in Topic constructions in most languages is that the Topic NP itself fills a role in the *soa*, being either the filler of a gap or the antecedent of a pronoun, so that the topic binding relation reduces to identity.

¹⁶See chapter 4 for discussion of formal problems associated with this view, and the suggestion by Lappin and Pollard [218] that situations should be replaced by event variables.

¹⁷Discourse referents are standardly treated as indices in HPSG [265].

2. *transitive*¹⁸

3. *antisymmetric* - to avoid the regress of two NPs restricting each other's variables.

It is thus a partial order, like the accessibility relation posited above.

The requirement of antisymmetry may appear counter-intuitive; for example with relational nouns such as *child* or *parent*, it would seem that either could be an attribute of the other. However the relation should be understood as being defined not over lexical entries and their denotations but over particular individuals relative to a particular discourse. In this sense, if a parent is a **supertopic** of a child, the same child may not then be a supertopic of the same parent in the same discourse sequence. Certainly with regard to the \preceq relation governing **topic-binding**, sequences such as the following are unacceptable:

- (5.49) **Risako wa sensei wa gakusei ga atama ga ii desu*
 [Risako Top]; teacher Top [student Nom]; head Nom good Cop
 Risako's teacher's student (i.e. Risako) is intelligent

It can be seen that the \preceq relation is semantically the same relation that was used to track topics intersententially in the previous chapter; here, however, it has extra linguistic significance as a well-formedness condition for sentence-initial Topic chains. Compare the *aboutness* tests in (5.50) (based on Reinhart [271]) with the Japanese examples in (5.51) and the proposed characterizations of the semantic content of the \preceq relation in each case.¹⁹

- (5.50) 1. Tell me about your family.

John is training to be a teacher,... (**partition**)

2. Tell me about Greece

The beaches are wonderful,... (**location**)

3. Tell me about Damon Hill

His car keeps breaking down,... (**possession**)

¹⁸Transitivity of \preceq :

$x \preceq y$ if $A(x, y)$

$x \preceq y$ if $\exists z: A(x, z)$ and $A(z, y)$

¹⁹Damon Hill and Tora Takagi are both Formula 1 racing drivers; thus cars can reasonably be interpreted as their "attributes".

- (5.51) 1. *Watashi no kazoku wa Risako wa sensei desu,...*
 I Gen family Top Risako Top teacher Cop
 My family - Risako is a teacher, (but)... (partition)
2. *Nihon wa yama wa utsukushii desu,...*
 Japan Top mountain Top beautiful Cop
 Japan - the mountains are beautiful, (but)... (location)
3. *Tora Takagi wa kuruma wa kirei desu,...*
 Tora Takagi Top car Top nice Cop
 Tora Takagi - his car is nice, (but)... (possession)

It seems that the relevant "parameter" of variation separating languages which allow this construction from more familiar languages which do not, can be stated as follows: in the former the condition in (5.52) is weakened to that in (5.53).

(5.52) A Topic Comment construction is well formed only if, if I_1 is the index of the Topic, there is some index I_2 such that I_2 is the value of a ROLE feature in the content of the Comment and $I_1 = I_2$.

(5.53) A Topic Comment construction is well formed only if, if I_1 is the index of the Topic, there is some index I_2 such that I_2 is the value of a ROLE feature in the content of the Comment and $I_1 \preceq I_2$.

The weaker version allows for the recursive embedding of Comments in Topic-Comment constructions to whatever extent it is possible to form a chain of appropriate pairs of indices linked by \preceq ; whereas if the only relation allowed is that of identity, it is impossible to form a non-trivial chain with more than one Topic.

In the case of non-trivial topic-binding chains, a different variable is abstracted over at each level of embedding, to be applied to the next topic up in the chain. Schematically, the successive abstractions in (5.42) may be represented as in (5.54). A new variable is introduced at each stage.

- (5.54) 1. $\lambda x[\text{long}(x)](a: \text{average_lifespan}(a))$
2. $\lambda y[\text{long}(a) \wedge \text{average_lifespan}(a) \wedge A(y,a)](b: \text{male}(b))$

3. $\lambda z[\text{long}(a) \wedge \text{average_lifespan}(a) \wedge A(b,a) \wedge \text{male}(b) \wedge A(z,b)](c):$
 $\text{advanced_country}(c)$

Putting this together, the whole sentence may be represented as in (5.55), showing the successive stages of β -reduction resulting in an overall categorical judgement.

- (5.55) 1. $\lambda x \lambda y \lambda z[\text{long}(x) \wedge A(y,x) \wedge A(z,y)](a: \text{average_lifespan}(a))(b: \text{male}(b))(c):$
 $\text{advanced_country}(c)$
2. $\lambda y \lambda z[\text{long}(a) \wedge \text{average_lifespan}(a) \wedge A(y,a) \wedge A(z,y)](b: \text{male}(b))(c):$
 $\text{advanced_country}(c)$
3. $\lambda z[\text{long}(a) \wedge \text{average_lifespan}(a) \wedge A(b,a) \wedge \text{male}(b) \wedge A(z,b)](c):$
 $\text{advanced_country}(c)$

What is being modelled by these successive stages of abstraction and reduction is, of course, the conversion of a proposition into a property by the introduction of new individual variables which can be abstracted over, and the obtaining of a proposition when that property is applied to a term. The new variables are introduced by anchoring relations.

This would lead to a regress in the case of a trivial topic-binding chain.

- (5.56) ** [_{TP} John [_{TP} he ... [_{IP} he snores]]]

- (5.57) 1. $\lambda x[\text{snores}(x)](\text{john})$
2. $\lambda y[(\text{snores}(\text{john}))(y)](\text{john})$
3. $\lambda z[((\text{snores}(\text{john}))(\text{john}))(z)](\text{john})$

Such trivial chains, in which the function is applied iteratively to the same term, can be ruled out by stipulating that an anchoring relation can only be introduced if the sentence is not already anchored.

The actual semantic relation between the indices in a Topic-binding chain can be characterized pre-theoretically as form of generalized possession. In this context is noteworthy that many

syntactic accounts of hanging Topic constructions have sought to explain it as “possessor raising” - the raising of a Genitive subconstituent within one of the NP arguments of the clause to the position of an extra (Subject) argument (e.g. [31]). However it has often been pointed out (e.g. [304, 225] that the proposed “deep structure”, in which the raising target actually appears as a Genitive, only accounts for a subset of the cases that occur. The following examples are from [225, pp.462,481]:

(5.58) *Nei-chang huǒ xìngkui xiāofang-duì lái de kuài* Mandarin Chinese
 that-MW fire fortunate fire-brigade come PART quick
 That fire - fortunately the fire brigade came quickly

(5.59) *TV -in Zenith -ka tǎntǎn -ha -ta* Korean
 TV Top Zenith Nom strong Cop Stat
 The TV, Zenith is durable

The relation between the fire and the fire brigade in (5.58), or between TV and Zenith in (5.59), cannot be expressed by a Genitive.

Equally importantly, not all Genitive NPs can be “raised” in this way to become the Topic of a hanging Topic construction, because of the semantic constraints on sentence Topics. Thus in the following examples the Genitive NP, denoting a cardinal GQ²⁰ or a negative GQ respectively, cannot be a target of raising.

- (5.60) 1. *Go nin buchyoō no hana ga nagai.* Japanese
 five MW(human) manager Gen nose Nom long
 The noses of five managers are long.
2. **Go nin buchyoō wa hana ga nagai.*
 five MW(human) manager Top nose Nom long
 Five managers have long noses.

The relation is thus not fully characterizable in terms of that between a Genitive NP and the head which it modifies (or specifies). Rather, the Topic specifies a restricted domain in which the Comment is to be interpreted (more precisely, in which the index of one of the arguments in the Comment is required to have its value). A Genitive NP is an archetypal example of such a domain

²⁰I assume a non-specific reading of *go nin*.

restrictor - crucially, provided that it is specific - because it picks out a subset of the denotation of the head noun which is non-logical (not constant under permutations of the universe (K&F [186], Sher [292], Keenan and Stabler [188])).

5.3 Summary

In this chapter a characterization of intersentential Topic relations has been proposed, based on the semantics of sentence Topics put forward in the previous chapter. It has been suggested that Topics in a discourse fragment form a partial order under a particular relation, which is defined as relating supertopics to subtopics. The individual denoted by a supertopic serves to fix the reference of any subtopic. It is also from the supertopic that the subtopic derives the necessary semantic property of specificity, if it is not already specific. Discourse coherence is achieved if the topics of individual sentences in a sequence all have a single supertopic. Successive sentences often proceed from supertopic to subtopic, but equally they may present a number of incomparable topics from which a supertopic is to be constructed.

The relation between topics was presented in different ways, as different aspects of its semantics were examined. In the first place it was presented in an abstract way as an accessibility relation, treating Topics as possible worlds. The formal justification for this was the conclusion of the previous chapter, that Topics denote individuals which have a support relation to *ps*oas analogous to that between situations and *so*as. Empirically, this characterization was used to draw out the parallels between Topic structures and conditionals, a relationship which has often been noted in the literature.

The semantic interpretation of the accessibility relation was argued to be a generalization of a locative or possessive relation (of which the much-discussed partitive relation can be seen as a special case). This relation was described as attributive, because the subtopic must be able to be construed as a stereotypical attribute of the supertopic. It is because of this relation that a proposition in which the supertopic is not an argument can be interpreted as information about

the supertopic. The semantic participation of the supertopic in such sentences is represented by its contribution to the restriction of the variable of the subtopic, an approach which adapts and generalizes the restriction logic of Gawron [114].

Finally data were examined from certain East Asian languages, where, it is claimed, the relation under discussion has reflexes in the syntax of the language, in the phenomenon of "hanging Topic" or "multiple Subject" constructions. The semantic relation between the fronted constituents in these constructions, termed **topic binding**, was characterized as an intrasentential manifestation of the relation claimed to hold intersententially between Topics.

This concludes the part of the dissertation whose purpose was to elaborate a formal semantics of the Topic relation within the sentence and in discourse. The theory presented has attempted to justify the treatment of Topics as the targets of predication. The remaining chapters examine, as begun in the last section, aspects of the effect of Topichood on core **grammatical relations**, particularly with regard to the claim in the first chapter that predicates with more than two arguments should be seen as composite, and that indirect Objects should be seen as the Topics (predication targets) of secondary prediacates. The next chapter will discuss data from Balkan clitic doubling and from Amharic on the relationship between Topics and Objects, which support the claim of an asymmetry between Direct and Indirect Objects with regard to topichood. Finally chapter 7 examines the Double Object construction with a view to establishing the relation claimed in the first chapter between Topics and Indirect Objects.

Chapter 6

Object clitics and Topics

6.1 Introduction

In previous chapters the default association of Topic with Subject has been emphasized. However it was noted that this is only a default, and some account must now be given of the many cases where it does not apply. In the first place, it was noted that inthetic judgements the Subject is not a Topic; in the treatment of these in Chapter 4 it was suggested (adapting the proposal of Shir [104]) that the supporting situation acts as Topic. Noting that sentences with individual level predicates cannot bethetic judgements, it was suggested thatthetic judgements are obtained by abstraction over the parameter restricting the situation, and conversion between categorical andthetic judgements can be obtained quite straightforwardly by changing the order of reduction of the λ -bound variables. Essentially the same approach will underlie much of this chapter, which deals with the converse of the case just described, the cases where the Topic is not a Subject but some other argument. In these cases the Subject variable will be reduced before a particular non-Subject variable. The contrast is shown in (6.1).

(6.1) 1. John admires Mary

$$\lambda x \lambda y [\text{admire}(y, x)](\text{mary})(\text{john})$$
$$\lambda y [\text{admire}(y, \text{mary})](\text{john})$$

2. Mary John admires

$$\lambda y \lambda x [\text{admire}(y,x)](\text{john})(\text{mary})$$

$$\lambda x [\text{admire}(\text{john},x)](\text{mary})$$

A number of syntactic and other means are available in language to signal the topicalization of a non-Subject argument. In English it can be signalled simply by intonation¹ or by the syntactic devices of topicalization and left-dislocation. Both of these involve the positioning of the Topic in a position above the clause. Its association with the argument structure of the Predicate² is mediated by a SLASH dependency or by a coreferential “resumptive pronoun” respectively.

(6.2) 1. Topicalization.

$$\text{Mary}_{\text{LOC}[1]} [\text{John admires}_{\text{SLASH}\{[1]\}}].$$

2. Left dislocation

$$\text{Mary}_{\text{INDEX}[2]} [\text{John admires her}_{\text{INDEX}[2]}].$$

The two devices are not mutually exclusive. In one strategy, which will be the main focus of this chapter, the equivalent of a “resumptive pronoun” is cliticized to the Predicate, while the Topic *may* be “extracted” (linked to the predicate by a SLASH dependency).

The element of dislocation does not, in my view, require a great deal of comment here, as it sets up precisely the isomorphism between syntax and interpretation that would be expected on the assumption that the last arguments to be combined syntactically with the Predicate will correspond to the last λ -variable to be reduced. The two elements bearing the overlay Grammatical Relations Topic and Comment correspond to surface constituents, just as they do in the basic Subject-VP construction. At the same time the PS schemata encoding these two structures, the head-filler and head-subject schemata, as noted by Cooper [75] and P&S [265, Ch9], seem to form a natural class.

¹Engdahl and Vallduvi [101] include an interesting comparison between English and Catalan in this respect; in the latter, information structure must be signalled syntactically. Here I confine attention to certain syntactic or morphosyntactic reflexes of information structure, deferring the study of phonologically interesting and HPSG-compatible theories of intonation to future work.

²Recall that Predicate, with a capital, is intended to denote the irreducible predicate which is the relational head of the clause.

Of more interest is the phenomenon of clitic doubling itself, which, although as has been said it may co-occur with extraction, may equally occur with the argument apparently *in situ* (I will argue that it is indeed *in situ*, at least in Greek). This situation is a *prima facie* violation of the uniqueness of subcategorization and role assignment, for which various resolutions have been proposed. Moreover there is a tantalizing connection between these clitic doubling constructions and agreement phenomena (Object agreement in the cases under discussion). Diachronically it has been argued by many writers (Givón [118], Bynon [57] among others) that pronouns are the source of agreement affixes. Nichols in an influential article [245] charts the “headward migration” of elements from dependents to heads in general, and in particular from arguments to predicates, of which the cliticization and eventual affixation of pronouns is a prominent example.

In general agreement is understood in HPSG as index sharing between a head and a non-head, which in the cases to be considered here means a predicate and an argument. An index is a feature bundle containing person, number and gender features, often referred to as “agreement features” or “pronominal features”. I adopt the term ϕ -features from Chomsky [65], in order not to prejudge the issue of Case, which is also intimately connected with pronouns and agreement, but which is not assigned to an index³.

This chapter falls into two parts. In the first I discuss the phenomenon of clitic doubling (CLD), primarily in relation to Balkan languages. The section begins with a brief overview of the morphosyntax of clitics before going on to the relational issues that are of more immediate concern. Discussion of the relational significance of CLD focusses on the question of whether it should be interpreted as agreement or topicalization (the latter involving the semantic interpretation of the clitic as a pronominal element). It appears that Balkan languages show a gradation in this regard, from Greek, where the topical nature of CLD is well established in the literature (Joseph [175], Horrocks [154], Zioga [289], Angouraki [17], Tsiplakou [312], Tsimpli [310], Alexopoulou [7]), to Macedonian, where it equally clearly appears to be a form of Object agreement (Spencer [297])

³Except possibly “lexical Case”, as discussed briefly in the next chapter

(picking out specific Objects, as does Direct Object marking in many languages⁴. The study will suggest a mechanism for obtaining both interpretations which is designed to bring out both the similarities and differences (cf. B&M [52]). The relational typology here patterns completely differently from the morphosyntactic typology; for example Greek and Macedonian, which are at opposite ends of the scale in relational terms, are morphosyntactically very similar with respect to their argument affixes.

In the course of this discussion I note some asymmetries between Direct and Indirect Objects with respect to CLD, which is somewhat parallel to Subject-Object asymmetries. This is taken up in the second part of the chapter, where I examine Amharic, a language with Object clitics which are known to be sensitive to topicality. I examine the relational structure of Amharic, and conclude that the participation of Indirect Objects in this system is not due to $3 > 2$ advancement but rather provides evidence of the inherent topicality of 3's. This in turn will be the main theoretical claim of the next and final chapter.

6.2 Balkan clitic doubling

There are (at least) two dimensions to the problem of CLD in Balkan languages: the morphosyntactic question of cliticization as against affixation, and the relational question of whether (doubled) clitics are agreement markers or whether they retain pronominal functions. The two questions lead to somewhat different typologies, and I therefore argue that they should be kept distinct rather than attempting to harmonize them.

In the first subsection I discuss the question of the morphosyntactic typology of pronominal argument "clitics" as it relates to clitic-doubling languages in the Balkans. It is not the central concern of the section, but a necessary preliminary. I will conclude that it is in fact orthogonal to the relational question which constitutes my main concern. However I am not entitled to assume this *a priori*.

⁴e.g. Turkish (Özkaragöz [247], Enç [99], Amharic (Givón [118], cf. also section 6.5 below), Chicheŵa (Bresnan and Mchombo [52]).

My approach to the second question is based on Bresnan and Mchombo's influential analysis of Chichewa [52]. Looking at a number of Balkan languages with clitic doubling, I observe that neighbouring and/or closely related languages may contrast in precisely this area.

6.3 The surface realization of pronominal arguments

Following Bresnan [51, 53], I distinguish five cross-linguistic surface realizations of pronouns.

(6.3) Zero⁵, - Affixal - Clitic⁶ - Weak⁷ - Strong

A considerable body of research has argued that "pronominal clitics" in many languages are, morphologically speaking, simply affixes on the head verb. In HPSG this is standardly represented, following Miller and Sag [233], by means of an extra valence feature PRONOMINAL-ARGUMENTS (PRO-ARGS), which, like SLASH, takes a subset of the subcategorized arguments for uncanonical realization, the pronominal affixes themselves satisfying the valence requirement. This approach to pronominal clitics as affixes has subsequently been applied to Italian (Monachesi [237, 240]), Romanian (Barbu and Ionescu [21, 159], Monachesi [239]) and Greek (cf. Kolliakou [197]⁸). Of these, Greek and Romanian have clitic doubling (CLD), which is a well-known Balkan areal phenomenon.

However Miller and Sag do not claim that this analysis is valid for clitics in general, or even pronominal argument clitics in general⁹. Within the Balkan area it is problematic for Bulgarian, in which the pronoun is proclitic to the verb except clause-initially, when it is enclitic.¹⁰ It is even less obviously appropriate with languages such as Serbo-Croat which have 2nd-position or "Wackernagel" clitics (WCL), and it is not even clear whether the elements which can precede

⁵As in Chinese, Japanese and other East Asian languages where agreement is completely absent, not cases where zero realization is simply one member of a paradigm.

⁶These correspond to Zwicky's "special clitics" [326].

⁷Zwicky's "simple clitics" (ibid.). These occur in the positions predicted by the syntax, but are atonic.

⁸A compelling case for regarding Greek pronominal argument "clitics" as affixes is made by Joseph [176] (at least for standard Greek and many other dialects), and for Macedonian by Spencer [297]. Gregory [124] gives some additional evidence for Greek following the lines of Spencer's arguments.

⁹cf. Everett [106], who argues that there is no such thing as clitics as a distinct domain of enquiry.

¹⁰The "Tobler-Mussafia" distribution of clitics (TMCL), so called from Medieval Romance scholarship. (Details are in Fontana [110].) It's influence is still apparent in Romance in European Portuguese (Barbosa [20]). It was also found in Medieval Greek and survives in some dialects, especially in the islands.

them are determined on syntactic, discourse-semantic or prosodic grounds (cf. Progovac [268], Radanovic-Kocic [269], Tomic [309], Camdzic [58]).¹¹¹²

One approach to the Bulgarian data which is common across many frameworks is to treat clitics as syntactically proclitic to the verb, but phonologically enclitic to the preceding word (Rudin [277]). This is to capture the fact that it cannot occur sentence-initially; the underlying idea seems to be that sometimes expressed as "prosodic subcategorization" (cf. Halpern [135, p.33]). However in Bulgarian the pronominal clitic does not interact phonologically with the preceding word¹³. This contrasts for example to the clearly enclitic Bulgarian definite article (Halpern [135, p.150-51]), which can sometimes affect the pattern of vowel-zero alternation in the preceding word, as well as generally blocking word-final devoicing and affecting stress.

Moreover the idea of prosodic subcategorization, though intuitive as a metaphor, is arguably less appealing as a formally defined concept. The relation of a clitic to its host is not analogous to that of a head to its complement either phonologically (where the head of a domain is a particular nucleus, not a morpheme or subdomain), or syntactically; and it seems undesirable *a priori* to introduce a concept of phonological subcategorization just for this class of phenomena, when subcategorization in general is notably insensitive to phonological features¹⁴, a generalization which is built into the HPSG feature geometry. The phonologically distinctive point about clitics is that they are atonic, and therefore must be combined with a stress-bearing domain (like affixes, cf. Jensen [167]). It is not clear, however, how selection and directionality of the kind required could be stated in phonological terms.

¹¹This typology, WCL - TMCL - affix, cannot be regarded as a parochial phenomenon; all these patterns are attested in non-European languages, and Uto-Aztecan languages seem to show the same variety, with a similar pattern of diachronic development, from WCL to TMCL to affixes [301, p.552f].

¹²Serbo-Croat does not have the CLD phenomenon which is of interest however. Nonetheless it is possible that some conservative dialects of Bulgarian which have preserved WCL [88], also combine it with CLD (Catherine Rudin, p.c., states that all Bulgarian dialects have CLD). From anecdotal evidence I suspect that Pomak, a Slavonic language (alternatively a dialect of Bulgarian) spoken in the Rhodope mountains of Bulgaria and Greece, may be such a language, but little evidence is available. Some Uto-Aztecan languages however do show such a combination (with Subject clitics).

¹³Rudin, personal communication.

¹⁴The distinction between light and non-light arguments in French (Abeillé and Godard [1]) and other languages does not seem to be a case of phonological subcategorization; even if it were, the "light" elements are the selected complements, not the selecting head.

A recent HPSG treatment of Bulgarian by Avgustinova [19] proposes the notion of a “morphosyntactic complex”, a type of sign distinct from lexical and phrasal signs. Clitics form part of this complex. On the one hand they do not occupy independent nodes in the syntax, while equally they are not affixes of the verb. Their positioning within the morphosyntactic complex is dictated by rules appropriate to the morphosyntactic “module”, which has access to information about prosodic domains¹⁵.

As compared to the Miller-Sag model, this analysis addresses a similar issue to that discussed in section 2.3.4 above, namely the existence of apparently conflicting demands on the delineation of the interface area between the lexicon and syntax. Avgustinova’s proposal, like that of A&W [3], involves the recognition of a construct which projects information into the syntax as if it were a lexical head but is not lexically simple in the way envisaged in traditional lexicalism. In effect, the head of the clause is no longer a lexical verb, but a complex to which clitics of various kinds also contribute information. This information generally involves morphosyntactic information relating to the clause as a whole, such as tense and clause typing (for example interrogative complementizers). In other words it relates the predicate to aspects of the model against which the predicate is to be interpreted. In the next section I will argue that the reason why pronouns are included in this complex is related to their topicality. Information about the topic of the sentence has to be passed up to the top level of the clause in order for the Topic-Comment structure of the sentence to be determined, and the natural way for this to be done in an HPSG-based framework is for it to be marked on the information complex which constitutes the relational head of the sentence, and thence passed up to the clause level.

Thus at the morphosyntactic level, the difference between Greek, Romanian and Macedonian on the one hand, and Bulgarian on the other, is that whereas the former have a lexically simple relational head (the verb with its affixes¹⁶), the latter has as its head a non-lexical morphosyntactic complex in the sense of Avgustinova [19]. Both cases attest the incorporation of pronominal elements into a rather complex informational head of the sentence, the morphosyntactic structure

¹⁵cf. the idea of clitics as phrasal affixes (Klavans [196], Anderson [13]).

¹⁶see Joseph [176] for arguments that tense particles and some complementizers are affixes of the verb in Greek.

of which varies apparently independently of the issues which are the main object of enquiry here.

6.4 Agreement Markers or Pronominals?

6.4.1 A theoretical interpretation of the issue

Turning to the relational properties of clitics, the main question I wish to investigate in this section is whether “pronominal clitics” are really pronominal or whether they are agreement markers, a possibility which is brought into focus for Balkan languages by the fact that most of them support clitic doubling. I will try to show that there is an interesting ambivalence in this respect when different languages of the area are compared, an ambivalence which I take as indicating that pronominal and agreement phenomena are not totally disjoint (a conclusion which has often been argued on other grounds, cf. Givón [118], Anderson [11]).

I assume that the relevant concept of “grammatical agreement” comprises structure-sharing between a head and one of its arguments, the structure-shared object being an *index* which contains within it the ϕ -features which are the categories reflected in overt agreement systems. The term “agreement” has also been used in the literature to cover a wider range of phenomena involving co-variation of form - e.g. “Case agreement”¹⁷, “definiteness agreement” (Suñer [303], Rudin [277]) and “Wh-agreement” (Chung [68]) - but as a terminological matter I reserve **agreement** for co-variation which can be shown to involve structure sharing of an *index*. Following P & S, I assume that the lexical entry for the root of the head may subsume a morphological paradigm whose HEAD features restrict the ϕ -features of its arguments; the ϕ -features themselves are introduced by the index feature of the argument, which is accessible to the head by virtue of the need to assign it a semantic role (P&S [266, p.81]).

A **pronoun**, by contrast, is not just an index but an informational object whose semantic content is of sort *ppro*¹⁸. It comprises a (referential) *index* and an empty restriction set [265,

¹⁷Case agreement will only occur in cases of *synsem* sharing (LFG's “functional control” cf. Bresnan [47]). That will apply to subset of the cases under consideration but not all. cf. Fassi-Fehri [107], B&M [52, p.33f].

¹⁸Although anaphors are also involved in cliticization in many languages, I do not consider them here.

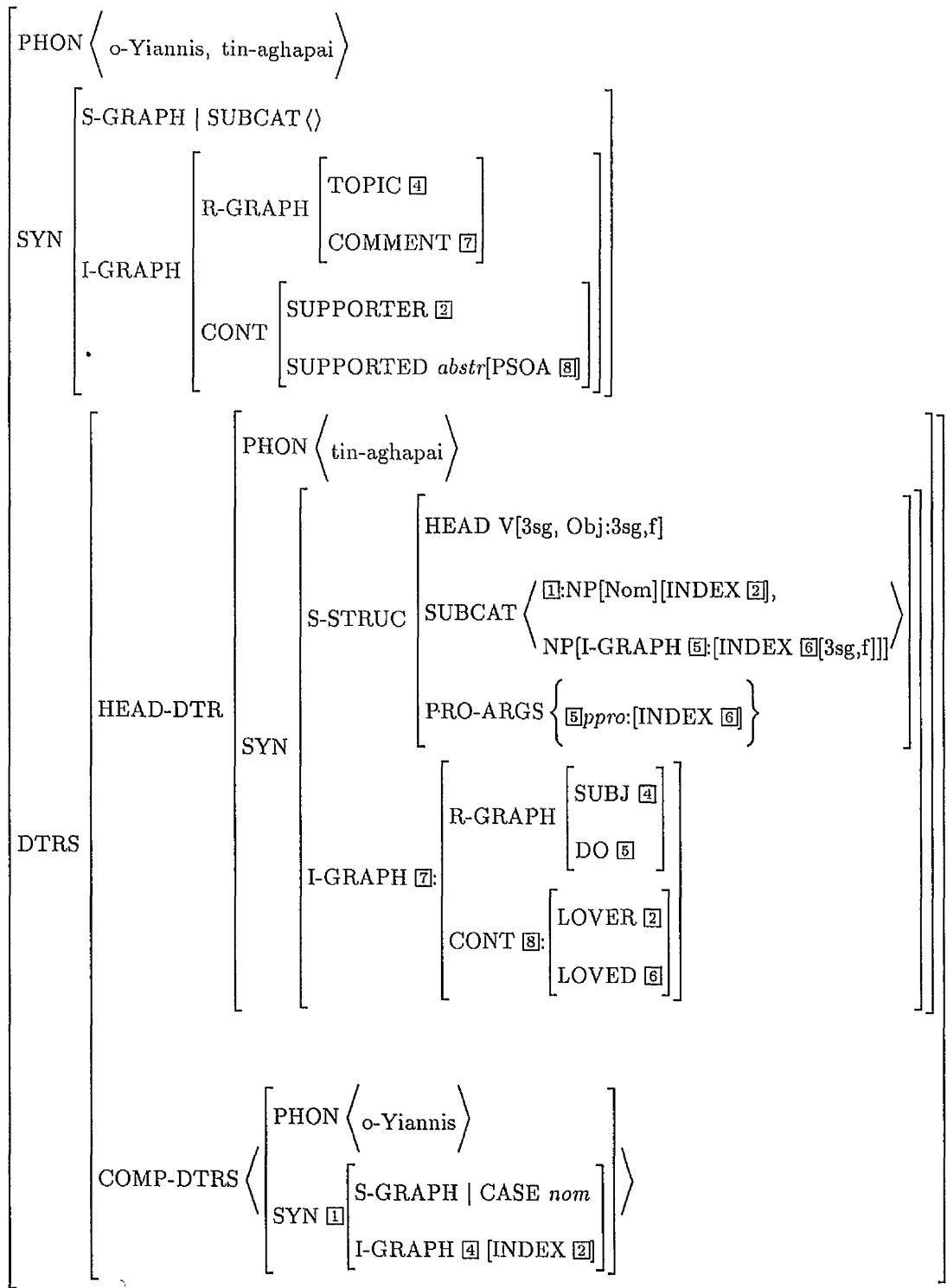
24-5]. The index may enter into relations of anaphoric agreement with other objects as a result of various kinds of referential dependencies.

Thus the difference between the two is that in agreement, the affix or clitic merely restricts the subcategorization potential of the verb. In the second case it bears a Grammatical Relation, analogous to that borne by a full pronoun, except that in this case it is not a category in the syntax¹⁹. The difference may be illustrated by the contrast between a Subject agreement affix and a Direct Object clitic in Greek.

(6.4) *o-Yiannis* *tin-aghapai*.
 the-John, Nom, m, sg CL, Acc, 3sg, f-love, 3sg, Pres
 John loves her.

(6.5)

¹⁹Because of the separation of GRs from subcategorization, there is no need to posit an empty category to fulfill a subcategorization requirement (cf. A&W [3]).



In this example, whereas the Agr affix just constrains the Subject index [2] to be 3sg, the Object clitic introduces a pronominal argument [5] under PRO-ARGS which satisfies the DO valence requirement and also fills the LOVED role of the *psoa*. This PRO-ARGS feature, which

is intended to correspond roughly with the PRAS feature of M&S [233] (though I have not yet assumed any interaction with the SLASH feature), hosts a nominal object of subtype *pro* (the type of nonanaphoric pronominals) to satisfy these requirements. The object thus supplied is also intended to correspond to the LFG functional structure (\uparrow PRED)='PRO', which is the semantic value of the corresponding GF in LFG (Bresnan [48], B&M [52]).

In the crucial case of clitic-doubling constructions (CLD), the clitic can be taken either as pronominal (as it is when it occurs without a doubling NP) or as a simple agreement marker. Chicheŵa provides an example of a language in which both structures occur, thus clarifying the differences and also the similarities between them [52]. The Object Marker (OM) is an incorporated pronominal, and a number of tests show that any full NP coindexed with it is not the Object of the verb but a Topic²⁰. By contrast the Subject Marker (SM) is ambiguous between an incorporated pronominal and a marker of grammatical agreement. If no overt Subject is present, then the SM is disambiguated in the former sense. If there is a full NP however the SM is interpreted as an agreement marker, unless the NP is a Topic, conforming to the same diagnostics as NP's co-indexed by the OM²¹. In the last case, the SM is performing the same function as the OM.

Similar considerations have led to the suggestion that "Agreement" in some languages, even where there is no question of pronominal cliticization in the morphology, is pronominal in function. In pro-drop languages, for example, Subject agreement may be regarded as a pronominal argument of the verb in the absence of an overt NP, rather than (as traditionally) a marker of agreement with an empty category in Subject position. Evidence for such an approach can be found in Breton, for example (Anderson [11, p.575-584]), where verbal agreement is in complementary distribution with overt NPs and also with "Subject" pronouns (which can only have Topic functions), making it plausible to suggest that Agr itself assumes the role normally assigned to weak pronouns. The question of *pro*-drop will be returned to shortly.

²⁰In other languages, it has been argued that a CLD'd NP is an adjunct, a claim which is problematic in the languages under discussion (Sportiche [299, p.10], cf. also Jaeggli [166]) though it is still made for some languages. The main point at the moment is that in such cases it cannot be an argument in complement position.

²¹Namely: (i) free word order; (ii) exclusion from VP as marked by distinctive tone for VP boundary; (iii) patterns of construal with NPs in previous discourse (iii) inability to be questioned.

Thus CLD can in principle mark the presence of either grammatical agreement or pronominal structures, and on the basis of B&M's analysis of Chicheŵa, nothing in principle prevents their co-occurrence in the same language, even with regard to the same grammatical relation (Subject or Object). In the Balkans CLD seems to occur only in those languages where pronominal clitics adhere to the verb. This seems to be common but not universal; in Uto-Aztecan, for example, there seem to be some languages where a Subject clitic in the Wackernagel position can be doubled by an overt Subject (Steele [301]). I will therefore not attempt to derive it as a universal principle (cf. Spencer [297, p.359]). Nonetheless it means that Serbo-Croat can be more or less excluded from consideration for the remainder of this section.

6.4.2 An overview of CLD in Balkan languages

Within the Balkans CLD occurs in Albanian, Macedonian, and more or less optionally²² in Greek, Bulgarian and Romanian. (Unfortunately I have been able to obtain very few relevant data for Albanian, and will concentrate on the other languages).

Probably the most "developed" form of CLD as a form of Object Agreement is that found in Macedonian (to which Albanian appears to be similar, except that it is optional with certain types of definite DO). CLD is obligatory in Macedonian with all definite DOs as well as with all IOs, its omission resulting in actual ungrammaticality (Rudin [277, p.18]):

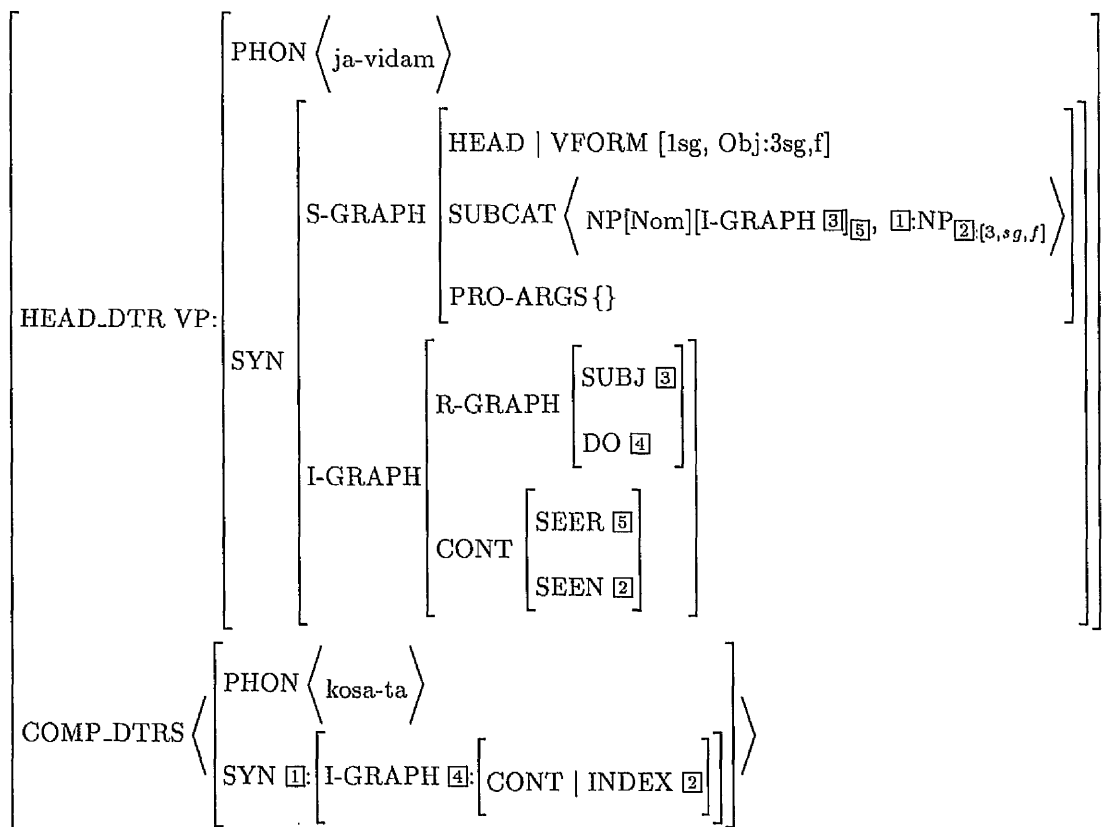
- (6.6) *Dajte *(mi) *(go) ogedalo-to da *(si) *(ja) vidam kosa-ta*
 give 1sg,Obj 3sg,n,Obj mirror-the C refl 3sg,f,Obj see,1sg hair-the
otzadi. (Macedonian)
 from-behind
 Give me the mirror so I can see my hair from the back.

Moreover CLD for DOs is not restricted to NPs that are in any sense "topical" (see below for discussion). For this reason Macedonian CLD is widely argued to be a form of Object Agreement (Rudin [277], Tomic [309]), the clitic being generated in AgrO. According to Rudin [277, p.17] the overt NP moves to Spec AgrOP to check agreement features at LF (as specified by

²²In Greek it is stigmatized but universal; certain constructions in particular sound very odd without it. A similar situation seems to hold for Bulgarian [277].

Sportiche's "clitic criterion" [299, p.67]). For IOs the relevant feature is Case, and for DOs Case and specificity (cf. Suñer [303]). (The contrast between DO and IO will be discussed in Section 6.4.3.) It may thus be accepted that CLD in Macedonian represents Agreement; thus when an overt NP is present the clitic merely constrains the ϕ features of the Index to which a role is assigned, otherwise it is associated with a non-empty Pro-Args feature which absorbs the role, just as occurs with Subject Agr in *pro*-drop languages. I assume that the relevant feature sharing when the NP is overt is mediated simply by subcategorization, in the configuration licensed by the standard head-complement schema [266], as in (6.7), a partial feature structure for the Object agreement in the lower clause of (6.6). (I omit details of the Subject in order to simplify the AVM; in the example given, the Subject would on this account be a PRO-ARG, representing *pro*).

(6.7)



The primary differences between Bulgarian and Macedonian in this area are (i) the morphosyntactic difference that the Bulgarian clitic is not clearly an affix of the verb, (ii) that CLD is normally optional (though there are cases when it is difficult to avoid even in literary Bulgarian), and (iii)

that CLD of a DO requires not only specificity but also “topicality”, being particularly common when the NP is fronted.

The optionality of CLD in Bulgarian would seem to be related to the additional requirement of topicality for the NP; the same two characteristics co-occur in Greek (see 6.4.2 below). However one significant difference between the two languages is that when the doubled NP is not fronted, in Greek it appears to be right-dislocated. This at least is suggested by the intonation; the NP comes after the normal intonation contour for the end of the sentence, which would naturally be taken as also implying the end of the VP (just as in the Chicheŵa data discussed above). According to Rudin (p.c.), however, this intonational break is not paralleled in Bulgarian; she also presents structural evidence that the doubled NP remains within the VP. In (6.8), for example, assuming that the DO (which is not doubled) is within the VP, the doubled DO must be also [277, p.12].

- (6.8) *Šte vi otmerja na vas drugo po-hubavo.* (Bulgarian)
 Fut 2pl,Dat measure,1sg Prep 2pl another nicer
 For you I'll measure off another, nicer (piece).

Rudin invokes this as an evidence that the doubled NP is an argument, and that therefore the clitic marks Agreement as in Macedonian. It might be noted that data are cited only for cases where the IO is doubled, while, as will be discussed in the next section, there is a crucial asymmetry between IO and DO which makes it precarious to apply the same conclusion without further argument to doubled DOs. At present I am not aware of structural evidence as to whether or not doubled DOs in Bulgarian are in the VP, though Rudin's information about the lack of an intonational break does support this possibility. However, doubled DOs in Bulgarian also have a requirement which Rudin describes as topicality, and which is not significantly affected by whether the NP is (ex hypothesi) within the VP or whether it is fronted. In Rudin's typology [277, p.23], this is ascribed to an agreement requirement imposed by the AgrDO head in Bulgarian, that the features checked must be [+topical] as well as (as in Macedonian) [+specific].

However, although a [+topical] feature is often invoked in theories of feature-checking, the use of it here seems to me problematic. Presumably in many cases it is legitimate to use such

notation as shorthand for what may be a more complicated bundle of features; [+specific], for example, could denote a restriction on the index of an NP, perhaps linking it with a resource situation (Gregory [123])²³. Moreover, topicality seems more of a relational notion, relating the NP to the discourse context, than an intrinsic property of the NP concerned, and it is therefore particularly difficult to see how it can be checked in the same way that Case is checked. On the present approach topicality is not a feature on the NP but a dependency, in which features of an NP (including minimally its Index, but possibly other information) is non-locally shared with other information under the Context attribute of the AVM for a sentence. Like other nonlocal dependencies (e.g. Wh-questions), I assume that the option exists in some languages of targeting an *in situ* constituent rather than a dislocated one.

These issues will be discussed below with respect to Greek, which is similar to Bulgarian in the topicality requirement for CLD's Direct Objects. First I return to the role of pronominal affixes in *pro*-drop.

Pro-drop

It has often been observed that *pro*-drop is a misleading term, in that it assumes, rather Anglocentrically, that languages lacking an overt subject have an empty category corresponding to the presence of an overt pronominal category in English and similar languages. This has been questioned from many points of view. From a semantic point of view, it is worth making the simple observation that in standard logical representations of the meaning of a verb, such as that in first order logic, it is represented as already including one or more free variables, which correspond to the interpretation of pronominals. This variable can subsequently be bound by a quantifier or another operator, but at the innermost level of representation of the verb's meaning the variables are free. The analogous situation occurs in situation semantics and hence in HPSG, where a ROLE parameter of a verb has as its value an *index* which is neither the argument of a quantifier nor

²³The fact that it has an interpretive dimension raises theory-internal questions about why it has to be checked, within the minimalist programme (Chomsky [66]). It would seem that such an account could only explain the case of overt extraction (CLLD), and not the *in situ* CLD cases where the NP is within the VP at Spell-out, since covert movement is assumed not to check interpretive features (Lasnik [222]).

anchored to a discourse referent. The addition of overt, or hypothetically covert, pronominals in the syntax does not change this situation. Thus the "simplest", and by implication the unmarked case, should be expected to be the situation found for example in Japanese, where the pronominals are completely unmarked (6.9). The rules governing the interpretation of such bare-verb clauses are not relevant here (cf. Kameyama [177]).²⁴

(6.9) *Aishite iru.* (Japanese)
 love, Asp be
 (e.g.) I love you

If the sharing of these ROLE values with pronominal objects, whether effected by morphological, morphosyntactic or purely syntactic combination, seems to have no significant effect on the semantic interpretation, the question then arises what they contribute in those languages which have them, rather than why some languages lack them. In particular, it may be asked what is involved when the Subject agreement affix, in a language like Greek which has "rich agreement" morphology, is interpreted as a pronominal in order to "satisfy the valence and role assignment requirements" of the verb.

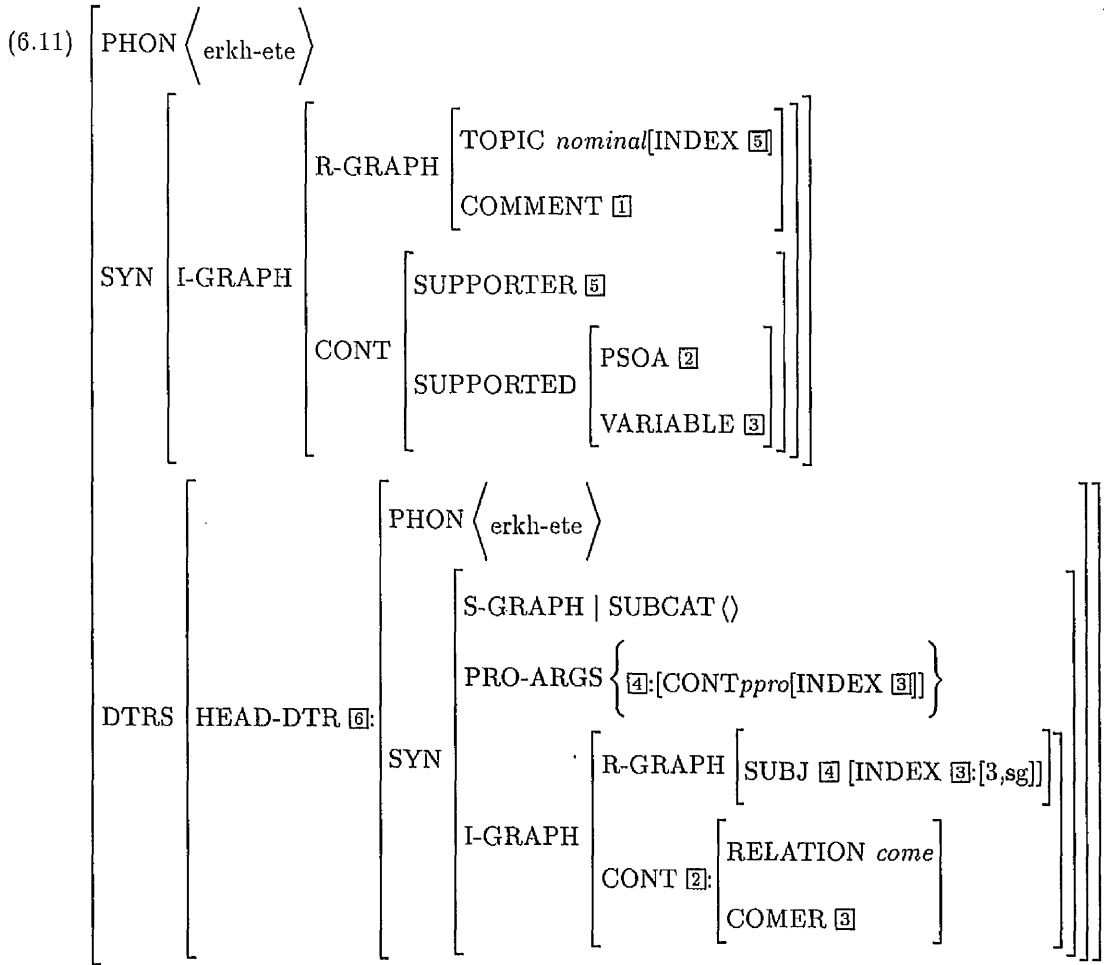
I suggest that these elements have the effect of designating the semantic content of the sentence as a λ -abstract, which is already (on widespread assumptions) the semantic content of the VP. In other words it signals that one ROLE parameter will not be saturated within the clause, and the clause as a whole should be interpreted as a λ -abstract, with the abstracted variable corresponding to that parameter²⁵. Thus the structure-sharing of the agreement index not with an NP complement but with a value in the PRO-ARGS list should be interpreted as abstraction on the variable corresponding to that index, its identification with the λ -variable of a Comment feature and the designation of that Comment as the semantic content of the whole clause, the Topic of which has to be supplied from context.

(6.10) *Erkh-ete.* Modern Greek
 come-Pres, 3sg

²⁴The translation is the most natural one as a declarative clause out of context.

²⁵Ionescu [159] argues similarly, but chiefly from a syntactic point of view, that unsaturated sentences should be considered grammatically well formed sentences in *pro-drop* languages.

He/she/it is coming.

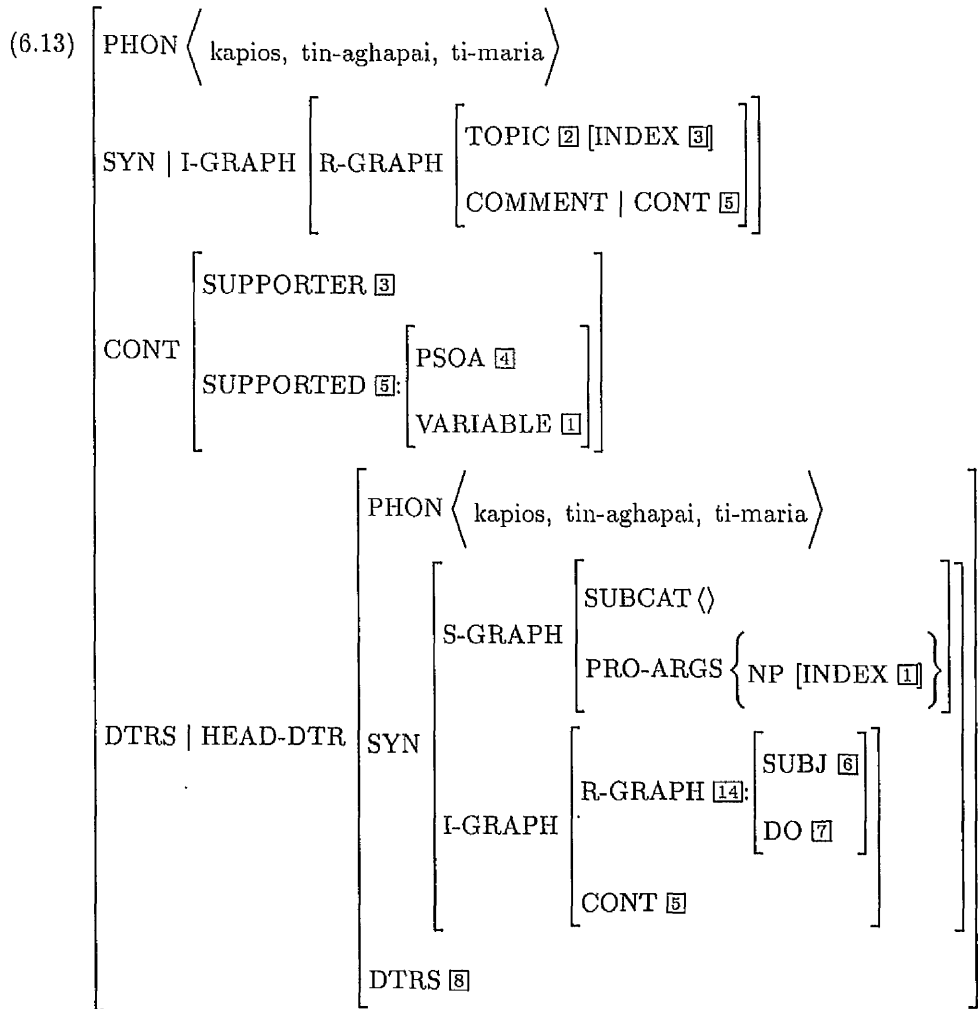


In this proposed structure, the *index* assigned to the *ROLE* of the *psoa* is identified, by means of incorporation in the *PRO-ARGS* feature, with the variable [3] in the λ -abstract, which is the top level semantic value of the clause (the sentence node is [6] - it is syntactically saturated at this point). The clause thus denotes a λ -abstract or individual property which requires to be unified with a *Topic*, not provided by the clause, whose index is able to be the argument of the λ -formula in β -reduction.

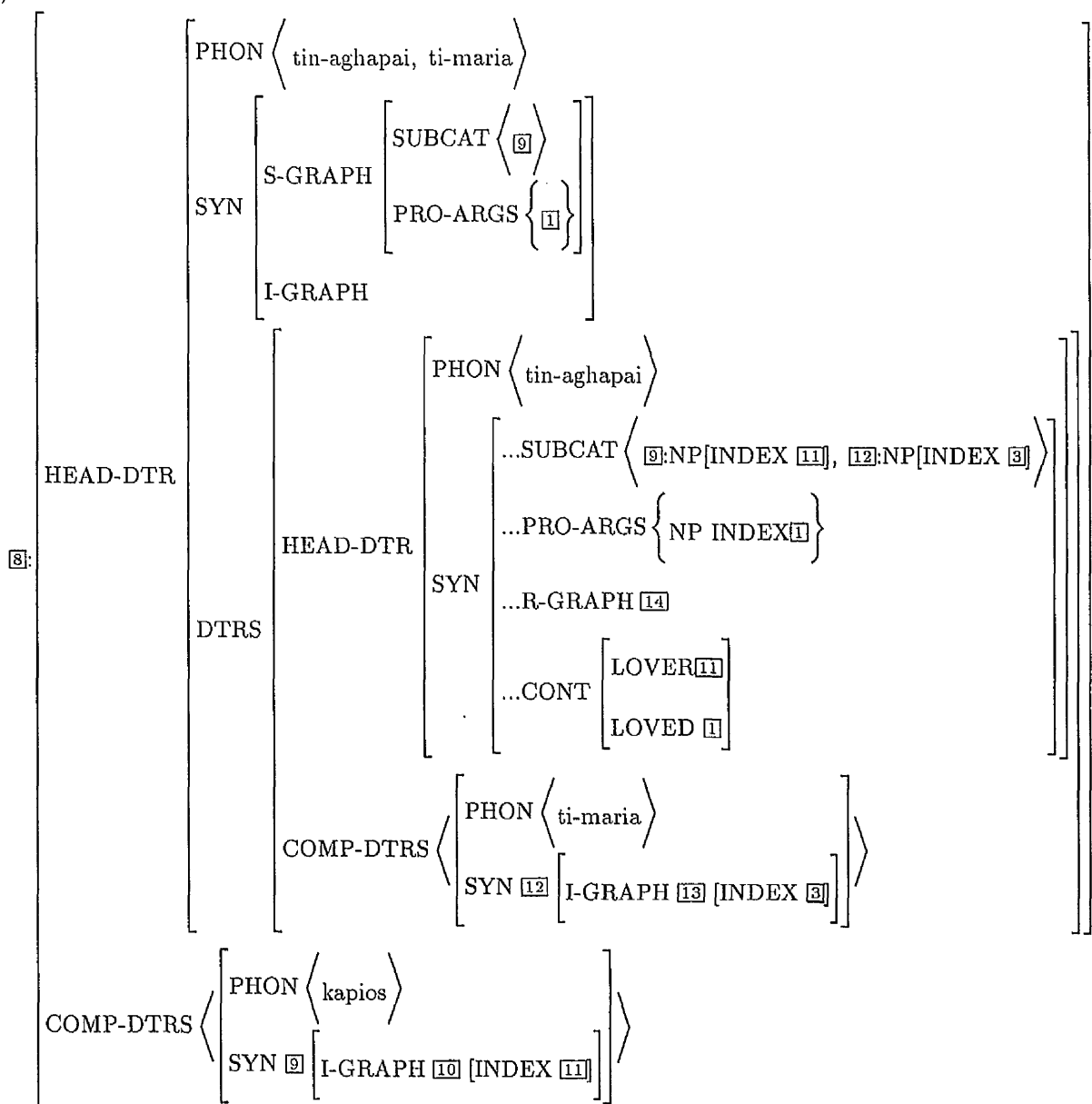
In this perspective, it is possible to see the function of the clitic in those *CLD* constructions which are sensitive to topicality in a way which combines its function in *Object Agr* constructions with its function in *pro-drop*. Because Greek does not have *Direct Object* agreement, the affix (or "clitic") is interpreted as a pronominal by structure-sharing with the non-empty *PRO-ARGS* set.

Note, however that it cannot unify with any substructure of the overt NP, because of a mismatch in their CONTENT values (the pronoun is of type *ppro*, while the NP is *npro*). Consequently their indices are not structure-shared at this point. The index of the pronoun, which is assigned the appropriate ROLE of the *psoa*, is abstracted over, forming a λ -abstract, which is passed up to become the content of the clause. The index corresponding to the λ -variable is not available to be structure-shared with the Object NP at any level below the clause, whereas the Subject combines with the Verb in the usual way. Finally at the top level the index of the Object NP is identified with that of the Topic, and hence by β -reduction with the index of the pronominal affix and that of the ROLE in the *psoa*. This identification of the Object NP as the Topic is forced in order to obtain a well-formed AVM.

- (6.12) *Kapios* *tin-aghapai* *ti-Maria* (Greek)
 someone,Nom CL,Acc,3sg,f-love,3sg the-Maria,Acc
 Someone LOVES Mary



(6.14)



After the identification $[1] = [3]$ is forced by β -reduction at the top level, the Object NP's index is structure-shared with the value of the LOVED role of the *psoa*, and the index of the pronominal affix. Its *synsem* is however not shared. This corresponds to the relation of anaphoric control in B&M's analysis, though unlike the latter, it permits the Object NP to remain syntactically within the VP.

The role played by the mismatch between the *ppro* content of the pronoun and the *npro* content of the NP in forcing this structure may be compared with the suggestion of Aoun (reported in

Zioga [289]) that the presence of the pronominal forces the NP to raise out of the clause at LF to avoid a binding violation. The framework here is different, but the idea is similar in that it forces the required Topic-Comment relationship at a semantic level of representation in contrast to the surface syntax.

A note on the syntactic position of Greek clitic-doubled NPs

Greek clitic doubling occurs with both fronted and non-fronted Objects. In the latter case the NP appears either extraposed from the VP or in a right margin of the VP which falls outside the domain of normal VP intonation, as discussed above.²⁶ There are some interpretive differences between the fronted and non-fronted cases (for example the former can be contrastive, see Tsipplakou [311, p.238], *contr.* Zioga [289, p.116]), and also some possibly significant distributional differences (for example non-fronted cases must have a determiner, whereas fronted cases may include bare NPs such as partitives [289, p.201]). Following Zioga [289, p.113f], however, I treat them as essentially *in situ* and dislocated variants of the same construction, deferring the differences to further study.

The question of whether the doubled NP is actually extraposed (as argued by Zioga, though with significant qualifications [289, p.36]) is a delicate one. I have already described the very robust intonational effects which suggest extraposition. However, application of the structural tests applied by Rudin to Bulgarian seems to yield the same result for Greek, namely that the doubled NP is actually within the VP.²⁷ Thus in (6.15) the doubled IO NP is assumed to be within the VP, as otherwise the DO, which is neither doubled nor specific, would have to be outside the VP as well. Despite this, (6.16) shows that a topicality constraint still applies to the IO (it cannot be modified by the focus operator *mono*, "only"). In (6.17) the same test is applied to a doubled DO; again, on the assumption that the undoubled and non-specific IO is in the VP, it appears that the DO must be also.

²⁶ A similar extraposition can occur with Subjects as "post-topics"; and these too may also be doubled by Nominative clitics in the case of the deictic constructions discussed mentioned above.

²⁷ I am grateful to George Monios for the data below.

(6.15) *Tha tou dho-s-o tou Yiorghou ena vivlio. (Greek)*
 Fut 3sg,m,Gen give,Pfve,1sg the George,Gen a book,Acc
 I will give George a book.

(6.16) *Tha tou dho-s-o (*mono) tou Yiorghou ena vivlio. (Greek)*
 Fut 3sg,m,Gen give,Pfve,1sg (*only) the George,Gen a book,Acc
 I will give (*only) George a book.

(6.17) *Tha to dhoso to vivlio mias kopellas. (Greek)*
 Fut 3sg,n,Acc give,Pfve,1sg the book,Acc a girl,Gen
 I will give the book to a girl.

There thus appears to be a significant mismatch here between configurational structure and grammatical relations, which does not occur in Chicheŵa, where the doubled DO is outside the VP. This distribution of phenomena is not predicated by B&M's analysis, to which the extraposition of the topical NP in the presence of an Object Marker is important. The analysis proposed above, however, appears to capture these data.

6.4.3 The IO-DO asymmetry

Clitics show a distinct asymmetry cross-linguistically as between Direct and Indirect Objects. This includes the following aspects:

1. In many languages CLD of DOs is subject to the "topicality" effect described in the preceding sections. When it is not subject to this effect, it is at least sensitive to specificity. By contrast IOs are subject to no such restriction.
2. CLD of IOs is more likely to be obligatory than that of DO's, even where the conditions for the latter are met.²⁸
3. DO clitics show characteristics of A' dependencies, whereas IO clitics do not.²⁹

The precise conditions for DO CLD vary between different languages. In Greek the relevant condition is that the NP should be Topic, and on the basis of Rudin's analysis (op.cit.) I assume

²⁸e.g. Chilean and Caracas Spanish, where CLD is obligatory for all IOs (Suñer [303, p.404, n.17]); also Albanian (Rudin [277, p.18]), though here 1st and 2nd person DOs also trigger CLD.

²⁹Thus Sportiche [299, p.84-85] claims that the relevant Agr projections are A' positions and A positions respectively.

the same for Bulgarian. In Macedonian the doubled NP is not interpreted as Topic but it must be specific. In Romanian, as analyzed by Dobrovie-Sorin [?, 92] CLD is subject to a D-linking condition, which is closely related to specificity, but again it need not be Topic. In fact according to Ionescu ([159] and p.c.), CLD in Romanian is obligatory for certain types of NP (proper names and pronouns) even when they are the answers to Wh-questions, and there is an increasing tendency in modern Romanian for this to spread to certain quantified NPs. However it is noteworthy that these do not include non-specific indefinites. Thus I propose that the condition for CLD of Direct Objects in Romanian is that the NP must be topicalizable (though not necessarily actually Topic), following the distinction drawn in chapter 4. Ionescu in fact analyses Romanian CLD as putting conditions on the subcategorization potential of the verb, according to the quantificational properties of the Object NP. These quantificational properties can however be seen as affecting the *index* of the NP. This relation to the *index* makes it justifiable to see it as a form of Object agreement. Spencer's description of Macedonian suggests that a similar analysis should be possible there as well (except that generics do not admit CLD, a fact for which I have no explanation). Although more research is necessary in this area I draw the following general conclusion:

- (6.18) Direct Object CLD either (i) forces the NP to be interpreted as Topic, through the interpretation of the "clitic" as a pronominal, or (ii) is interpreted as compulsory object agreement with (a subclass of) topicalizable NPs. The subclass included and the degree of compulsion shows a gradual development over time, as illustrated by Ionescu's data.

CLD of Indirect Objects contrasts with this in being insensitive to either topicality or specificity, and is in general compulsory. The following example from Greek, where CLD is generally optional for Direct Objects, illustrates both these contrasts. I take the adverb *ke* as indicating Focus.³⁰

- (6.19) *I-Maria* *(ton)-aghapai* *ton-Kosta.* (Greek)
 the-Mary,Nom CL,Acc,3sg,m-love,3sg the-Costas,Acc
 Mary LOVES Costas.

³⁰In standard Modern Greek the Genitive and Dative Cases have a single exponent (historically the Genitive). It is labelled Dative here to make it clear that it is the Indirect Object.

- (6.20) *I-Maria* *(*ton)-aghapai* *ke ton-Kosta.* (Greek)
 the-Mary,Nom CL,Acc,3sg,m-love,3sg also the-Costas,Acc
 Mary loves COSTAS too.

- (6.21) *I-Maria* *?(tou)-edhose* *ta-vivlia* *tou-Kosta.* (Greek)
 the-Mary,Nom CL,Dat,3sg-give,Past,3sg the-books,Acc the-Costas,Dat
 Mary gave Costas the books.

- (6.22) *I-Maria* *?(tou)-edhose* *ta-vivlia* *ke tou-Kosta.*
 the-Mary,Nom CL,Dat,3sg-give,Past,3sg the-books,Acc also the-Costas,Dat
 (Greek)

Mary gave COSTAS the books too.

- (6.23) Indirect Object CLD is invariably interpreted as Agreement. It is usually compulsory where it occurs, and is not subject to either of the foregoing conditions.

Many agreement-oriented treatments of CLD approach this asymmetry by assuming a specificity and/or topicality feature on the clitic (presumably on its index), with which a DO (but not an IO) has to agree [303, 277, 299]; the IO only has to check Case features, this being an unexplained (despite its cross-linguistic stability) idiosyncratic property of the licensing head AgrIO. Even this stipulation, however, does not account for the A vs A' contrast which seems to be an integral part of the same asymmetry.

If constructions with IO are seen as involving a secondary predication in which the IO serves as target (i.e. as a secondary Subject), then the behaviour of IO's with CLD is easily explained; the "clitic" represents agreement, and is subject to the same conditions as Subject agreement. In some languages this is reflected in the syntax (as has been claimed for some Scandinavian languages (Herslund [142])), as discussed in the next chapter. Even where it is not, I assume that it is represented at some level of structure, in such a way that the IO position, like the Subject position, is naturally associated with the required interpretive structures. For DO (and Oblique) NPs, by contrast, this relation of topicality has to be set up by a dependency in the syntax, either involving displacement (with a SLASH feature), or the use of a pronominal to force the required Topical interpretation.

6.5 Advancement and topicalization in Amharic

In this section I examine the relational structure of Amharic, another language in which pronominal clitics have an observed relation to topichood (Givón [118]).³¹

Amharic is well known as a language which co-indexes specific Objects by clitics on the verb. Furthermore this cliticization is sensitive to topicality, both in the sense of overt topicalization in the syntax and the construal of an *in situ* Object as Topic [118].

6.5.1 Basic Clause Structure in Amharic

Amharic is a strongly Verb-final language, in which (i) there is some freedom in the order of nominals, although the basic order is generally taken as SOV, and (ii) the verb morphology incorporates a considerable complex of relational and other information³². Subordinate clauses occupy roughly the positions that would be occupied by the corresponding non-clausal NPs (Subject, Object etc.) or APs (preceding the head-nominal); and it is very rare for any material to be extraposed to the right of the verb³³.

The Subject of a non-stative verb is co-indexed by the Agreement markings on the Verb exemplified in (6.24). These markings, which vary slightly for different morphological classes of verbs, will be referred to as Set A.

	1.	mitta-x ^u	1(pl)	mitta-nn
(6.24)	2(m)	mitta-x	2(pl)	mitta-ccux
	2(f)	mitta- \int		
	3(m)	mitta-	3(pl)	mitta-ccaw
	3(f)	mitt-ac		

The Direct Object of a transitive verb is co-indexed by a second set of markings, henceforth

³¹The research in this section was based on work with an informant, Yalew Kebede.

³²Including complicated morphological realization of Aspect and Polarity. In general, I will abstract away from these complications by using the affirmative forms of the Past Tense.

³³The few exceptions elicited appear to involve Focus rather than Topic, and will be ignored here.

Set B. This only occurs if the NP is "specific"³⁴ or D-linked³⁵, a point which will be developed shortly. In the example (6.25) the Subject is 3 sg m, whose exponent is the null affix, represented by the place-holder "-".

	1	mitta--ŋ ^y	1(pl)	mitt(a)--ann
(6.25)	2(m)	mitta--x	2(pl)	mitt(a)--accux
	2(f)	mitta--f		
	3(m)	mitta--u	3(pl)	mitt(a)--accaw
	3(f)	mitt(a)--at		

The same set of markings is also used to co-index the Subject argument of a number of stative verbs, including the copula. I interpret this agreement pattern as showing that these verbs are impersonal and take the co-indexed argument as their (deep and superficial) Object. These arguments do not seem to be subject to the specificity constraint described for the objects of non-stative verbs³⁶. In the next section I focus on the latter, where the connection with specificity is clear.

Objects and Topics

As has been described, the Direct Object of the clause triggers verbal agreement (Set B) if it is specific, i.e. involving reference to a set already accessible from previous discourse or other contextual information; i.e. it correlates closely with the concept of specificity as defined by Enc [99], or that of D-linking (Pesetsky [260]). The same characteristics also hold, however, of Topics. The examples in (6.26) show that when the word order in the sentence is SOV, the appearance of Set B marking on the Object is optional, whereas if the Object is fronted by topicalization then it is compulsory.

³⁴In the sense of Enc (1991).

³⁵Pesetsky (1987)

³⁶In some sentences involving stative verbs, the informant's judgements indicated that the Subject had to be construed as part of the set introduced in the previous sentence, or another set contextually given (cf. Enc op.cit., p6).

- (6.26) 1. *Yalāw set ay-i (-at). (Amharic)*
 Y.(Nom) woman saw,Subj:3sg,m (-Obj:3sg,f)
 Yalaw saw a woman.
2. *Set Yalāw ay-*(at). (Amharic)*
 Woman Y.(Nom) saw,Subj:3sg,m-Obj:3sg,f
 A woman Yalaw saw.

These examples are evidence that SOV order is basic, whereas OSV represents Topicalization. Throughout this section I will use the convergence of the following three criteria as informal diagnostics of Topics: clause-initial position; the presence of the specificity effect; and felicitous use of the sentence in reply to a question in which the putative Topic is presupposed, not focussed (thus in the previous example, the sentence with the inflection for Object would be unacceptable in reply to "What did Yalaw see?").

The question then arises, how the rule governing Set B endings is to be described in relational terms.

One possibility would be to regard it as a Topic marker, (or rather, as marking the intersection of Topic with 2), with the corollary that specific Object NPs even in SOV word order can be regarded as *in situ* Topics. Although in this thesis I claim that *in situ* topics do occur, this hypothesis does not explain the Amharic data, given the absence of the expected specificity constraint with stative verbs. Nor does it explain why in (6.26) the presence of Set B is optional even when the Object is specific. To account for the failure of Set B marking to occur with non-specific Objects, I turn to an idea which has been used in Relational Grammar analyses of Turkish [247], where the same specificity constraint applies in order for a Direct Object to be marked with Accusative Case³⁷. According to this view, in the case of a non-specific Object, a dummy 2 is introduced which overruns the existing 2 and forces it "en chomage". The non-specific Object itself is therefore not a 2 but a 2-Chômeur in the stratum at which agreement is determined.

Although it seems necessary to reject the idea that Set B endings overtly co-index Topics, their close relation to Topichood does not stop here; they require the D-linking of the Object, and in

³⁷In Turkish, unlike Amharic, it is only the noun morphology that is affected, as Object agreement is not marked on verbs.

this regard show very similar behaviour to the clitics which mark D-linking in a number of clitic-doubling languages³⁸. Crucial here is the contrast between the bare interrogatives "who" and "what", along with non D-linked QNPs on the one hand (6.27a,b), and the determiner "which", which both in interrogative and relative clauses requires clitic doubling.

- (6.27) 1. *Cine (*l-)ai văzut?* (Romanian)
 who (*him,Cl)-have,2sg seen
 Who did you see?
2. *Ceva (*l-)ai sa descoperi și tu.* (Romanian)
 something (*it,Cl)-have,2sg Comp discover,2sg and you
 You too have something to learn
3. *Pe care l-ai văzut?* (Romanian)
 Acc- Θ who (= which person) him,Cl-have,2sg seen
 Who did you see?
4. *Băiat-ul, pe care l-ai văzut a venit ieri.*
 boy-the Acc- which him,Cl-have,2sg seen has,3sg come yesterday
 (Romanian)

The boy who you saw came yesterday.

The same effects are shown by the Amharic equivalents (6.28), showing that whatever their precise morphological status, Set B behave syntactically very much like the object clitics which in CLLD languages characteristically mark the presence of D-linking, and hence normally topicalization. In (6.28a,b), the totally general *min* and the strongly D-linked *yitimya* are contrasted (the former is incompatible with Object marking while the latter is virtually unacceptable without it). *Min sau.* which seeks an answer out of the entire set of men, cannot be indexed by a Set B element, while *man* can be so indexed if it is understood that a contextually restricted set of men is under discussion.

- (6.28) 1. *Min ayi-x (*-ow)?* (Amharic)
 what saw-Subj:2sg,m (*Obj:3sg,m)
 What did you see?

³⁸For D-linking, cf. Pesetsky [200], and for its association with "clitic left dislocation" cf. Cinque [69]. My main evidence for comparison will be taken from Romanian, as discussed in Dobrovie-Sorin [91].

2. *Yitimya-u-n sau ayi-x-*(ow)?* (Amharic)
 Which-Def-Acc man saw-Subj:2sg,m-Obj:3sg,m
 Which man did you see?
3. *Min sau ayi-x (*ow)?* (Amharic)
 what man saw-Subj:2sg,m (*Obj:3sg,m)
 What man did you see?
4. *Man-in ayi-x (-ow)?* (Amharic)
 who-Acc saw-Subj:2sg,m (Obj:3sg,m)
 Who did you see?

In Relative Clauses (cf. the Romanian data above) a pronoun is not used, but the Object markers are an obligatory part of the relativization strategy:

- (6.29) *Ye-mitta-xu-t sau-ye*
 Part-hit-Subj:2sg-Obj:3sg,m man-Def.....
 The man who you hit...

In this section I have illustrated the close connection of Set B markings with topicalization and specificity. I have rejected the simple identification of Set B marking with (Object) Topics.

Prepositional Objects

Amharic permits structures in which the prepositions *lä-* and *bä-* are apparently incorporated into the verb. Thus the sentence "he sent the book to Yalaw" has any of the following forms (6.34):

- (6.30) 1. *māz'haf-u-n lä-Yalāw lakī.* (Amharic)
 book-Def-Acc to-Yalew sent,Subj:3sg,m
 He sent the book to Yalew.
2. *māz'haf-u-n lä-Yalāw lak-ow.* (Amharic)
 [book-Def-Acc]_i to-Yalew sent,Subj:3sg,m-Obj:3sg,m_i
 He sent the book to Yalew.
3. *māz'haf-u-n lä-Yalāw lakī-l-īt.* (Amharic)
 book-Def-Acc to-Yalew_j sent,Subj:3sg,m-to-Obj:3sg,m_j
 He sent the book to Yalew.

The Object-affixes co-index *māz'haf* in the second sentence and *Yalaw* in the third, as becomes clear from the gender markings if *Yalaw* (m.) is replaced by *Mariam* (f.) (6.31).

- (6.31) 1. *māz'haf-u-n* *lä-Mariam* *lak-ow* (*-wat).
 [book-Def-Acc]_i to-Mariam sent,Subj:3sg,m-Obj:3sg,m; (*Obj:3sg,f)
 (Amharic)

He sent the book to Mariam

2. *māz'haf-u-n* *lä-Mariam* *lakī-l-at* (*-l-it)
 book-Def-Acc to-Mariam_j sent,Subj:3sg,m-to-Obj:3sg,f_j (*-to-Obj:3sg,m)
 (Amharic)

He sent the book to Mariam

The thematic meaning of the prepositional object in this construction appears to be Benefactive rather than precisely that normally associated with an Indirect Object; the informant's translation was often "on behalf of". The latter meaning can also be rendered in Amharic as *bä-* [NP] *sim* (lit. "in the name of [NP]"). This can co-occur with *lä-*; in which case the latter is coerced into a more Indirect-Object-like interpretation. Thus *māz'haf-u-n* *bä-Yalāw sim* *lä-Mariam lakī-l-at* means "He gave the book to Mariam on behalf of Yalew".

Parallel data can be given for the preposition *bä-*, expressing Instrumentality. Both sentences in (6.32) mean "I killed Mariam with the knife".

- (6.32) 1. *Bä-kara-u* *Mariam-in* *gādā-kw-at*. (Amharic)
 with-knife-Def M.-Acc; killed-Subj:1sg-Obj:3sg,f;
 I killed Mariam with the knife
2. *Bä-kara-u* *Mariam-in* *gādā-ku-b-it*. (Amharic)
 [with-knife-Def]_j M.-Acc killed-Subj:1sg-with-Obj:3sg,m_j
 I killed Mariam with the knife

These verb-preposition complexes take the whole paradigm of Set B endings to co-index their objects. For completeness, the paradigm for *lä-* is given in (11), with *lakī*, "he sent (sth.)". (Instrumental examples with 1st and 2nd persons as instrument are presumably never felicitous).

- (6.33)
- | | | | |
|---------------|------------------------|----------------|--------------|
| ...to me | laki-l-iŋ ^v | ...to us | laki-l-ann |
| ...to you (m) | laki-l-ix | ...to you (pl) | laki-l-accux |
| ...to you (f) | laki-l-ij ^f | | |
| ...to him | laki-l-it | ...to them | laki-l-accäw |
| ...to her | laki-l-at | | |

The point to note here is that these endings, like the simple Direct Object endings, are related in a systematic way to Topichood; they can only be used when the prepositional object is (i) specific, and (ii) preposed at least before the direct object. The examples in (6.34) illustrate these points.

- (6.34) 1. ?*Bä-kara* *Mariam-in* *gädäl-i-b-it*.
 with-knife(non-specific) Mariam-Acc killed-Subj:3sg,m-with-Obj:3sg,m
 (Amharic)

He killed Mariam with a knife

2. **Mariam-in* *ba-kara(-u)* *gädäl-i-b-it*. (Amharic)
 M.-Acc with-knife(-Def) killed-Subj:3sg,m-with-Obj:3sg,m
 He killed Mariam with a knife

Furthermore the ending can only be used when the NP coindexed is presupposed ("old information"), not when it is focussed or questioned. Interchanging the verb endings in the responses in (13a,b), both of which mean "I killed Mariam with the knife", was judged completely unacceptable.

- (6.35) 1. (a) A: *Bä-kara-ui* *man-in* *gädäl-k(i-b-itä)?* */*gädäl-k-at*.
 A: with-knife-Def who-Acc killed-Subj:2sg,m (-with-Obj:3sg,m)
 (Amharic)

Who did you kill with the knife?

- (b) B: (*Bä-kara-ui*) *Mariam-in* *gädäl-ku-b-itä*. */*gädäl-kw-at*.
 B: with-knife-Def M.-Acc killed-Subj:1sg-with-Obj:3vsg,m
 (Amharic)

I killed Mariam (with the knife)

2. (a) A: *Mariam-îni bā-min ḡāḏl-k-ati?* */*ḡāḏl-ki-b-it.*
 A: M.-Acc with-what killed-Subj:2sg,m-Obj:3sg,f
 (Amharic)

What did you kill Mariam with?

- (b) B: *Mariam-îni bā-kara-u ḡāḏl-kw-ati.* */*ḡāḏl-ku-b-it.*
 B: M.-Acc with-knife-Def killed-Subj:1sg-Obj:3sg,f
 (Amharic)

I killed her with a knife

The same phenomena hold for *lä-*. I have concentrated here on *bä-* because *lä-* could (though I will presently argue against it) be construed as an Indirect Object, and hence a Term, whereas it is more remarkable for an Instrumental Oblique to share these kind of privileges.³⁹

The conclusion to be drawn is that certain Oblique relations trigger Agreement in the verb complex under much the same conditions as Direct Objects, showing a correlation at least with the topicalizability of the nominal, and in many cases with its actual topicalization.

Datives

In the first part of this section I give a brief summary of the basic data concerning Datives, and suggest a few conclusions. In addition however some data will be given on word order and discourse-structural aspects.

The behaviour of certain prepositional objects in the previous section poses a dilemma for a relational approach, whether or not to regard them as "Terms". This is favoured by their ability to cliticize at all, but as pointed out by [41], this privilege is not always confined to Terms (one well-known counter-example is the French Directional/Locative clitic *y*). In any event the parallels between *lä-* and *bä-* cliticization make it difficult to argue that the former is automatically a term rather than an Oblique.

³⁹The extension of grammatical privileges to Instrumentals is found in Mayan and Philippine languages (cf. for example Klaiman [195], Robertson [272]). However the relational structure of these languages is complicated by other factors. Mayan languages are ergative (Larsen and Norman [220], Craig [80], Aissen [5]; grammatical prominence is thus associated with the initial DO rather than the initial Subject, and from the examples I have seen, accordingly seems to be associated with Focus rather than Topic. The classification of Philippine languages in terms of the Accusative / Ergative dichotomy is also problematic. cf. Shachter and Otanes [286], Kroeger [202], Bell [31], Ramos and Cena [270] for contrasting views. Thus comparisons with the Amharic data are not straightforward, and require further research.

I therefore turn to the class of triadic verbs which appear to govern the assumption by the "Recipient" argument of Object markings, which might (though I will argue against it) be taken as an indication of 3 > 2 advancement. I use primarily the verb *satta* ("he gave"):

- (6.36) 1. *Mäz'haf(-u-n) lä-Yaläw satt-(ow)*.
 book(-Def-Acc) to-Yalaw gave,Subj:3sg,m-(Obj:3sg,m)
 He gave a (/the) book to Yalaw.
2. *Mäz'haf(-u-n) lä-Mariam satt-(at)*.
 book(-Def-Acc) to-Yalaw gave,Subj:3sg,m-(Obj:3sg,f)
 He gave a (/the) book to Mariam.

The gender marking on these examples makes it clear that the Set B endings are here coindexing the Recipient and not the book (even when the latter is definite). This might seem to be an indication of 3 > 2 advancement. However I would like to suggest that it in fact marks Obl > 3 advancement, that is to say, Set B endings co-index not simply 2 Arcs but the natural class of Object Arcs, {2, 3}.

There are several reasons for this proposal. In the first place, the Set B endings seem responsible for the following change in meaning: the co-indexed nominal is construed as Recipient, whereas the basic thematic meaning of *la-*, appears to be more loosely Benefactive, as discussed above. The verb *satta* is in fact grammatical with the incorporated preposition endings discussed in the previous section, but the translation then elicited is "on behalf of" rather than "to".

Second, this proposal is also supported by the evidence of dyadic verbs having what can reasonably be regarded as an Experiencer or Benefactive argument, both of which cross-linguistically typically surface as Indirect Objects. An example in Amharic is the verb "to have", which is rendered by a verb meaning "to be"; the possessor is co-indexed by a Set B ending, whereas it is not in any sense a Direct Object.

- (6.37) *Mäz'haf all-eny. (Amharic)*
 book is-Obj:1sg
 I have a book.

Further arguments come first from Causative constructions, which I will present here, and from

Passivization, which I will defer to the next section (though to anticipate, the disputed nominal cannot become a Passive Subject, as would be expected if it were a 2).

I will not attempt a full account of Amharic Causative constructions here, but only their interaction with IOs. Following a cross-linguistically well-known pattern, the Subject of the embedded verb (henceforth the "causee") surfaces as a Direct Object if the embedded verb is intransitive (in the immediately preceding stratum) and as an IO if it is transitive (Aissen [4], Comrie [73], Shibatani [294]). I concentrate here on the latter case. (6.38) shows variations on a simple example.⁴⁰

- (6.38) 1. *Isu (lä-)sau-yow usha-(u-n) indä-gidil*
 He (to)-man-Def dog-(Def-Acc) Comp-kill,Subj:3sg,m
adiriḡ-ow. (Amharic)
 made,Subj:3sg,m-Obj:3sg,m
 He made the man kill the dog.
2. *Isu (lä-)set-iyoa usha-(u-n) inda-t-gidil*
 He (to)-woman-Def dog-(Def-Acc) Comp-kill,Subj:3sg,f
adiriḡ-at. (Amharic)
 made,Subj:3sg,m-Obj:3sg,f
 He made the woman kill the dog.
3. *Isu (lä-)sau-yow (/set-iyoa) usha-u-n as-gidil*
 He (to)-man (/woman-Def,Acc) dog-Def-Acc Caus-kill,Subj:3sg,m
-ow (/at). (Amharic)
-Obj:3sg,m (/f)
 He made the man / woman kill the dog.

In these sentences the Set B markings on the matrix verb co-index the causee (cf. the Gender agreement). In the first two examples the embedded verb retains its own Subject, while in the third the two predicates are collapsed into a single clause; the relevant co-indexing, however, remains constant across both constructions. The important point here is that the Causee is not (at any level) a Direct Object; it is ungrammatical with Accusative markings, even if definite⁴¹.

The question then arises, in clauses containing both a 2 and a 3, which one is co-indexed. The answer seems once again to be that it depends on the Topicalizability of the nominal: its

⁴⁰ A note on the glosses: I analyse *inda-* as a prepositional complementizer, introducing embedded complements whose Subject is not identified with that of the matrix verb.

⁴¹ It can be made Accusative if it is positioned between *inda-gidil* and *adiriḡ-*. This, however, is no longer a causative construction; the noun receives its semantic role direct from the matrix verb. The meaning given by the informant for such a sentence was "He put the man/woman in a position to kill the dog".

specificity, priority in linear order and discourse-status as old information. In the case of Dative verbs such as *satta*, the normal order is for the 3 to precede the 2 and to be co-indexed. However the converse is also possible. In (6.39), the Object coindexed is taken as the one that precedes in linear order.

- (6.39) 1. *Yalāw lä-sau-yow mäs'haf satta (-ow). (Amharic)*
 Yalew [to-man-Def]_i book gave,Subj:3sg,m (-Obj:3sg,m)_i
 Yalew gave a book to the man
2. *Yalāw mäs'haf lä-sau-yow satta (ow). (Amharic)*
 Yalew book; to-man-Def gave,Subj:3sg,m (-Obj:3sg,m)_i
 Yalew gave a (specific) book to the man

An apparently even stronger constraint, however, is that the coindexed Object must be "old information", as tested by question-answer congruence. (See the examples of this above).

Finally if either Object is fronted before the Subject, then it is obligatorily co-indexed. (The example is somewhat forced, but was designed to avoid the bias inherent in the fact that 3's are usually animate, while 2's in these constructions are usually inanimate).

- (6.40) 1. *La-Howard Yalāw Mariam-in sittä(-ow / *-at).*
 to-Howard Yalew Mariam-Acc gave,Subj:3sg,m (Obj:3sg,m /*Obj:3sg,f)
 (Amharic)
 Yalew gave Mariam to Howard
2. *Mariam-in Yalāw lä-Howard sitt *-(-at) /*
 Mariam-Acc Yalew to-Howard gave,Subj:3sg,m *(Obj:3sg,f)/(/*Obj:3sg,m)
 (*ow). (Amharic)
 Yalew gave Mariam to Howard

The obligatoriness of the Object marking is clearer in the case of the topicalized 2 (sentence 2) than the topicalized 3 (sentence 1). However in both cases the "wrong" Object marker is clearly ungrammatical. (Preposing the second Object nominal too before the Subject has no effect).

The effect of Topicalization is equally clear in the Causative examples; in (6.41b), the Object marking is obligatory.

- (6.41) 1. *(ine) lä-Yalāw Mariam-in inda-gädäl adiri-ku-(t).*
 (I) to-Yalew Mariam-Acc Comp-kill,Subj:3sg,m made-Subj:1sg

(Amharic)
(-Obj:3sg,m).

I made Yalaw kill Mariam.

2. *lä-Yaläw ine Mariam-in inda-gädl adiri-ku-*(t). (Amharic)*
to-Yalaw I Mariam-Acc Comp-kill,Subj:3sg,m made-Subj:lsg *(-Obj:3sg,m).
I made Yalaw kill Mariam.

In this section I have extended the analysis to show that Set B endings co-index both Direct and Indirect Objects, and that their distribution in both cases is determined by the discourse status of the nominal(s) concerned. The comparison with causativization indicates that the occurrence of Set B markings on the Recipient when it precedes the Theme in a ditransitive construction is not due to the former being promoted to Direct Object, but to its topicality. On the other hand this privilege cannot be extended to Obliques unless they are first promoted to Indirect Object. The operation of Obl > 3 advancement, and its association with Topichood, may seem exotic at first, but in the next chapter I will argue that in fact it underlies the familiar so-called Double Object construction in English and parallel constructions in a number of other languages.

6.6 Summary

In this chapter I have discussed some of the syntactic options for topicalizing non-Subject arguments, especially the use of affixes in a number of languages whose correct analysis is debated as between incorporated pronominals and agreement markers. Following in outline the proposal of B&M, I have attempted to capture the similarities and differences between the two functions in an HPSG account, using the proposals in previous chapters that semantics of the Topic-Comment construction involves a relation between an individual and a λ -abstract. As applied to Direct Object CLD in Greek, this approach was able to give an account of how the presence of the pronominal forces a Topic reading of the doubled NP, and the relation of this construction to the more familiar ones of *prodrop* on the one hand and straightforward agreement marking on the other. It was noted that the cross-linguistic tendency of CLD to develop into Object agreement still leaves it sensitive to the semantic properties which were argued in previous chapters to be

involved in the *topicalizability* of an NP, even though it differs from CLD in not requiring actual topichood.

The asymmetry between Direct and Indirect Objects with regard to CLD was then discussed, and it was argued that the affix or clitic in Indirect object CLD is always an agreement marker, patterning with Subject agreement rather than Direct Object CLD. The reason suggested for this was that IO's, like Subjects, are predication targets by default, and that there is no need for marked syntactic devices to make them into predication targets. They share with Subjects the property of "default topicality".

This argument was extended by an analysis of data from Amharic, which shows, again by clitic markings on the predicate, the extension of grammatical privileges to arguments on the basis of their topicality. The same contrast between DO and IOs was observed, and it was noted that the preferential treatment of IOs over DOs with regard to co-indexing on the predicate should not be attributed to a process of 3 > 2 advancement. Rather it is due to the inherent topicality of IOs, and certain Oblique nominals are promoted to 3 in order to enjoy the same privileges. In the next chapter the GR Indirect Object is treated in more detail.

Chapter 7

Indirect Objects in the Germanic Languages

7.1 Introduction

This chapter develops the proposal, sketched in chapter 1 and motivated by the asymmetries between Direct and Indirect Object discussed in the previous chapter, that Indirect Objects are co-Topics of their clause, and thus in some sense default co-Subjects. First the proposal will be summarized (section 7.2), and supported by data from Danish and from Dutch. In the second part of the chapter the relational structure of clauses containing IOs will be discussed in a comparative study of the relevant constructions in the history of the Germanic languages.

The following sentences illustrate the main constructions to be discussed, with their traditional labels (which will be retained for convenience).

(7.1) Double Object construction (DOC)

John gave Mary chocolates

(7.2) Dative construction

John gave chocolates to Mary

(7.3) Recipient passive

Mary was given chocolates

(7.4) Passive with Dative

Chocolates were given to Mary

(7.5) Experiencer Subject construction

Mary likes chocolates

Most theories posit a relationship between the DOC and the Dative construction, whether in terms of a transformation (cf. Larson [221]), a lexical or relational operation (cf. Bresnan [48, 253]) or a relation in lexico-semantic structure (cf. Jackendoff [163, 164], Pinker [261]). The standard relational assumption (modulo the different expression of GRs in different frameworks) is that the initial structure of these sentences is as in the Dative construction, in which the nominals are respectively 1, 2 and 3, and that the DOC is produced by $3 > 2$ advancement and chômeage of the initial 2. The Recipient Passive and the Passive with Dative can be derived from these structures by $2 > 1$ advancement, thus avoiding complicating the rule for the most common cross-linguistically attested form of passive (Perlmutter and Postal [258]). Moreover the standard assumption that 2 outranks 3 in the Relational Hierarchy offers a simple account of the word order (in English and many languages) and the priority of the Recipient¹ (here “Mary”) for phenomena such as binding. This approach has also been incorporated into standard HPSG.

Experiencer Subject constructions are superficially unexceptional in English (although in some languages they are associated with unexpected binding phenomena (cf. Belletti and Rizzi [32])). In many languages however their deviation from the expected patterns of transitive sentences is more obviously marked, notably by Case-marking patterns other than the expected Nom/Acc assignment. These deviations are often accounted for by transformations [32] or by appeal to a θ -hierarchy (e.g. Jackendoff (op.cit.)). Relationally, the complications of these sentences are

¹I use this term for convenience to describe the nominal with the semantic roles and grammatical functions of “Mary” in these sentences, without presupposing a theory of θ -roles.

expressed by a distinct relational structure; in RG this is usually 1 > 3 retreat or "Inversion"².

In the following discussion, the peculiarities of these constructions will be treated in relational terms. However I will argue against the theory of 3 > 2 advancement for the DOC, replacing it by a theory in which 3 outranks 2 by virtue of its greater topicality. I then discuss the cross-linguistic parallels between Recipient Passive and Experiencer Subject constructions, and argue for a common treatment of both as 3 > 1 advancement, this operation being motivated by the special role of Indirect Objects as secondary Subjects.

7.2 Towards a theory of Indirect Objects

7.2.1 Predicate composition

The theory of Topics proposed in earlier chapters was based on the idea that they are the target of an underlying predication, and that they must have the appropriate semantic properties to enable them to p-support the *psoa* which is the content of the clause. By default it is the initial Subjects which have this role in a sentence in which they occur. A DO which meets the semantic requirements can become Topic by a number of syntactic devices, some of which were discussed in the previous chapter.

To extend this account to predicates with more than two arguments, I propose an operation of predicate composition, governed by the following principles:

- (7.6) 1. **Atomic predicates** are maximally binary. They are of two types. A **primary predicate** has as its arguments an initial 1 or 2 or both. A **secondary predicate** shares the non-Subject argument of a **primary predicate**, and may introduce one further argument, which is an initial 3 or OBL.
2. At most one of the arguments of each atomic predicate is selected as the default predication target or Topic. This argument **outranks** any other argument of that atomic predicate.

²Harris [137, 138], Perlmutter [256]

3. A **composite predicate** comprises a primary predicate and at most one secondary predicate.³
4. A composite predicate concatenates the arguments of its atomic predicates, no argument appearing more than once.
5. Outranking relations established by atomic predicates are preserved by the process of composition.
6. Arguments of a primary predicate outrank those of a secondary predicate.

Secondary predicates differ as to whether their predication target is the argument shared with the primary predicate or the new argument introduced. The former case will yield initial relational structures such as 1, 2, OBL. In the latter case the ranking rules 2, 5, 6 will result in the ordering 1, X, 2 where X is the predication target of the secondary predicate. I claim that this structure is precisely what defines a 3; a 3 is defined, on this theory, as an argument introduced by a secondary predicate which is also a predication target. In this structure 3 precedes 2 (by condition 5), giving the ranking $1 > 3 > 2$. When the argument introduced by the secondary predicate is not a predication target, then the ranking is $1 > 2 > \text{OBL}$. The combined relational hierarchy for core arguments is $1 > 3 > 2 > \text{OBL}$ (in contrast to the standard ordering of $1 > 2 > 3 > \text{OBL}$). Note that the present theory also predicts (I believe correctly) that 3 and OBL cannot co-occur, a fact which is unmotivated in standard approaches.

The following examples illustrate these processes of composition, and also show the situation in an unaccusative environment, where the initial 1, for whatever reason, is missing. If a 3 is present, it is the highest ranking argument in the resulting structure.

- (7.7)
1. $\langle 1, 2 \rangle \oplus \langle 2, \text{OBL} \rangle$
 2. $\langle 1, 2, \text{OBL} \rangle$
 3. $\langle \emptyset, 2, \text{OBL} \rangle$ (Unaccusative)

³Thus predicting that natural language predicates are maximally triadic. The only convincing counter-example to this I know of is *bet*, where “[John] bet [Bill] [£100] [that Mary would come]” appears to have four arguments. (Pointed out to me by Dick Hudson).

4. $\langle 1, 2 \rangle \oplus \langle 3, 2 \rangle$
5. $\langle 1, 3, 2 \rangle$
6. $\langle \emptyset, 3, 2 \rangle$ (Unaccusative)

I claim that the relational structure of a DOC is $\langle 1, 3, 2 \rangle$, while that of the Dative construction is $\langle 1, 2, \text{OBL} \rangle$. (Compare the standard view, on which the DOC is $\langle 1, 2, \hat{2} \rangle$, derived from an initial stratum $\langle 1, 2, 3 \rangle$ which corresponds to the Dative construction). Thus "Dative shift" in the proposed theory is not $3 > 2$ but $\text{Obl} > 3$, the operation hypothesized in the discussion of Amharic in the previous chapter. On both accounts the "passive with Dative" is derived from the Dative construction; on my account it will simply have the structure in 3. My account however differs sharply from the standard view with regard to the Recipient Passive, which on my proposal is treated as $3 > 1$ advancement, the 3 taking over from the 1 as the highest ranking nominal left.

The semantic basis for these proposals is as follows. It has been argued by many writers (see especially Jackendoff (op.cit.), Pinker (op.cit), Herslund [142]) that the structures represented here as $\langle 1, 2, \text{OBL}_{Goal} \rangle$ correspond at the lexico-semantic level to a predicate of causation combined with a predicate of change of location (or more abstractly, change of state). The 2 is the Topic of the second predicate, in that it is the object being located. The DOC by contrast is analyzed as a predicate of causation together with a predicate of possession. Possession (again following Jackendoff) is an abstract form of location. However in this construction it is the possessor which is the Topic of the second predicate. This becomes clearer under passivization, where the "primary" predicate of causation is removed.

(7.8) 1. - Tell me about Mary

- She was given chocolates by three linguistics professors.
- (??) Chocolates were given to her by three linguistics professors.

2. - Tell me about that money.

- It was given to a hospital.
- (??) A hospital was given it.

It has been pointed out that one of the main differences between a DOC verb and the equivalent "Dative" construction (flagged in English by the preposition "to") is precisely that the former entails the receipt of the Theme by the Recipient, and the Actor can be understood as a Cause of this event. It would thus seem that the main use of a Passivized DOC would be to foreground this act of receiving at the expense of the act of causation, in other words foregrounding the secondary predicate and its argument structure, in which the Recipient is the predication target.

It is noteworthy that the Germanic language to be discussed here which shows the greatest aversion to this reanalysis, namely German, has had to produce an alternative way of doing the same thing, namely the Passive construction with "bekommen" (7.9). This can be understood as a template allowing by lexical subcategorization the Recipient to become Subject of a triadic verb, with the action of the Agent suppressed.

(7.9) *Sie hat das Buch geschickt bekommen (German)*
 she has the book give-as-present,Pass received
 She was given the book (as a present).

It is possible to extend this approach to the 3 in the *active* DOC. Larson [221], in the context of a configurational analysis of this construction, proposes that the transformation which brings the 3 above the 2 can be regarded as a VP-internal analogue of passivization. I would like to re-interpret this in terms of it being a VP-internal analogue of a Subject in the sense of the Subject's role as the default Topic and target of predication.⁴

Preliminary arguments for the plausibility of this approach can be found in the following facts. In the first place, there is a strong cross-linguistic preference for the linear order IO < DO, which is reminiscent of the prevalence of the Topic < Comment ordering rather than the ordering of arguments which is normally subject to parametric variation. Second, the DOC seems unnatural in several languages (including British English) when the IO carries presentational Focus, the alternative NP PP[to] construction being used for this purpose. Finally in some languages, of which MSc languages are relevant here, the 3 of a DOC has certain privileges normally confined

⁴In GB terms, the NP will be an A position which is not a θ position - exactly like a Subject assuming the VP internal Subject hypothesis - and not in complement position. Of course if the formation of the DOC by "Dative shift" is to be regarded as a transformation, this is the sort of landing site that would be expected.

to Subjects. This will be illustrated in the next section.

7.2.2 Danish evidence for the prominence of 3's

A particularly striking instance of this is provided by Danish (Herslund [142, p.134f]), in which the DOC patterns almost identically to English with respect to most of the parameters considered in this chapter. Besides the same argument from binding which I have used for English (following Larson), Danish also allows an argument from Q-float. The quantifier *hver* ("each") floats only from the Subject in Danish; (7.10), in which it floats from a DO, is ungrammatical in Danish, unlike its English translation.

- (7.10) *?*Han kyssede pigerne tre gange hver.* (Danish)
 he kissed the-girls; three times each;
 He kissed the girls three times each.

However, "each"-float is possible from the IO of a DOC (7.11):

- (7.11) *Jeg gav dem fem dollars hver.* (Danish)
 I gave them; five dollars each;
 I gave them five dollars each.

By contrast it is completely ungrammatical with the corresponding "Dative" construction

(7.12):

- (7.12) **Jeg gav fem dollars til mændene hver.* (Danish)
 I gave five dollars to the-men; each;
 I gave five dollars each to the men,

Herslund also offers other data involving reflexivization and extraction (ibid.) supporting the idea that the IO is acting as a secondary Subject (even in an Active DOC where the primary Subject is present).

The idea that the DOC is in some sense a double predication involving a causative component and a transfer of possession or location has been suggested many times, from traditional grammatical analyses onwards. The main question is, at what level this semantic biclausality should be represented. In many languages DOC's can be shown not to be syntactically biclausal. In

Japanese, for example, Subject-oriented anaphors, which are a standard diagnostic for biclausality in Japanese (Kuno [203], Howard and Howard [156], Shibatani [294]), cannot refer to an Indirect Object, implying that in the syntax it is not a Subject. Danish seems to be exceptional in the degree to which this biclausality is visible in the surface syntax. By contrast the semantic effect of the DOC, in contrast to the "Dative" construction, is widely agreed to be well described in terms of the double predication discussed above (cf. the thorough discussion of the lexical semantics and argument structure of ditransitive verbs and Dative verbs in Pinker [261], besides the short but suggestive section in Herslund [142, p.139-143]). The approach taken here is to locate the idea of predication (and hence the relevant concept of clausality) neither in the surface syntax nor purely in the semantics but in the relational structure.

7.2.3 Some asymmetries in Continental West Germanic (CWG)

This section discusses a certain clustering of phenomena common to German and Dutch. Although in both languages only the Initial 2 may be promoted to Subject, the Initial 3 may be preposed before this derived Subject (7.13). In Dutch, but not in German, this preposed 3 acquires (apparently to the exclusion of the 2 > 1 advancee) control and binding properties which in these languages normally refer exclusively to Subjects (7.14).

- (7.13) 1. ...*dat mij de boeken zijn bevalen* (Dutch)
 that me,Obj the books,Nom were please,PPP
 ...that the books pleased me (I liked the books)
2. ...*daß mir die Bücher gefallen haben.* (German)
 that me,Dat the books,Nom please,PPP have
 ...that the books pleased me (I liked the books)
3. ...*dat mij de boeken worden gegeven.* (Dutch)
 that me,Obj the books,Nom were give,PPP
 ...that I was given the books
4. ...*daß mir die Bücher gegeben wurden.* (German)
 that me,Dat the books,Nom give,PPP were
 ...that I was given the books

- (7.14) 1. *Na teruggekeerd te zijn, is mij het meisje bevallen.*
 after [returned to be]_{SUBJ:[1]} is [1]:me,Obj the girl,Nom pleased
 (Dutch)

After I (*she) got back, I liked the girl.

2. *Na teruggekeerd te zijn, word mij een nieuwe sekretarisse
 gegeven.* (Dutch)
 after [returned to be]_{SUBJ:[1]} was [1]:me,Obj a new secretary
 given

After I (*she) got back, I was given a new secretary.

The Dutch data as given here are subject to some variation. They appear to be well-established in the literature⁵. Many of my informants have rejected them, though a significant minority agreed with them. (A few went further, allowing the Initial 3 to receive Nominative Case and to control Agreement). I am not aware of any geographical basis for this variation. However I assume the existence of (at least) two dialects of Dutch with respect to the data in (7.14): Dutch A (probably regarded as prescriptively the more "correct"), which rejects them, and Dutch B (more interesting for my purposes) which accepts them. Subsequent references to Dutch will refer to the second variety: the first seems to pattern with German.

In all these sentences, *mir/mij* takes clause-initial position, while the Nom NP appears to be in Object (complement) position. (That it is indeed in complement position is shown by the test of "wat voer / was für split" mentioned just previously, a diagnostic for *in situ* complements in these languages, which applies to the Nom NP in these constructions (Hoekstra [151], Den Besten [35])). Just in case this inversion takes place, control into adjunct clauses refers to *mij / mir* in preference to the Nom NP in Dutch (Hoekstra [151], Harbert and Toribio [136])⁶, though not in German. Nonetheless even in Dutch the Nom NP remains the Subject for purposes of Equi and Raising, and controls agreement⁷.

⁵They are first brought to attention, as far as I know, by Koster [198], and subsequently discussed by Hoekstra [151] and Den Besten [35], the latter in particular exhibiting the close parallelism between the two languages.

⁶Dutch speakers I have consulted regard this as a tendency rather than a hard-and-fast rule, and it is also subject to considerable individual variation. I have found it is supported more often when the adjunct clause is preposed, as in the examples in (7.14).

⁷In some Dutch dialects the Theme, if pronominal, cannot be assigned Nom (Hoekstra [151, p.188]), and some speakers allow the Recipient to trigger agreement (Wechsler [319, p.104]). The latter data were replicated by a small minority of my informants. Nonetheless the data for Raising, which I take throughout as being the most reliable structural test for subjecthood, give the same result as for German.

The symmetry between the two constructions in both languages has been attributed since Koster [198] to the fact that Experiencer verbs are unaccusative, thus patterning with Passives⁸. It is the initial objecthood of the Theme that enables the Experiencer / Recipient to take precedence over it, in the absence of an initial Subject, in both linearization and (apparently) some instances of control. These data lead Koster to posit a 1 > 3 > 2 hierarchy, a suggestion which is taken up by Hoekstra [151] in opposition to Perlmutter and Postal. On this view a 3 takes precedence over a 2 in its own right, without having to be derived from an Initial 1.

It is worth remarking that in both the Dutch and German examples, the linear precedence of the 3 is not a case of topicalization as familiar from English, i.e, a marked structure usually having a contrastive interpretation⁹. It simply seems to mark the 3 as the predication target, from which can be assumed to derive whatever other Subject-like properties it enjoys.

7.3 Recipient Passives and Experiencer Subjects

I now turn to the proposal that Recipient Passive and Experiencer Subject constructions have a common relational structure, one which is illuminating for the relation between IOs and Subjects. I focus on constructions in which, in a number of languages, a clause-initial Dative-marked nominal shows characteristics normally associated with Subjects, and typically alternates with similar constructions in related languages in which the corresponding nominal bears Nominative Case. I concentrate here on the Germanic languages¹⁰

The two critical constructions involved are what I will term "Recipient Passives" (7.3 and "Experiencer Subjects" (7.15)¹¹

⁸Koster does not use the term, but appears to anticipate the Unaccusative hypothesis in his treatment. Note that the unaccusativity of Experiencer verbs is supported in Dutch by auxiliary selection.

⁹Den Besten [35] for Dutch, Thea Bynon (p.c.) for German.

¹⁰cf. the influential survey of Cole et al. [71]. I will refer chiefly to German (Nerbonne et al. (eds.) [244], Toman (ed.) [308]), Dutch Koster [198], Hoekstra [151]), Icelandic (Thraínsson [307], Andrews [14], Maling and Zaenen [228], Sag et al. [282], Holmberg and Platzack [152]), and the diachronic development of English (Lightfoot [226], Denison [85], Allen [8, 9]). A number of subscribers to the Linguistlist generously helped me to compile a more extensive survey, not all of which is used here. Apart from those named, these include: Homme Piest, Wim Vandenbusche, Marie-Louise Gerla, Christof Vanden Eynde and Dieter Vermandere (for Dutch); Henno Brandsma (Frisian); Bjoern Wiemer, Julia Kemper and Tobias Schoofs (German); Jan Engh and Janne Johannessen (Norwegian); Thomas Martin Widman (Danish). Unfortunately I have not had access to native speakers of Icelandic or Faroese, though I have tried to check the data over a number of secondary sources.

¹¹These labels are purely for convenience of reference, and imply no assumptions about Thematic Role labels,

- (7.15) 1. He was given the money. (**Modern English**)
2. Honum (Dat/*Nom) vru givnir peningarnir (Nom). (**Icelandic**)
3. Ihm (Dat/*Nom) wurde das Geld (Nom) gegeben. (**German**)
- (7.16) 1. He likes milk. (**Modern English**)
2. Honum (Dat/*Nom) likar mjölkin (Nom). (**Icelandic**)
3. Ihm (Dat/*Nom) schmeckt die Milch (Nom). (**German**)

In the English sentences, the italicized pronoun has Nominative Case, and is uncontroversially the Subject. In the Icelandic sentences, it has Dative Case, but a number of syntactic tests¹² show, beyond reasonable doubt, that it is nonetheless the Subject (henceforth a "Dative Subject"). In the German sentences, it similarly has Dative Case, but by the same criteria, is clearly not a Subject but simply a preposed Indirect Object¹³. (Comparable cases in other Germanic languages are sometimes less clear-cut with respect to this typology, as will be discussed presently).

The correspondence between the two constructions within each language suggests that their underlying relational structure has a common element, so that they can be treated as a natural class. In this case evidence from Recipient Passives, whose initial relational structure is relatively clear, can be used to elucidate the more controversial Dative Subject constructions¹⁴. I will argue that this is in fact the case, and that both structures should be treated as 3 > 1 advancement (in English and Icelandic, whereas in German the advancement fails to take place, the nominal instead being topicalized). This contrasts with widely held views, on which (7.3a,b) are "normal" passivization fed by advancement of the recipient in the Double Object construction (thus giving 3 > 2 > 1 advancement), while Dative Subjects (7.15b) are often analyzed as 1 > 3 retreat, or "Inversion". The comparison of this operation of 3 > 1 advancement with Indirect Object

which are not used in the theory followed here.

¹²See 7.6 below.

¹³cf. Cole et al. (op.cit.). The three-way contrast here is reminiscent of their scheme of three "stages" in the diachronic acquisition of subjecthood in Germanic languages - though I maintain a measure of agnosticism as to the actual situation in early Germanic. Also, it will be necessary to recognize more than three discrete stages; rather, the languages considered here can be thought of as arranged on a cline, e.g.: German < Dutch (some dialects) < Icelandic < Faroese < English / Mainland Scandinavian

¹⁴cf. the discussion in Hoekstra [151, p.182-194, 215-224], which in fact provided one of the main starting points for this section.

topicalization (3 > Top) may help to elucidate both the diachronic "acquisition of subjecthood" and the synchronic relationship between Subjects and Topics.

The principal claim will thus be that there is an alternation in Germanic between 3 > Top and 3 > 1; the latter, which underlies the English and Icelandic phenomena, is thus related to Topichood (specifically the topicality of 3s) rather than simply being an extension of the normal cross-linguistically attested passive operation involving 2 > 1 advancement.

The relational structures of the above sentences are given in (7.17a,b) (using the German examples, for reasons which will shortly become apparent). From a relational point of view the two constructions can be regarded as a natural class by virtue of sharing the substructure in (7.17c), comprising an Initial 2 and an Initial 3 (the initial 1 either being absent or en chômage).¹⁵

(7.17) 1. Ihm wurde das Geld gegeben. (German)

PRED _{c1,c2} [4]:	geben
SUBJ _{c1} [1]:	<i>pro</i>
SUBJ _{c2} [2]:	Geld
DO _{c1} [2]	
IO _{c1,c2}	ihm
CHO _{c2} [1]	

2. Ihm schmeckt die Milch. (German)

PRED _{c1,c2} [4]:	gefallen
SUBJ _{c1}	∅
SUBJ _{c2} [2]:	Milch
DO _{c1} [2]	
IO _{c1} [3]	ihm

¹⁵For comments on the stratified feature notation, cf. Chapter 2.1 above.

$$3. \begin{bmatrix} \text{PRED}_{c1} \text{ ④} \\ \text{SUBJ}_{c1} \emptyset \\ \text{DO}_{c1} \text{ ②} \\ \text{IO}_{c1} \text{ ③ ihm} \end{bmatrix}$$

In the German examples given, the 2 is promoted to 1 (as would be predicted by the relational hierarchy). Thus it enjoys the following properties, to the exclusion of the Initial 3: it is assigned Nominative Case, controls verb agreement, can be raised, can control into adjunct clauses and can undergo Equi or co-ordinate Subject "deletion". In the remainder of this chapter I will follow Keenan [183] and Cole et al. [71] in distinguishing between the first two ("marking" properties) and the remainder ("structural" properties), and will generally take the ability to be raised (to matrix Subject or Object) as the most reliable of the latter (the one for which non-syntactic explanations are least plausible). Topicalization of the 3 in these sentences (3 > Top) does not affect the distribution of any of these properties.

The other languages illustrate, by contrast, a process in which some or all of these Subject diagnostics pick out the 3 and not the initial 2. In Icelandic the structural properties pick out the former, while the latter is assigned Nom and controls Agreement. In English all these properties devolve upon the (ex hypothesi) initial 3.¹⁶

In this section I will put forward the following proposals. The substantial symmetry between the two constructions suggests a common relational analysis. This can be achieved if they are both cases of 3 > 1 advancement in an unaccusative environment. I will argue that this is the best analysis for each of the constructions individually, which entails defending at least two controversial positions: the Indirect Object status of the Recipient in Double Object constructions (DOC), and also a 3 > 1 analysis of Dative Subjects, which are more commonly treated in Relational Grammar, following Harris' analysis of Georgian, as 1 > 3 retreat or "Inversion" [137, 138, 251, 12]¹⁷. I will

¹⁶Both languages have the alternative possibility of a passive with the Initial 2 as Subject (as in Modern English "The money was given him"). The acceptability of this in (British) English and Mainland Scandinavian will be discussed below. It is apparently fine in Icelandic.

¹⁷The term "Inversion" is derived from the descriptive grammar of Georgian, its analysis as 1 > 3 retreat, which

then examine the relationship between the topicalized Indirect Objects (3 > Top) in the German sentences and the stages in which these are reanalysed in other languages as 3 > 1 advancement. I will claim that this relationship between 3 > 1 and 3 > Top suggests that the former should be seen as a topic-related phenomenon (i.e. related to inherent topicality of 3's as proposed above).

7.3.1 Experiencer Verbs

These refer to the class of dyadic verbs exemplified by (7.15) above, where the first argument, realized as a Subject in ME, surfaces in many other languages as an apparent Indirect Object, bearing Dative or some other non-Nominative Case while still displaying a number of Subject-like properties. In Dutch and many other languages (including Japanese, Quechua and a number of Romance languages (Perlmutter [251], Belletti and Rizzi [32])), they show control and binding properties which have been used as Subject diagnostics¹⁸. In Icelandic, as has been mentioned, the evidence for subjecthood is stronger; in particular the nominal can be raised. Similar arguments apply to a number of Indian languages (Sridhar [300], Klaiman [195], Mohanan [236], Verma and Mohanan [317]).

These facts have been used within RG to argue for Inversion or 1 > 3 retreat. On this view, in these languages the retreat of the Initial 1 leaves an unaccusative stratum, resulting in unaccusative advancement of the other ("Theme") argument. However, the parallelism between these structures and Recipient passives favours the alternative suggestion that the characteristics common to both constructions are due to the behaviour of an Initial 3 in an (already) unaccusative environment.

has been influential in the RG literature, being due to Harris. In fact this discussion is not directly concerned with Georgian, where the evidence is rather different in character, and is complicated by the prolific variety of morphosyntactic patterns governing Case assignment and Agreement in Georgian. I do not wish to claim that 1 > 3 retreat does not exist as a syntactic process (a clear case where it does seem well motivated is in the formation of causatives from transitive verbs in many languages (Comrie [73])), but only that it is more reasonable to treat experiencer subject phenomena in terms of a 3 > 1 relational configuration. Conceptually this is preferable as this phenomenon essentially concerns an argument which at the level of semantic role (the "initial" level) is highly non-agentive, yet enjoys syntactic privileges normally associated with (final) Subjects, for which I assume that structural properties (especially raising) are more definitive than mere Case assignment (cf. Shibatani [293]). For a critical account of Harris' analysis of Georgian in general, cf. Hewitt [144, 143, 145].

This whole issue is one that I intend to return to in future research, examining on the one hand the relationship between the recipients of ditransitive verbs and the secondary subjects of causative constructions, and on the other hand the rich data for experiencer subjects provided by Indian languages (Klaiman [195], Verma and Mohanan (eds.) [317]).

¹⁸I have suggested above that they are not reliable ones, as they have sometimes been argued to be sensitive to topichood or other semantic factors rather than subjecthood. Binding phenomena can also be found in association with the IO in an Active DOC, which do not appear to be Subjects in any stratum.

Since the 3 in a Recipient Passive cannot plausibly be regarded as an Initial 1, the same would seem to be true of the 3 in Experiencer constructions (cf. Hoekstra [151]). In this case some other solution must be sought for the origin of the Subject-like properties, or actual subjecthood, of the Initial 3. I have suggested that these be sought in the inherent semantic function of an Initial 3 as a predication target, which makes it rather than an Initial 2 the natural candidate for topichood, leading in some languages to subjecthood by the reanalysis of 3 > Top as 3 > 1 advancement.

7.3.2 Double Object Constructions (DOC)

DOCs, or the configuration $V NP_{[RECIPIENT]} NP_{[THEME]}$, occur productively in all the Germanic languages under discussion. They are particularly associated with a subclass of triadic verbs including the cognates of “give”, “send” and others, which show striking cross-linguistic regularities in their behaviour; following H&P [152] and others, I will refer to them as “canonical” triadic verbs, and they will form the main focus of the following analysis. Other triadic verbs may behave in a more idiosyncratic manner in different languages. The unmarked linear order is always as just given. The “Recipient” in “canonical” DOCs is always marked Dative in those languages (Icelandic, Faroese, German) which retain the morphological Case distinction between Acc and Dat (henceforth “m-case”, again following [152]); in other languages both NPs are marked with what I will call Objective Case (essentially Acc, but see below for further discussion).

Under passivization, the Theme can become Subject in all languages, with certain reservations about English and Danish which will be discussed presently. This operation is of course simple 2 > 1 advancement, with the presence of a 3 or OBL playing no role. English, Mainland Scandinavian (MSc) and Insular Scandinavian (ISc)¹⁹ also allow the Recipient Passive construction (7.3 above) in which the Recipient becomes Subject. In the case of ISc this nominal retains its Dat Case-marking.

According to a well-established view (henceforth the “standard” view)²⁰, the Recipient in a

¹⁹The terminology is from Haugen [139]. This partition of the Scandinavian languages is based on their patterning with respect to m-case and agreement. Certain dialects of Faroese and Norwegian indicate that the dichotomy is not entirely a clear-cut one (H&P [152]).

²⁰Translated into different frameworks it is held by Chomsky [65], Bresnan [48], Perlmutter and Postal [253] and Pollard and Sag [265]; thus for once it is hardly controversial to refer to it as “standard”. It is also applied by Allen [9] to the historical development of the DOC in English.

Active DOC is promoted from 3 to 2 (even in ISc, where it retains Dative Case). I will argue below that in the “canonical” DOC the Recipient remains a 3, and that even in those languages which do not retain *m*-case, it should be regarded as bearing “abstract Dative Case”. The Recipient Passive is formed by direct 3 > 1 advancement from this stratum, the same relational structure that was posited for Experiencer verbs.

7.4 The reanalysis of the “Theme”: from Subject to Object

In the literature on the acquisition of Subjecthood by the Recipient in these constructions, less attention has been paid to its corollary, the transformation of the Theme from a fairly unexceptional Subject (as in German) to a fairly unexceptional Object (as in ME) - via its apparently ambivalent status in Icelandic, of being a structural Object assigned Nominative Case and (with certain reservations) controlling verb agreement²¹.

In German, as illustrated above, both marking and structural properties pick out the Theme as final Subject. According to Den Besten²², though the idea had been discussed earlier (cf. Hoekstra [151]), these NPs also show certain Object characteristics, notably with respect to “*was für*” or “*wat voor*” extraction, which is taken as an Object diagnostic. However even if these data are accepted (they are rejected by most of my informants), they only show the Initial Objecthood of the Theme, which is not in question. This relational structure, which is cross-linguistically common, seems to represent the situation in Old English, and (following Cole et al. [71]) Old Germanic generally.

At the other end of the scale, the exact Final GR borne by the Theme in the Recipient Passive in ME is also not entirely uncontroversial. According to the “standard” RG analysis, where the advancement of the Recipient follows the trajectory 3 > 2 > 1, the Theme should be put “*en chômage*” in the second stratum and then fall through as a 2-*chômeur*, i.e. an adjunct. This aspect

²¹For evidence of a similar transitional phase in Early Middle English, see Allen [9].

²²[35]

of the analysis is also retained by Larsen [221], despite his advocacy of direct 3 > 1 advancement, and despite the fact that in canonical ditransitives the presence of this nominal is never optional (in standard British English). The analysis proposed here, however, predicts that it remains a 2. The behaviour of Wh extraction in environments which show Object-Adjunct asymmetry suggests that the nominal is in "complement position", thus supporting the latter analysis. Thus the mild abnormality of the (a) sentences in (7.18) contrasts with the complete ungrammaticality of the (b) sentences, where an adjunct is extracted.

- (7.18) 1. (a) (?) [1]:[Which girl] do you wonder when he [will like]*SLASH*[1]?
 (b) * [1]:When do you wonder which girl he [will like]*SLASH*[1]?
 2. (a) (?) [1]:[Which books] do you wonder when he [will be given]*SLASH*[1]?
 (b) * [1]:When do you wonder which books he [will be given]*SLASH*[1]?

The idea of an NP receiving Nominative Case in Object ("complement") position is of course not unique to this construction, being also found for example in existential sentences and (Romance) unaccusatives with postverbal Subjects (Burzio [56]); and a variety of mechanisms have been proposed for permitting this Case assignment to take place²³. For present purposes the two significant points are: first, the fact that the NP fails to assume Subject position; and second, that at some point in the sequence of re-analyses described above, its Nominative Case is replaced by Accusative. Thus first the 2 > 1 advancement of the the Theme fails to result in normal Subject behaviour, though it is still reflected in its marking properties, while in the fully reanalyzed structure (as found in ME) the advancement does not take place at all and it remains an accusative-marked Object. It appears, from the languages studied, that the Theme loses Nominative Case before the Recipient or Experiencer acquires it, with a certain time-lag in between.

The apparent blocking of the advancement of the Initial 2 would appear to be entirely due to the presence of an Initial 3, since all the languages under discussion appear to have unaccusative advancement in other circumstances. It is often attributed to the greater topicality of the Initial 3,

²³ibid., also Chomsky [65], Zaenen et al. [325], Yip et al. [322], Harbert and Toribio [136], Sag et al. [282].

deriving from its (normal) thematic interpretation as a Recipient or Experiencer, hence generally human²⁴ This would seem to be the main reason for the first step in the loss of Subjecthood by the Theme, namely its failure to take the Subject position, an assumption which is confirmed by a tendency for the immediately pre-verbal position to be assumed by Topics even in those languages (German, Old English) in which they do not show any (other) Subject properties. Once this situation is reached, then the pressure for grammatical re-analysis is clear on the assumptions made above about the composite nature of the argument structure of triadic verbs. Thus the grammatical re-analysis seems to be one possible solution to the requirements of topicality.

7.5 Advancement of Indirect Objects in Modern English

In this section I argue for the theoretical claim that the English Passive represents two distinct processes, the "normal" cross-linguistically attested $2 > 1$ Advancement and the "marked" $3 > 1$ Advancement (cf. (7.3) above).

7.5.1 The Relational Structure of Triadic Predicates

As discussed above, ditransitive verbs are widely assumed to govern the initial GR's 1, 2 and 3, corresponding to the relational structure of Dative constructions. According to this view, "Double Object" constructions are derived from Dative constructions by the 3 advancing to 2 and forcing the Initial 2 *en chômage*.

(7.19) John gave Mary a book. (from: John gave a book to Mary)

John paid Mary £5. (from: John paid £5 to Mary)

I would like to argue first that in fact ditransitive verbs are not homogenous but are partitioned into two classes, of which *give* and *pay* are representative members. The "standard" view, I maintain, applies only to the *pay* class, while with the *give* class $3 > 2$ Advancement fails to take

²⁴However it is not the humanness or animacy in itself that is the determining factor in these relational structures, at least as far as Recipients are concerned; cf. Herslund [142].

place. Thus in the second sentence Mary heads a 2-arc, but in the first she heads a 3-arc. The relational networks are given in (7.20, 7.21).

(7.20)
$$\left[\begin{array}{l} \text{PRED}_{c_n}: \text{gave} \\ \text{SUBJ}_{c_n}: \text{John} \\ \text{IO}_{c_n}: \text{Mary} \\ \text{DO}_{c_n}: \text{book} \end{array} \right]$$

(7.21)
$$\left[\begin{array}{l} \text{PRED}_{c_{n-1}, c_n}: \text{paid} \\ \text{SUBJ}_{c_{n-1}, c_n}: \text{John} \\ \text{DO}_{c_n}: \text{①: Mary} \\ \text{OBL}_{c_{n-1}}: \text{①} \\ \text{CHÔ}_{c_n}: \text{②: £5} \\ \text{DO}_{c_{n-1}}: \text{②} \end{array} \right]$$

Prima-facie evidence for this claim comes from the different syntactic status of the Theme in the two sentences. Given that a 1-Chômeur²⁵ is realized in English as an optional adjunct, a 2-Chômeur might be expected to show similar behaviour, and on the standard account the question is often raised why this does not occur²⁶. My hypothesis, by contrast, would predict that the Theme is optional in (7.21), where it is a Chômeur, but not in (7.20), where it is still a 2. This turns out to be the case (7.22).

(7.22) 1. John gave Mary *(a book).

2. John paid Mary (£5).

A further corollary of this hypothesis can be seen in its interaction with Passivization. Triadic verbs can be passivized in English in either of two ways:

(7.23) 1. A book was given to Mary.

²⁵The initial Subject in a Passive construction

²⁶e.g. Larsen [221]

2. £5 was paid to Mary.

(7.24) 1. Mary was given a book.

2. Mary was paid (£5)

According to the standard view, both the sentences in (7.24), in which the Final 1 is the Recipient, are formed by 3 > 2 Advancement ("Double Object" formation) followed by 2 > 1 Advancement (Passivization). On the present proposal, this can apply to *pay* but not to *give*, 3 > 2 Advancement not being available for this class of predicate. I therefore have to maintain that (7.24,1) is formed by direct 3 > 1 Advancement, as in (7.25).

(7.25) $\left[\begin{array}{l} \text{PRED}_{c_{n-1},c_n}: \text{give} \\ \text{SUBJ}_{c_n}: \text{Mary} \\ \text{DO}_{c_{n-1},c_n}: \text{book} \\ \text{IO}_{c_{n-1}}: \text{Mary} \\ \text{1-CH}\hat{\text{O}}_{c_n}: \text{Agent} \\ \text{SUBJ}_{c_{n-1}}: \text{Mary} \end{array} \right]$

At first sight, it may seem that there is little empirical motivation for positing such a far-reaching difference between the two structures under passivization. Apart from (once again) the surface optionality of the Theme in constructions headed by *pay* in contrast to those headed by *give*, evidence for such a difference can, I suggest, be found in the formation of adjectival passives. The next section will examine these data.

7.5.2 Grammatical Relations and Adjectival Passives

It has long been noted in the literature that adjectival passives cannot be formed from all the verbs which allow a verbal passive in English²⁷. The crucial cases for present purposes concern triadic verbs. These generally allow adjectival passives which can be predicated of the Theme argument.

²⁷e.g. Bresnan [49]

As to the Recipient argument, however, the class of triadic verbs partitions along precisely the same lines described in the previous section. In (7.26), (7.27) I use one of the tests for adjectival passives proposed by Levin and Rappaport [223], that of *un-* prefixation.

(7.26) *give* un-given flowers *un-given girlfriends
send un-sent letters *un-sent grandmothers
buy un-bought equipment *un-bought hospitals

(7.27) *pay* un-paid bills un-paid debt-collectors
serve un-served sherries un-served ambassadors
teach un-taught lessons un-taught teenagers

In their widely accepted study of this phenomenon, Levin and Rappaport (henceforth L&R) conclude that the decisive criterion governing this behaviour is whether the target NP can stand alone as the Object of the head verb (the "Sole Complement Generalization", or SCG).

On the view I have proposed, the SCG does not stand as an isolated observation but can be derived from the relational structure of the predicates involved. All that is needed is the formulation of the rule of (adjectival) passive formation as targetting (only) the Direct Object for advancement (7.28) (thus it obeys the common cross-linguistically attested rule for passive in general), and the RG principles already discussed.

(7.28) Rule for (adjectival) passive formation.

An (adjectival) passive structure with final stratum c_n is well-formed iff the head of the 1 arc at c_n heads a 2 arc at c_{n-1} .

It follows from this that the Recipient can only become an (adjectival) Passive Subject if it has been promoted to 2, a process which, on this hypothesis, applies only to *pay* class triadic verbs. By the same process, however, this argument will be able to stand as "sole complement" of the verb, because the Theme argument will have been put *en chômage* by the advancement.

(The SCG is applied by L&R to other domains besides Dative verbs, including the "locative alternation", which is naturally treated in RG as Obl > 2 Advancement. I will not give details here, but it can easily be verified that (7.28) gives the right results for those data as well).

7.5.3 The diachronic development of 3 > 1 Advancement in Modern English.

Further evidence for the distinction between two passive rules can be found in the diachronic development of the English passive. Recipient passives were impossible in Old English; they are first attested in the late 14th century²⁸. Lightfoot links this change²⁹ with the development of a "syntactic passive" in English alongside the inherited lexical passive³⁰ - the latter being closely related to the adjectival passive (p.252). Lightfoot's particular formulation of the difference encounters some problems, which he himself discusses: (i) OE passives do not always show adjectival properties (p.280f); (ii) raising passives are allowed in OE (this does not, on lexicalist assumptions, mean that it is not lexical, but it does indicate that it is not adjectival); and (iii) there is a small class of verbs that appears to allow promotion of the Recipient to Passive Subject even in OE. (p.264). On the last point, most of the verbs he gives appear to be able to take the so-called Recipient as their sole Object, thus satisfying L&R's Sole Complement Condition and the condition proposed in (7.28). The exceptions are a subclass involving "possessor raising", the syntax of which I have not been able to research in OE:

(7.29) *he was oftogen thare clatha.* (Old English)
 he was taken-away his clothes
 He had his clothes taken taken away.

²⁸ Allen [9, p.459]. They were still condemned by grammar books in the early 20th century (Lightfoot [226, p.262]) - as they still are in Swedish, where they are attributed to young Swedes knowing too much English and not enough Latin (Wechsler [319, p.102]).

²⁹ He dates it later, to the 15th century (p.261f), which is when he regards the "transformational passive" as having been introduced (p.276f).

³⁰ This formulation of the distinction is due to Wasow [?], which he relates to the present adjectival passive. The impression of being "syntactic" is presumably due to its greater range of targets for advancement, one of the arguments for a transformational view of passive (Chomsky [64]).

It would seem that these difficulties become much less serious if Lightfoot's formulation of the change involved is replaced by (7.30):

(7.30) OE passives allowed only 2 > 1 advancement. From the late 14th century onwards 3 > 1 advancement was allowed in verbal passives.

Thus OE verbal and adjectival passives advance only 2s, as is still the case for adjectival passives. This allows the raising passive cases (on the standard LFG and HPSG account of the latter, in which they undergo SOR followed by 2 > 1 advancement, cf. Bresnan [49], P&S).

7.5.4 Evidence for the persistence of Abstract Dative Case

In this Section I give some evidence that even in languages which have suppressed the morphological distinction between Acc and Dat, the difference between IO and DO in the DOC is still present just as in those languages which maintain the overt distinction. One way of representing this is to claim that the first postverbal NP is understood to have (abstract) Dat, picking out the GR 3 (as argued above). Contrary to standard views of Dative Case assignment (e.g. Chomsky [65], I assume that this Dative case is assigned "structurally" (in HPSG terms, by SUBCAT specifications for ditransitive verbs, inherited from the hierarchical lexicon (Flickinger [109], Pollard and Sag [264])). If this approach is accepted (some arguments will be given presently), then the historical change in Case morphology can be understood as simply introducing a morphological category which picks out the natural class of Objects, {2, 3}, in place of the older system with separate exponence of 2 and 3.³¹

One immediate argument in favour of this possibility is the fact that an NP can occur as the complement of certain adjectives in MSc (7.31), despite the well-known generalization that adjectives cannot assign Acc (e.g. Chomsky (1986)). Both examples are from Swedish³², though they can be replicated in other MSc languages and also Dutch, which likewise lacks m-case.

³¹cf. the discussion of Amharic in the previous chapter, where the object clitics were argued to follow exactly this rule.

³²They are from H&P p.150 and Wechsler [319, p.102]

- (7.31) 1. *Han var henne inte trogen.* (Swedish)
 he,Nom was her,Obj not faithful
 He was not faithful to her.
2. *Det är mig likgiltigt.* (Swedish)
 that is me,Obj the-same
 That is all the same to me.

These may be compared with the corresponding examples from German³³, which does have m-case:

- (7.32) *Er war ihr nicht treu.* (German)
 he was her,Dat not faithful
 He was not faithful to her.
1. *Das ist mir gleichgültig.* (German)
 that is me,Dat the-same
 That is all the same to me.

The simplest account of these data would seem to be to allow heads to subcategorize for abstract Dative Case even in the absence of any morphological marking. In other words "Objective" Case can be used to mark an NP which bears the Indirect Object GR. This is what is being claimed in this section for the DOC.

Further illustration of this claim comes from dialectal variation in Greek (Gregory [120]). Separate exponence of Dative Case has disappeared, and in standard Greek the Indirect Object relation is marked Genitive. In northern Greek, however (the dialect of Thessaloniki and Macedonia), it is marked Accusative (though morphological Genitive still exists and is used for other functions). In standard Greek the "canonical" ditransitive verbs assign morphological Genitive to their Recipient arguments, and these arguments can never be made the Subjects of "Recipient Passives". Other ditransitives are subject to idiosyncratic variation: they may mark the Recipient with Acc (normally only if it is the sole Object), and the latter may then become Subject under passivization. However, the grammatical behaviour of these verbs is identical in northern Greek, despite the fact that there is no morphological Case available to distinguish verbs in which the Recipient is an IO

³³Kindly provided for me by Thea Bynon.

from those where it is a DO. This supports the position that abstract Dative Case can be assigned structurally to IOs even in the absence of a distinct morphological exponence for Dative.

I conclude this part of the chapter with a brief discussion of the the corresponding constructions in Icelandic.

7.6 Icelandic: Dative Subjects and "Quirky Case"

It now seems to be generally accepted that in Icelandic, as in a number of other languages³⁴, an NP marked with Oblique Case can be a Subject, while a co-argument, though marked Nominative and co-indexed by verb agreement, is nonetheless the Object. This conclusion is based on the ability of the former, but not the latter, to antecede an anaphor, to control into a non-finite complement or adjunct clause, to co-ordinate with other Subjects, and (exemplified in (27a) and (27b) respectively) to undergo raising to Subject (SSR) or to Object (SOR). I take raising as the most reliable test for subjecthood. Examples are given in (7.33) and (7.34).

(7.33) *Honum er talið hafa verið gefnir peningarnir.* (Icelandic)
 him, Dat is believed have, Inf been given the-money, Nom
 He is believed to have been given the money.

(7.34) *Ég tel honum hafa verið gefnir peningarnir.* (Icelandic)
 I, Nom believe him, Dat have, Inf been given the-money, Nom
 I believe him to have been given the money.

It is also characteristic of Icelandic that arguments bearing any GR can be assigned idiosyncratic ("quirky") Case, which is preserved under the relation-changing operations of passivization, raising and anticausativization³⁵. The Case-marking of Dative Subjects is normally treated as an instance of this phenomenon. By contrast, I wish to maintain that the Dative-marking of the nominals in question (i.e. those in (7.3) and (7.15) above) is not "quirky" but a function of their bearing the GR 3 (in some stratum). Evidence for distinguishing these cases from "quirky Case" phenomena can be found, I suggest, in (i) the systematic (rather than quirky) nature of Dative

³⁴ Particularly in South Asia, where it is an areal characteristic. cf. the articles in Verma and Mohanan [317].

³⁵ In those anticausative verbs which are morphologically marked as derived from the corresponding causative, however, the quirky Object becomes a nominative Subject (Zaenen and Maling [324])

assignment to Indirect Objects, and (ii) the existence of a closely related language (a dialect of Faroese) in which quirky Case has been lost, but the Dative Case of Recipient and Experiencer subjects is unaffected.

The first point may seem to go against the evidence, as the Case marking of Double Object constructions in Icelandic is at first sight highly idiosyncratic. However, once triadic verbs in Icelandic are divided into canonical ditransitives and their complement, the picture changes³⁶. In Class A, comprising many of the "canonical double-object verbs", the Case marking is quite straightforward, the Recipient being assigned Dat and the Theme Acc.; I suggest that the relational structure of these verbs, in the stratum at which Case is assigned, is $\langle P, 1, 3, 2 \rangle$, as posited above for the corresponding verbs in English³⁷.

In class B, by contrast, in the V NP NP configuration both "Objects" are assigned idiosyncratic Case. Unlike class A, they alternate with an alternative configuration, V NP PP, in which the Theme (the NP) bears the same idiosyncratic Case as it does in the former construction. These data can be explained if the first construction represents advancement of the Recipient to 2, putting the Theme *en chômage*; it will then preserve the Case it was assigned in the stratum where it was an actual 2^{38, 39}.

This relational interpretation is supported by the data for passivization. With class A verbs either Object can become the Passive Subject, as in English. With class B verbs, however, the Theme cannot become Subject, as is to be expected if it is a *chômeur*. It can become a Subject by contrast under passivization of the V NP NP construction, in which it is predicted to still be a Direct Object.

The second piece of evidence involves linear inversion of the postverbal nominals (i.e. inversion of the Recipient < Theme linear order, taken as canonical for Double Object constructions). In the

³⁶There is much support in the literature for this partition; cf. H&P p.187f, Zaenen et al. [325, p.111].

³⁷Some of these verbs can also occur with a PP, as in the "Dative construction", but the interpretation then is purely directional (H&P, p.204), not as a cause of possession (cf. section 7.2 above).

³⁸The default rule of the *Chômeur* Marking Principle in Relational Grammar (P&P [257])

³⁹The Case of the advancing Recipient can be either Acc or Dat, but not Gen. If the Case marking of Recipients is assumed to be quirky, this would seem like an accidental gap. However if it is assumed that quirky Case is assigned only by verbs in initial strata, then it is reasonable that the Recipient should be able to take either Acc or Dat, since it bears the IO and DO relations in successive strata, but not Gen. Its Case in the initial stratum is assigned by a preposition, not the head verb.

case of Class A verbs, this occurs freely⁴⁰. With Class B verbs it can only occur under the "Heavy NP extraposition" of the Recipient. It has been noted that this operation normally (i) targets Direct Objects⁴¹; and (ii) moves them over adjuncts, among which Chômeurs are presumably to be included.⁴²

Thus the evidence of Icelandic tends to support the conclusion argued above, that there is a significant and relatively cross-linguistically stable subclass of triadic verbs which forms "Double Object" constructions on the basis of a relational stratum ⟨P, 1, 2, 3⟩ (linear ordering $1 < P < 3 < 2$), leaving both Objects available for passivization. Within this domain, on which I will now exclusively concentrate, Case assignment follows a predictable relation-based pattern.

That the Dat assigned in this construction is structural and not idiosyncratic is supported by some indications that even when the rule preserving lexical Case in Icelandic is relaxed, the rule assigning Dative Case to Recipients is unaffected - suggesting that they are not the same rule. I am not aware of any such possibility in Icelandic proper⁴³, but this suggestion arises from the evidence of the closely related Faroese⁴⁴, in which precisely the scenario just envisaged appears to be realized. Many Faroese verbs assign quirky Case, as in Icelandic, but in contrast to Icelandic, this Case is not normally preserved under passivization (7.35) or raising.⁴⁵

- (7.35) 1. *Teir fagnaðu Depilsmönnum væl.* (Faroese)
 They,Nom welcomed Depil-men,Dat heartily
 They welcomed the men from Depil heartily.

⁴⁰With focussing of the IO, for which I have no explanation.

⁴¹Postal [267]; cf. the discussion in P&S p.113f.

⁴²It should be noted here that when the linear order is inverted in this way, with class A verbs the Theme can bind a reflexive in the postposed IO, whereas with class B verbs it cannot. This is also predicted on the present account, the Theme being a DO in the first case and a chômeur in the second.

⁴³Andrews, however, presents some interesting data concerning the relative acceptability to Icelandic speakers of the suppression of Oblique Case under raising [15]. This is normally impossible both for quirky Case and for Dative Recipients (which Andrews also regards as assigned Case lexically). (The latter is illustrated in (7.33) and (7.34) above.) A number of respondents were prepared to accept the suppression of lexical Accusative, whereas the Dative Case of recipients was not accepted under any circumstances. This tends to support the line of argumentation being given here using Faroese. However note that Andrews and others interpret it as merely a penchant for quirky Dative as against other quirky Cases, a tendency labelled "Dative sickness" by Icelandic grammarians.

⁴⁴The dialect designated Faroese A in H&P, which is said to be associated with older people and to be disappearing in favour of a dialect which has no Oblique Subjects.

⁴⁵The example is from Lockwood [227, p.103], who notes that preservation of Dative is possible with some verbs. It is not clear whether he means verbs assigning quirky Dative. On checking a number of such verbs with an informant (not a native speaker), I was informed that they invariably took Dative Objects, while all with one possible exception assigned Nom to the corresponding passive Subject.

2. *Depilsmenn vóru væl fagnaðir.* (Faroese)
 Depil-men,Nom were heartily welcome,Pass
 The men from Depil were heartily welcomed.

Thus, "quirky Case", including Dative, is not normally preserved under passivization in Faroese. However, Experiencer Subjects (7.36) and passivized Recipients (7.37) continue to be assigned obligatory Dative⁴⁶

- (7.36) *Henni damar mjolkinu.* (Faroese)
 she,Dat likes milk,Acc
 She likes milk

- (7.37) 1. *Hann gav gentuni blýantin.* (Faroese)
 He,Nom gave the-girl,Dat the-pencil,Acc
 He gave the girl the pencil.

2. *Henni var givin bókin.* (Faroese)
 She,Dat was given the-book,Acc
 She was given the book.

Thus a case can be made that Icelandic Dative in these contexts is not quirky but systematic. The assignment of Dat to the Recipient in the DOC is unsurprising if, as I have argued, it is a final 3. The Recipient Passive Subject and Experiencer Subject are, on my analysis, final 1's. However I have argued, contrary to other views, that they are 3's in the penultimate stratum.

7.7 Conclusion

The relational analysis of ditransitives in Icelandic which I have undertaken in this last section seems to support the relational structures proposed at the beginning of the chapter. That proposal was that the nature of the GR Indirect Object is intrinsically linked to its being a predication target and hence a co-Topic and in some sense a co-Subject of the composite predicate. I argued

⁴⁶Carlson T. Schutze, p.c., suggests (following work by M.Barnes which I have been unable to locate) that the Passive Subject in this last example may simply be derived from an alternative subcategorization frame in which the complement has (presumably structural) Accusative. However H&P, who cite this as an example of the "weakness" of m-case in Faroese compared to Icelandic, give the impression that it is a more general phenomenon. Moreover David Margolin (p.c.), who is not a native speaker but has lived in the Faroes, maintains that the verbs in question take only Dative Objects. Even if Barnes' explanation is accepted, it would not entirely invalidate my point, which is that in the examples given below the Dative Case is never optional in the dialect under consideration.

for a revised version of the relational hierarchy in which 3 outranks 2, an outranking which is based on topicality but whose reflexes are found in its greater grammatical prominence. In contrast to a view which is widely accepted across different frameworks, I proposed that this prominence is not due to 3 > 2 advancement, but to the properties of the 3 itself, and that it shows this prominence, both in the active DOC and especially in unaccusative environments, while remaining a 3. In fact it was claimed that for an important subclass of ditransitive verbs, for the languages considered, 3 > 2 advancement does not take place at all. This is the theoretical motivation for positing a 3 > 1 passive operation distinct from the cross-linguistically common 2 > 1 passivization. This distinction seems to be supported by the evidence given both from the historical development of English and from other Germanic languages.

Chapter 8

Summary and concluding remarks

In this dissertation I have proposed an approach to Grammatical Relations based on two main claims: first, that Topics are the targets of underlying predications; and second, that the relational hierarchy and the familiar data which motivate it can be derived from the composition of such underlying predicates. The approach is based on a relational view of the structure of language, integrated into a typed feature structure grammar based on HPSG and given a model-theoretic semantics related to situation semantics. However it allows a considerable degree of abstraction away from questions of constituent structure, which are regarded as matters of superficial language-specific encoding. This framework was elaborated and discussed in chapter 2.1.

The semantic side of the thesis has attempted to show that the Topic-Comment relation is analogous to that between possible worlds (situations) and the propositional contents which they support. This parallelism is derived from the tradition of Montague semantics, as represented especially by the work of Keenan and Faltz. However a partialization of this semantics was put forward to bring it into line with the insights of situation semantics. An algebra of “almost saturated psoas” was defined over individuals and properties, parasitic on and isomorphic to

the **infon algebras** of Barwise and Etchemendy's formalization of situation theory, which relate situations and the **soas** which they support.

In chapter 4 it was argued that the denotations of Topics and Comments can be treated as the **points** and **open sets** respectively of a topological space, the relation between the two being intuitively that between an instance and the properties which it instantiates. It was claimed that this captures well-known semantic restrictions on which NPs can be made Topics of a sentence. Two apparent difficulties for this theory were discussed: exception phrases, and vague quantifiers, the latter being deferred to further research.

The formal analogy between topics and situations (or **points**) is made the basis of an account of intersentential Topic relations (chapter 5). The underlying metaphor was still topological; that of defining a Topic by fixing its location in a conceptual space. Over a discourse fragment the location of an overall Topic, or **supertopic**, may be effected by giving information locating **subtopics** which are inferred to be in its conceptual "neighbourhood". Taking the idea of Topics as worlds seriously, this inter-Topic relation was developed as the accessibility relation of a modal logic of Topics, a perspective which brings out certain parallels with constructions which have been similarly treated, notably conditionals. The semantic content of this relation was described in terms of a generalized location relation, called **attributive** because it has the effect of using the one Topic-Comment structure to define a property which will be an attribute of a **supertopic**. The relationship was interpreted in terms of the fixing of restrictions on variables in subtopics relative to that of the supertopic, along lines proposed by Gawron [114]. The theory so developed was applied to certain discourse fragments discussed by Gawron, and argued to show greater flexibility and coverage while preserving Gawron's main insight. Finally it was applied to the East Asian areal phenomenon of hanging Topics (or multiple Subjects), which were claimed to be a case where the intersentential Topic relation as defined is reflected in the intrasentential grammar.

Chapter 6 examined the relationship between Topics and Objects, focussing on clitic doubling (or more neutrally argument co-indexing systems). I assumed a view (standard in HPSG) of agreement as structure-sharing of the index of an argument with the corresponding **ROLE** value in the

Predicate. Although any core argument may be so co-indexed (in some languages), this acquires particular significance when the co-indexed argument is the target of predication. Although by default the predication target is the Subject, many languages cross-reference a Direct Object precisely when the latter is Topic, the main variation being between languages which co-index it when it actually serves as Topic and those which co-index it whenever it is topicalizable (i.e. specific). I argued for an interpretation of this co-indexing as abstraction over the variable so that instead of being unified with that of the corresponding syntactic argument it is stored and discharged only at the top level of the sentence, thus producing the semantic effect of Object topicalization.

In the second part of chapter 6 a contrast was noted between Direct Object and Indirect Object clitics, the latter patterning in certain important respects with Subjects. For example they are not sensitive to actual topichood or even topicalizability, just like Subject agreement. Furthermore cliticized Indirect Objects resemble Subjects rather than Objects in some languages in obeying the Specified Subject condition and in not licensing parasitic gaps. This leads Sportiche, in his classic study of French clitics from a perspective very different from the present one, to stipulate that the clitic agreement functional heads for Indirect Objects are A positions whereas those for Direct Objects are A' positions. The same typology is adopted by Rudin [277] for her (GB-based) study of CLD in Bulgarian. The chapter closed with a detailed relational study of Amharic, concluding that the clitics which co-index topical Objects in that language co-index IOs not because they are "Objects", but because of the topicality of IO as a grammatical relation.

This led, in the final chapter, to a proposed revision to the relational hierarchy. It was claimed that basic predicates in language are maximally binary and sensitive to topichood, their predication target being the default Topic. Predicates of greater valency are treated as composite, the effects of the hierarchy being derived from the process of composition. Indirect Objects differ from Obliques essentially in being the Subjects, rather than the Objects, of a secondary predicate. In the unified argument structure of the resulting predicate, it is claimed that they rank above Direct Objects, functioning as co-topics and in some circumstances secondary Subjects of the clause. This has a certain semantic correlation with the thematic roles which are usually taken as

eligible for promotion to 3 (essentially variations on a Locative relation), which generally have the property of being extensional and allowing the secondary predicates targetting them to behave as homomorphisms.

This view of Direct and Indirect objects was argued in detail by means of a comparative study of the history of Germanic. In particular several arguments are given against the standard generative view that the syntactic privileges of the Recipient over the Theme in the Double Object Construction is the result of 3 > 2 advancement. It is argued that the Recipient remains a 3 and that 3 outranks 2 on the hierarchy, which accounts for the data normally taken to justify the standard view. The resulting theory raises the possibility of the relational hierarchy, instead of being a rather mysterious primitive, being derivable from an information-based account of predication.

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